A.M. BAIRD
ENGINEERING & SURVEYING, INC.
1257 Main Street • P.O. Box 396 • Fortuna, CA. 95540 • (707) 725-5182 • Fax (707) 725-5581

CONSULTING – LAND DEVELOPMENT – DESIGN – SURVEYING

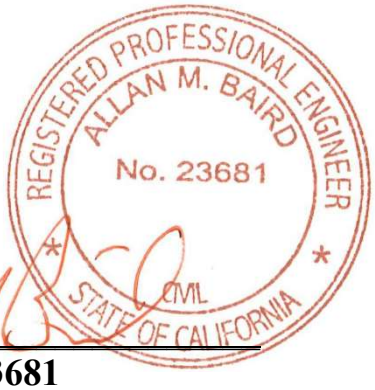
ENGINEERING GEOLOGIC SOILS REPORT

GEOLOGIC HAZARDS AND DEVELOPMENT CLASS R2

PREPARED FOR:

Aurel Coza
APN: 110-251-037 & 110-251-038
Block 199, Lots 31 & 32
Shelter Cove, CA
Humboldt County

PREPARED BY:



ALLAN M. BAIRD, RCE 23681

November 20, 2023
Job# 23-6059

CONTENTS

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

RE: Humboldt County Engineering Geologic Soils Report, R-2
Client: Aurel Coza
Site APNs: 110-251-037 & 110-251-038
Site Coordinates (WGS84): 40.0280 (latitude) , -124.0457 (longitude)

Introduction

Representatives from A.M. Baird Engineering performed a site investigation on March 30, 2023 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. Observations made during the site investigation and laboratory results regarding site soils are the focus of this report.

Site Description

The coastal community of Shelter Cove is located on Point Delgada on the Pacific Ocean approximately 82 land miles south-southeast of Eureka, and approximately twenty-five road miles southwest of Garberville. The subject property is located in a moderate-instability area on the southerly slopes of the Coast Range Mountains approximately 1,360 feet in elevation above Mean Sea Level (MSL). The subject property is designated as Lots 37 and 38 of Block 199 of the Shelter Cove Subdivision and encompasses an aggregate area of approximately 0.55 acres along the west facing slope of Blue Ridge Road. The property is largely wooded with a clear view of the Pacific Ocean. Slopes on both parcels are in excess of 30% throughout most of the landscape with a flat area near the middle of the southernmost parcel (APN: 110-251-038). The southernmost parcel is the most buildable with respect to an onsite wastewater treatment system; however, the merger of both parcels is likely required to meet appropriate septic dispersal field sizing requirements and site spatial conditions. The lot is served by the Resort Improvement District of Shelter Cove for municipal water supply. The property is located approximately 3,600 feet west of the Alquist-Priolo Fault in the Coastal Zone of Shelter Cove. The parcel is approximately 6,800 feet east of the Shelter Cove Airport runway and is not located within an Airport Compatibility Safety Zone.

Site Investigation

During the site investigation, one trench, ten feet in depth, was excavated adjacent to the flat area near the middle of the parcel. Both specialists onsite agreed that the single sampling location would be representative of both the primary and reserve fields, as both fields will be in close proximity to the sampling location. The test hole revealed three distinct soil horizons within the examined depth. The first soil horizon was dark brown sandy loam from the existing grade to approximately 32 inches below grade. The second soil horizon was yellowish brown sandy clay loam mixed with small to medium sized angular rock from approximately 32 inches below grade to approximately 53 inches below grade. The third soil horizon was light yellowish brown sand clay loam mixed with small to medium sized angular rock from approximately 53 inches below grade to the bottom

of the test hole. The second soil horizon appeared to be the most restrictive as field texturing showed a higher clay content than the other two. Field texturing was performed on site, no signs of groundwater were observed. Laboratory analyses were performed on a sample taken from approximately 48 inches below grade in the most restrictive layer; the results are appended.

Soil Conditions

Soil sampling at TH#1 revealed single-grain, Zone 2 dark brown sandy loam (Munsell color 10 YR 3/3) from approximately 0.5 feet in depth to approximately 2.75 feet in depth with a coarse content of approximately 25% consisting of gravel and small angular rock. The soil is loose when moist and non-sticky when wet with no plasticity. No soil mottling or oxidation was observed within the first 2.75 feet.

In the second soil horizon, the soil is single-grain, Zone 2 yellowish brown sandy clay loam (Munsell color 10 YR 5/6) from approximately 2.75 feet in depth to approximately 4.25 feet in depth with a coarse content of approximately 45% consisting of gravel and small angular rock. The soil is very friable when moist and slightly sticky when wet with slight plasticity. No soil mottling or oxidation was observed within the first 4.25 feet.

In the last soil horizon, the soil is single-grain, Zone 2 light yellowish brown sandy loam (Munsell color 10 YR 6/4) from approximately 4.25 feet in depth to the bottom of the test pit with a coarse content of approximately 45% consisting of gravel and small angular rock. The soil is very friable when moist and slightly sticky when wet with slight plasticity. No soil mottling or oxidation was observed in the test hole. The soil profile, textural analysis and soil chart are appended.

Groundwater

No groundwater or soil mottling was encountered during this soils investigation.

Slope Stability and Drainage Hazards

The nature of the entire property appears to be stable and should remain stable provided the recommendations given in this report are followed. Areas disturbed during construction activities should be re-vegetated prior to the rainy season. 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. This high to very high level of risk of seismic hazard is typical for Shelter Cove.

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 building site is located approximately 3,600 feet east from 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 (Local Hazards Map, 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, 2017). Site-specific soil parameters were calculated using the USGS U.S. Seismic Design Maps (Table 1) (ATC, 2022):

Table 1: USGS Ground Motion Parameters.

Latitude	40.0280
Longitude	-124.0457
Occupancy Category	II (normal buildings)
Importance Factor, I	1.0
Site Class	D (stiff soil)
Site Coefficients	F_a=1.2
	F_v=null
Mapped Spectral Response Acceleration Parameters	S_s=2.592 g (0.2-second spectral response)
	S_1=1.245 g (1-second spectral response)
Design Spectral Response Acceleration Parameters	S_{MS}=2.592 g (0.2-second period)
	S_{M1}=null (1-second period)

Design Spectral Response Acceleration Parameters (five-percent damped design spectral response)	S_{DS}=1.728 g (0.2-second period)
	S_{D1}=null (1-second period)
Seismic Design Category (SDC)	E (S_1>0.75g)
Peak Ground Acceleration (S_S/2.5)	1.0368 g

Flood Hazards

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

Existing Grade (Cut/Fill)

Slopes on both parcels are in excess of 30% throughout most of the landscape with a flat area near the middle of the southernmost parcel (APN: 110-251-038).

Earthquake Motion Hazards

Slope instability, liquefaction, and surface rupture due exclusively to faulting or lateral spreading are not considered consequential as to require specific analysis. Dynamic seismic loading for retaining walls supporting more than 6 feet of backfill and peak ground acceleration for design purposes shall be S_S/2.5 and use ASCE 7-22 Figure 22-7, unless additional site-specific analysis is provided beyond the scope contained herein.

Recommendations

No expansive soils were encountered during this investigation that require specific recommendations. The soil onsite is capable of supporting a load of 1,500 pounds per square foot (psf). One or two-level structures are suitable uses for this property. Settlement is not anticipated to be detrimental provided considerations are given to the recommendations presented herein:

1. Foundations for any residence 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 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 and a minimum of 24 inches wide for three-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 and a minimum of 10 inches thick for three-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.

2. 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%.

3. 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.

4. 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.

5. 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 max slope.

6. 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.

7. Floor slabs should be reinforced by #3 reinforcing bars at 18" o.c. or #4 reinforcing bars at 24" 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 shall be aware of the current recommendations and guidelines for slabs below grade according to the American Concrete Institute.

8. 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).

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

10. Any floor space at or below existing grade level that will be used as inhabitable areas or for storage shall be appropriately damp proofed or waterproofed 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.

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.

Sincerely,

Allan M. Baird
Principal, RCE# 23681

References

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

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.

County of Humboldt. (2022). Humboldt County Web GIS Planning and Building Mapping. Available Online
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 2022).
http://maps.conservation.ca.gov/cgs/fam/App/index.html

Prentice, C. S., Merritts, D. J., Beutner, E. C., Bodin, P., Schill, A., Muller, J. R. (1999). Northern San Andreas Fault near Shelter Cove, California. *Geological Society of America Bulletin*, April, 512-523.

United States Geological Survey Store (The USGS Store). (2022). Map Locator & Downloader Online
http://store.usgs.gov/b2c_usgs/usgs/maplocator/%28ctype=areaDetails&xcm=r3standardpitrex_prd&carea=%24ROOT&layout=6_1_61_48&uiarea=2%29/.do

California's Office of Statewide Health Planning and Development (OSHPD). (2022). U.S. Seismic Design Maps. Available Online
https://seismicmaps.org/

The Applied Technology Council (ATC). (2022). Hazards by Location. U.S. Seismic Design Parameters Available Online.
https://hazards.atcouncil.org/#/seismic?lat=40.0242&lng=-124.0398&address=

Appendix

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

Site Plan

Humboldt County WebGIS
Humboldt County Planning and Building Department

0 0.01 0.02 0.04 mi
0 0.01 0.02 0.04 mi
RF = 1:1,447 1 in = 121 ft

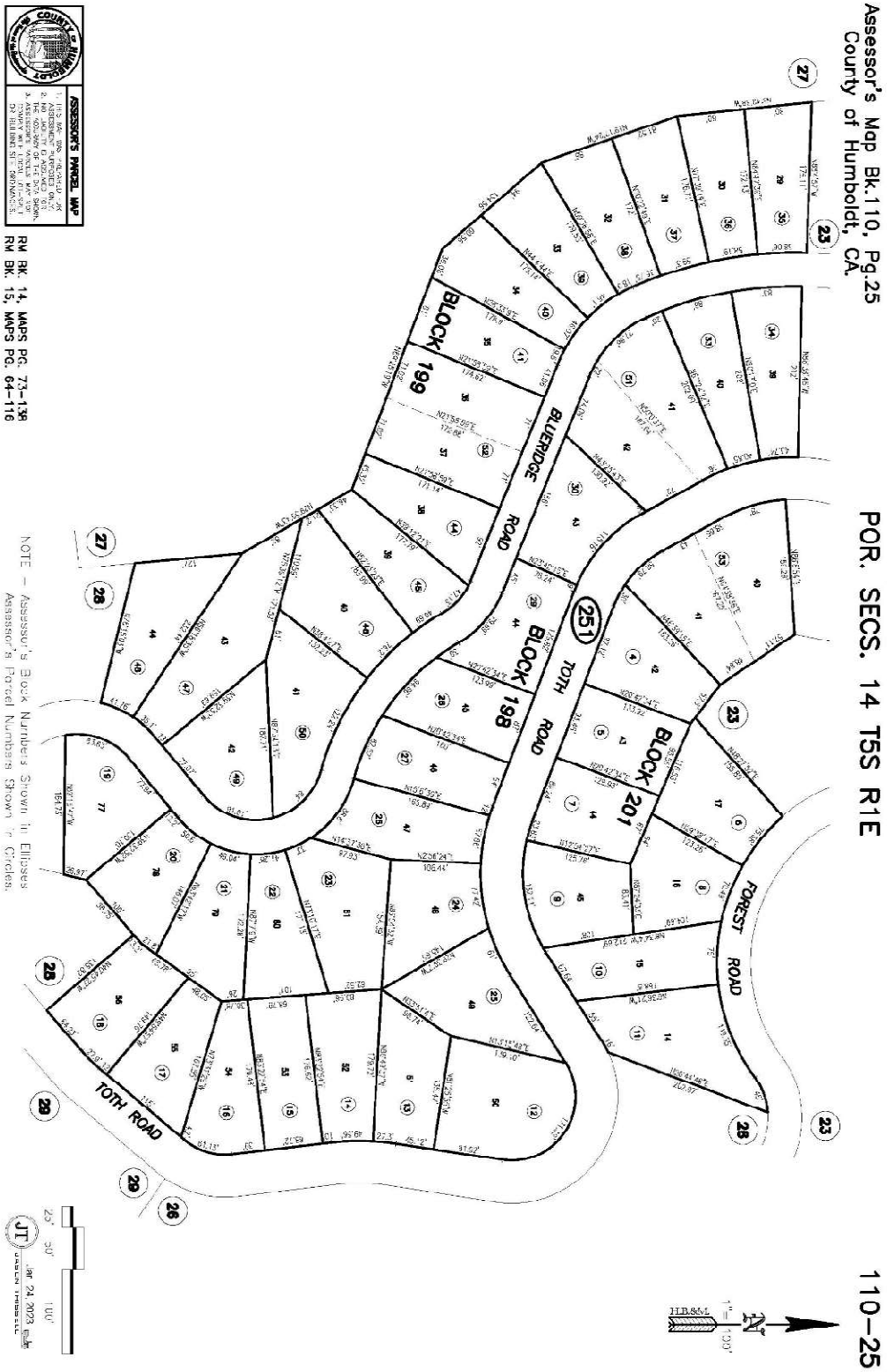
4/5/2023, 2:35:23 PM Web AppBuilder 2.0 for ArcGIS

Map Disclaimer:
While every effort has been made to assure the accuracy of this information, it should be understood that it does not have the force & effect of law, rule, or regulation. Should any difference or error occur, the law will take precedence.

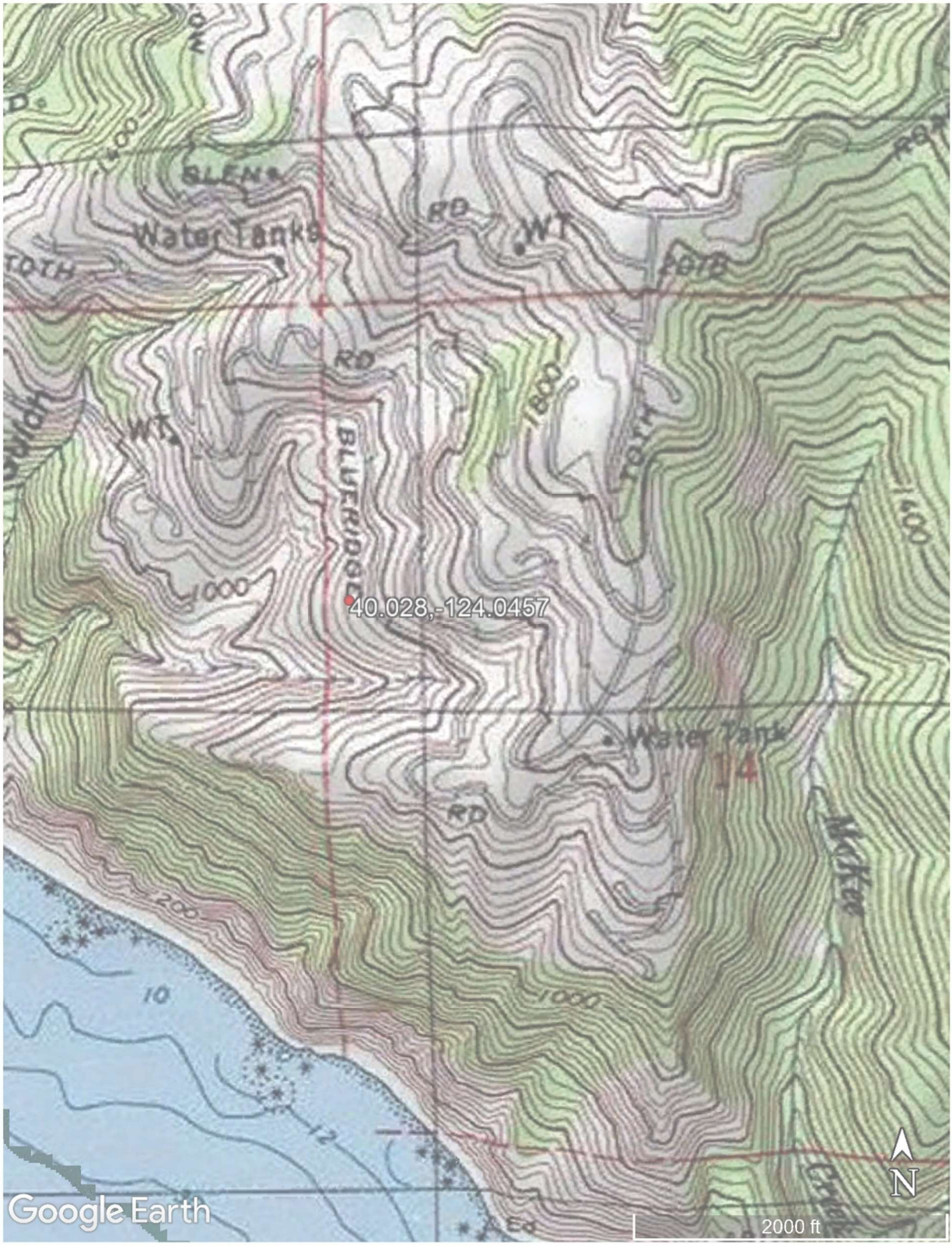
Source: Humboldt County GIS, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Highways and Roads
Principal Arterials
Minor Arterials
Major Collectors
Minor Collectors
Local Roads
Private or Unclassified
Major River or Stream
Blue Line Streams
Perennial 1-3
Perennial >4
Intermittent
Subsurface
City Boundary
Counties
Parcels (no APN labels)

Assessor's Parcel Map

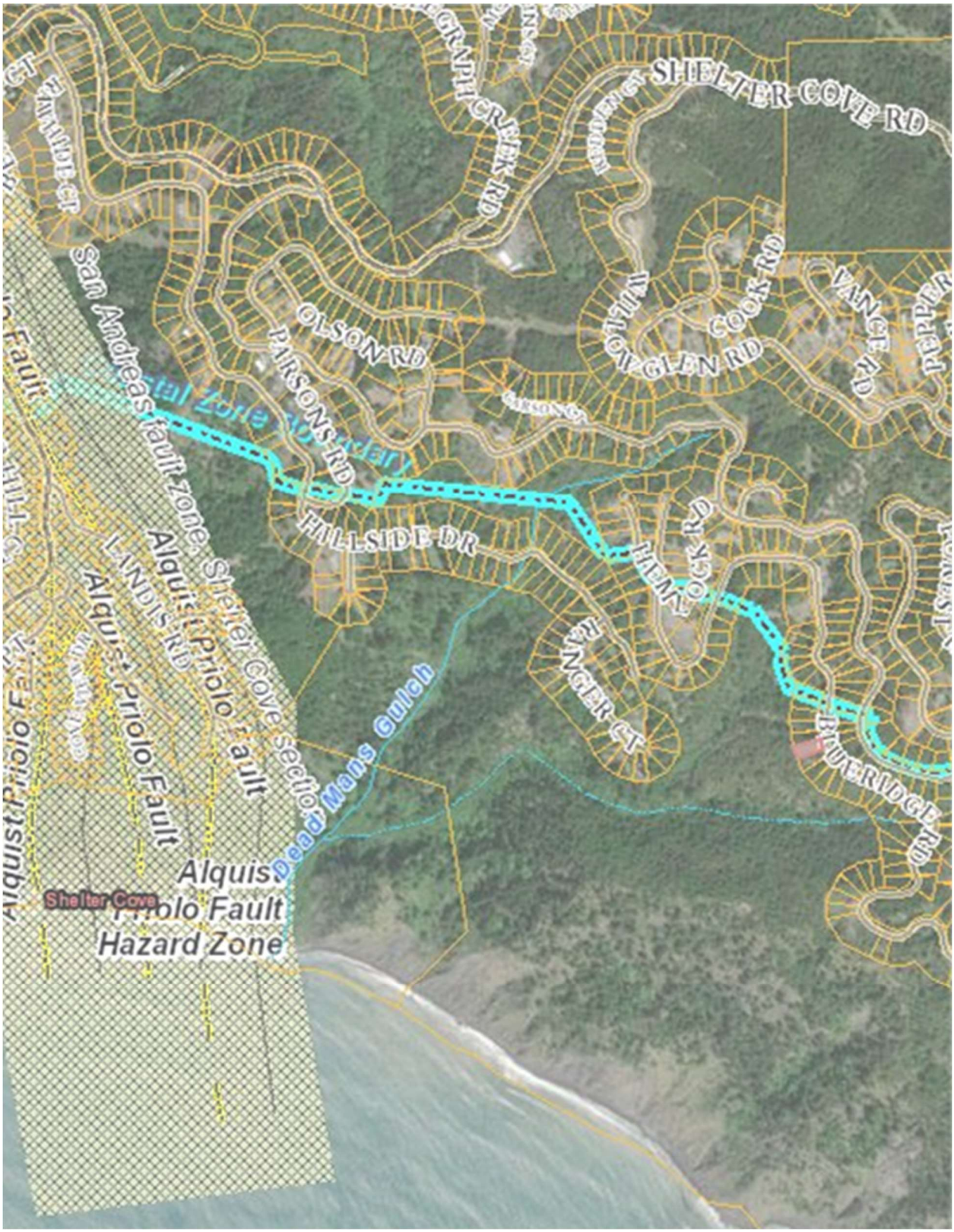


Topographic Map



Flood Map, 100-yr

Fault Activity Map



Seismic Design Parameters

⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

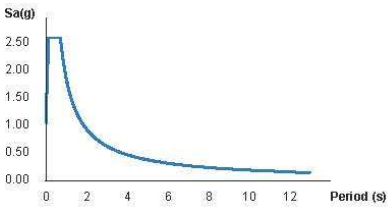
ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

ATC Hazards by Location

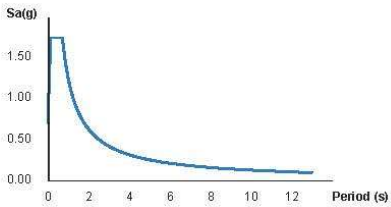
Search Information

Coordinates:	40.028, -124.0457
Elevation:	1362 ft
Timestamp:	2023-11-20T23:03:12.082Z
Hazard Type:	Seismic
Reference Document:	ASCE7-10
Risk Category:	II
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	2.592	MCE_R ground motion (period=0.2s)
S_1	1.245	MCE_R ground motion (period=1.0s)
S_{MS}	2.592	Site-modified spectral acceleration value
S_{M1}	1.868	Site-modified spectral acceleration value
S_{DS}	1.728	Numeric seismic design value at 0.2s SA
S_{D1}	1.245	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.906	Coefficient of risk (0.2s)
CR_1	0.89	Coefficient of risk (1.0s)
PGA	0.995	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.995	Site modified peak ground acceleration
T_L	12	Long-period transition period (s)
SsRT	3.066	Probabilistic risk-targeted ground motion (0.2s)
SsUH	3.383	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	2.592	Factored deterministic acceleration value (0.2s)
S1RT	1.441	Probabilistic risk-targeted ground motion (1.0s)
S1UH	1.619	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.245	Factored deterministic acceleration value (1.0s)

Soil Profile Test Hole #1

PROJECT NAME:	COZA	DATE OF EXCAVATION:	03/30/2023
PROJECT #:	23-6059	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	110-251-037 & 038	WEATHER SEASON:	WET
TEST HOLE #:	1	LOGGED BY:	CPL

DEPTH (ft)	DESCRIPTION	COLOR	SAMPLE DEPTH	SOIL CLASS
0	DRIED LEAVES, FOREST COVER			
-	TOP SOIL , ROOTS			LOAM
0.5 - 1.0 - 1.5 - 2.0 - 2.5	MUNSELL COLOR: 10 YR 3/3 - dark brown GRAVEL (%): ~25% ROOTS: first 30 inches STRUCTURE: Single Grain, crumb CONSISTENCY: Wet: non-sticky (0) ; non-plastic (0) ; Moist: loose (0) GROUNDWATER: no signs of groundwater observed from 0"-32"			SANDY LOAM
-	DISTINCT TRANSITION			
3.0 - 3.5 - 4.0	MUNSELL COLOR: 10 YR 5/6 - yellowish brown GRAVEL (%): ~45% ROOTS: few STRUCTURE: Single Grain CONSISTENCY: Wet: slightly-sticky (1) ; slightly-plastic (1) ; Moist: very friable (1) GROUNDWATER: no signs of groundwater observed from 32"-53"		●	SANDY CLAY LOAM
-	DISTINCT TRANSITION			
4.5 - 5.0 - 5.5 - 6.0 - 6.5 - 7.0 - 7.5 - 8.0 - 8.5 - 9.0 - 9.5	MUNSELL COLOR: 10 YR 6/4 - light yellowish brown GRAVEL (%): ~45% ROOTS: none STRUCTURE: Single Grain, crumb CONSISTENCY: Wet: slightly-sticky (1) ; slightly-plastic (1) ; Moist: very friable (1) GROUNDWATER: no signs of groundwater observed from 53" to the bottom of the test hole			SANDY LOAM
-	NO GROUNDWATER			
10.0	END OF EXCAVATION			

Soil Texture Test Hole #1

PROJECT NAME:	COZA	DATE OF EXCAVATION:	03/30/2023
PROJECT #:	23-6059	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	110-251-037 & 038	WEATHER SEASON:	WET
TEST HOLE #:	1	LOGGED BY:	CPL

TH1-1	SAMPLE NUMBER
5.0	DEPTH (ft)
883.0	TOTAL SAMPLE WEIGHT (gm)
339.0	COARSE WEIGHT (gm)
75.0	A. OVENDRY WEIGHT (gm)
1:00:00 PM	B. STARTING TIME (hh:mm:ss)
63.1	C. TEMP @ 40 SEC. (°F)
25.0	D. HYDROMETER READING @ 40 SEC. (gm/l)
-7.5	E. COMPOSITE CORRECTION (gm/l)
17.5	F. TRUE DENSITY @ 40 SEC. (gm/l) [D-E]
74.3	G. TEMP @ 2.0 HRS. (°F)
13.0	H. HYDROMETER READING @ 2.0 HRS. (gm/l)
-5.2	I. COMPOSITE CORRECTION (gm/l)
7.8	J. TRUE DENSITY @ 2.0 HRS. (gm/l) [H-I]
76.6	K. % SAND [100-(F/A •100)]
10.3	L. % CLAY [J/A •100]
13.0	M. % SILT [100-K-L]
SANDY LOAM	N. USDA TEXTURE
2	O. SOIL PERCOLATION SUITABILITY CHART ZONE
23.4	P. COMBINED % SILT AND CLAY [L+M]
38.4	Q. COARSE % BY WEIGHT [COARSE WEIGHT/A •100]
5.1	R. % COARSE ADJUSTMENT [0.000006Q^3+0.00012Q^2+0.11936Q-0.01882]

Soil Chart

PROJECT NAME:	COZA	DATE OF EXCAVATION:	03/30/2023
PROJECT #:	23-6059	EXCAVATION METHOD:	EXCAVATOR / HAND
SITE APN:	110-251-037 & 038	WEATHER SEASON:	WET
TEST HOLE #:	1	LOGGED BY:	CPL

COARSE ADJUSTMENT: TH#1 @ 4.0' = 5.1%