COUNTY OF MENDOCINO DEPT OF PLANNING & BUILDING SERVICES 120 WEST FIR STREET FORT BRAGG, CA 95437 Telephone: 707-964-5379	Case No(s) Bill CDF No(s) Date Filed Fee $ Receipt No. Received by Office Use Only

EMERGENCY PERMIT APPLICATION FORM

Name of Applicant	Name of Owner(s)	Name of Agent
Bill Knapp	Bill and Barbara Knapp	N/A
Mailing Address	**Mailing Address**	**Mailing Address**
43026 N Hwy 1 Westport, CA 95488	43026 N Hwy 1 Westport, CA 95488	N/A
Telephone Number	**Telephone Number**	**Telephone Number**
707-964-7355 Cell 408-892-6023	707-964-7355 Cell 408-892-6023	N/A

Project Description:

Stabilization of receding ocean facing bluff face near residence

Driving Directions

The site is located on the W (N/S/E/W) side of State Hwy 1 (name road)

approximately 2 miles (feet/miles) N (N/S/E/W) of its intersection with

Branscomb Rd. (provide nearest major intersection).

Assessor's Parcel Number(s)

APN 0138200200

Parcel Size	Street Address of Project
12.5 ☐ Square Feet ☒ Acres	43026 N Hwy 1 Westport CA 95488 **Please note: Before submittal, please verify correct street address with the Planning Division in Ukiah.**

EMERGENCY PERMIT
APPLICATION QUESTIONNAIRE

The purpose of this questionnaire is to relate information concerning your application to the Planning & Building Services Department and other agencies who will be reviewing your project proposal. The more detail that is provided, the easier it will be to promptly process your application. Please answer all questions. For questions which do not pertain to your project, please indicate "Not Applicable" or "N/A".

1. **NATURE OF THE EMERGENCY NARRATIVE** (use additional pages if necessary).

a) Describe the nature, cause and location of the emergency.

Retreating ocean front bluff face approaching our residence from the ocean side (West side) at 43026 N Hwy 1 Westport CA. Primary cause has been determined to be migrating groundwater seeping out of the bluff face adjacent to the residence. More detail in attached documentation from Brunsing Associates, Inc.

b) Describe the remedial protective or preventive work required to deal with the emergency.

Primary planned work is ground stabilization using permeation grouting techniques and ground water management to route ground water flow away from the residence to a more distant and stable area north of the residence site. See the attached document for detail on the engineering analysis and methodology to deal with the emergency situation.

c) Describe the circumstances during the emergency that justify the course(s) of action taken, including the probable consequences of failing to take action.

During heavy rain periods there is active soil movement from the bluff face, which is approximately 80' above sea level, to the beach below. Without stabilization and ground water flow management the integrity of the residence is threatened. More details are provided in the attached document.

d) Describe any secondary improvements such as wells, septic systems, grading, vegetation removal, roads, etc. that are necessary to deal with the emergency.

None

2. Are there existing structures on the property? ☒ Yes ☐ No

If yes, describe below and identify the use of each structure on the plot plan.

Residence with attached garages, see Plates 2 and 3 in attached document.

3. Is any grading or road construction planned? ☐ Yes ☒ No

Estimate the amount of grading in cubic yards None c.y. If greater than 50 cubic yards or if greater than 2 feet of cut or 1 foot of fill will result, please provide a grading plan.

Describe the terrain to be traversed (e.g., steep, moderate slope, flat, etc.).

4. Will vegetation be removed on areas other than the building sites and roads? ☐ Yes ☒ No

If yes, explain:

5. Project Height. Maximum height of structure(s): no new structures feet

6. Describe all exterior materials and colors of all proposed structures that are visible beyond the boundaries of the subject parcel.

No new structures will be created by this project.

7. Are there any water courses, anadromous fish streams, ponds, lakes, sand dunes, rookeries, marine mammal haul-out areas, wetlands, riparian areas, pygmy vegetation, rare or endangered plants, animals or habitat which support rare and endangered species located on the project site or within 100 feet of the project site?

No

SUBMIT ONLY ONE COPY

CERTIFICATION AND SITE VIEW AUTHORIZATION

1. I hereby certify that I have read this completed application and that, to the best of my knowledge, the information in this application, and all attached appendices and exhibits, is complete and correct. I understand that the failure to provide any requested information or any misstatements submitted in support of the application shall be grounds for either refusing to accept this application, for denying the permit, for suspending or revoking a permit issued on the basis of such misrepresentations, or for seeking of such further relief as may seem proper to the County.

2. I hereby grant permission for County Planning and Building Services staff and hearing bodies to enter upon and site view the premises for which this application is made in order to obtain information necessary for the preparation of required reports and render its decision.

Bill Knapp ____________________ 2/15/2024 __________

Owner/Authorized Agent Date

NOTE: IF SIGNED BY AGENT, OWNER MUST SIGN BELOW.

AUTHORIZATION OF AGENT

I hereby authorize ______________________________ to act as my representative and to bind me in all matters concerning this application.

______________________________ ____________

Owner Date

MAIL DIRECTION

To facilitate proper handling of this application, please indicate the names and mailing addresses of individuals to whom you wish correspondence and/or staff reports mailed if different from those identified on Page One of the application form.

Name	**Name**	**Name**
Mailing Address	**Mailing Address**	**Mailing Address**

SUBMIT ONLY ONE COPY

INDEMNIFICATION AND HOLD HARMLESS

ORDINANCE NO. 3780, adopted by the Board of Supervisors on June 4, 1991, requires applicants for discretionary land use approvals, to sign the following Indemnification Agreement. Failure to sign this agreement will result in the application being considered incomplete and withheld from further processing.

INDEMNIFICATION AGREEMENT

As part of this application, applicant agrees to defend, indemnify, release and hold harmless the County of Mendocino, its agents, officers, attorneys, employees, boards and commissions, as more particularly set forth in Mendocino County Code Section 1.04.120, from any claim, action or proceeding brought against any of the foregoing individuals or entities, the purpose of which is to attack, set aside, void or annul the approval of this application or adoption of the environmental document which accompanies it. The indemnification shall include, but not be limited to, damages, costs, expenses, attorney fees or expert witness fees that may be asserted by any person or entity, including the applicant, arising out of or in connection with the approval of this application, whether or not there is concurrent, passive or active negligence on the part of the County, its agents, officers, attorneys, employees, boards and commissions.

Date: 2/15/2024

Bill Knapp

Applicant

Brunsing Associates, Inc.

5468 Skylane Blvd., Suite 201
Santa Rosa, CA 95403
707-528-6108
www.brunsing.com

February 14, 2024 10945.05

County of Mendocino
Planning & Building Services
860 N. Bush Street
Ukiah, CA 95483
Attn: Mark Cliser, Interim Senior Planner

RE: 43026 North Highway, 1, Westport, California

Dear Mr. Cliser;

Brunsing Associates Inc. (BAI) has been retained to evaluate a landslide that occurred recently at 43026 North Highway 1, Westport California, Plate 1. The landslide is near to and approaching the residence on the ocean side of the property, Plate 2. A geotechnical investigation completed prior to construction of the residence in 2001 reported a non-conforming fill had been placed on the property by Caltrans in the 1950s when Caltrans was improving Highway 1 that abuts the property. The non-conforming fill was placed over the native terrace deposits which overlie bedrock. Based on the geotechnical investigation and subsequent drawings and specifications that were prepared and permitted for construction of the house, the house was constructed on drilled piers, which extend through the non-conforming fill and into competent bedrock.

Groundwater migrating beneath Highway 1 flows southwest beneath the residence and daylights, seeping out of the bluff face adjacent to the residence. This discharge has been observed at several locations. Runoff water from Highway 1 and ground water seepage collect at the toe of the slope on the uphill side of the Knapp driveway. This water seeps into the ground and saturates the underlying fill and terrace deposits in the Knapp residence vicinity. To mitigate the water runoff/seepage concerns, a drainage system was designed by a structural/civil engineer and permitted by the County of Mendocino. The drainage system consists of an uphill ditch that empties into a culvert under the driveway about 250 feet northwest of the residence. The culvert water is carried by an unlined ditch over to an outfall over the bluff edge, Plate 2.

Currently, the roof drains and a driveway drain collect surface water that is then piped to a sump shown on the construction drawings. The water accumulating in the sump is pumped to an existing swale which also conveys surface water and collected seepage from Caltrans Highway 1. The swale discharges collected water to the ocean at the previously permitted discharge location shown on Plate 2.

During high flow conditions, typically after an extended period of high precipitation these seeps cause instability in the bluff face leading to slope failure in the non-conforming fill and eroding the underlying terrace deposit. This accelerated bluff retreat is imposing an immediate threat to the stability of the ground surrounding the residence which will lead to loss of lateral support of the drilled piers if not mitigated.

BAI completed an updated geotechnical investigation for the purpose of evaluating emergency mitigation measures, Appendix A. BAI has evaluated the following options for mitigating the problem created by the excessive erosion created by high groundwater flow seeping out of the bluff through the non-conforming fill.

Option 1 is to construct a series of drilled piers, a grade beam and tie backs between the residence and bluff after grouting the non-conforming fill in the same location.

Option 2 is to redirect groundwater that is seeping out of the bluff face to a safe discharge at the existing outfall shared by Caltrans and the residence.

Option 3 is to place an impermeable liner within the ditch that outlets over the bluff edge. Standing water in the ditch is seeping into the subsurface fill soils. Too much of the water is soaking into the ground before it reaches the bluff edge outfall.

Option 4 is stabilizing the non-conforming fill by permeation grouting the high void content reported in the geotechnical documents available for the property.

BAI recommends Options 2, 3, and 4 because they are less intrusive and more effective over a broader region of the bluff face partially surrounding the residence.

The high void ratio reported in the non-conforming fill would be significantly reduced by a properly designed grouting program. The seepage at the bluff causing excessive bluff failure within the non-conforming fill can be intercepted by a series of extraction wells which pump the collected groundwater to the existing stormwater sump.

The pumping rate necessary is estimated to be less than a gallon per minute due to the moderate permeability of the non-conforming fill and underlying terrace deposits. The current discharge rate from the referenced swale during a high rain event is estimated to be over 100 gallons per minute. Consequently, the steady state added flow from the interceptor wells would be negligible compared to the flow in the swale during rain events.

The proposed mitigation measures include four 4-inch diameter extraction wells extending to a depth of 35 feet below ground surface as shown on Plate 3. The area to be grouted is approximately 1000 square feet. The permeation grout should extend from near surface to bedrock within the recommended grouted area shown on Plate 3.

Grouting will ensure that both the non-conforming fill and underlying terrace deposit are more resistant to failure caused by seepage. The shape of the grout area is designed to deflect any groundwater that is not intercepted by the wells parallel to the bluff face so that it will seep out of the bluff face away from the residence. Due to the gradation of soils to be grouted, BAI recommends permeation grouting using an ultra-fine cement. This type of grout does not pose any environmental threats to the property or to the ocean.

BAI proposes to complete the installation of the extraction wells as shown on Plate 3 and the permeation grout of the area as soon as permitting allows in order to arrest further advance of the recent landslide also shown on Plate 3.

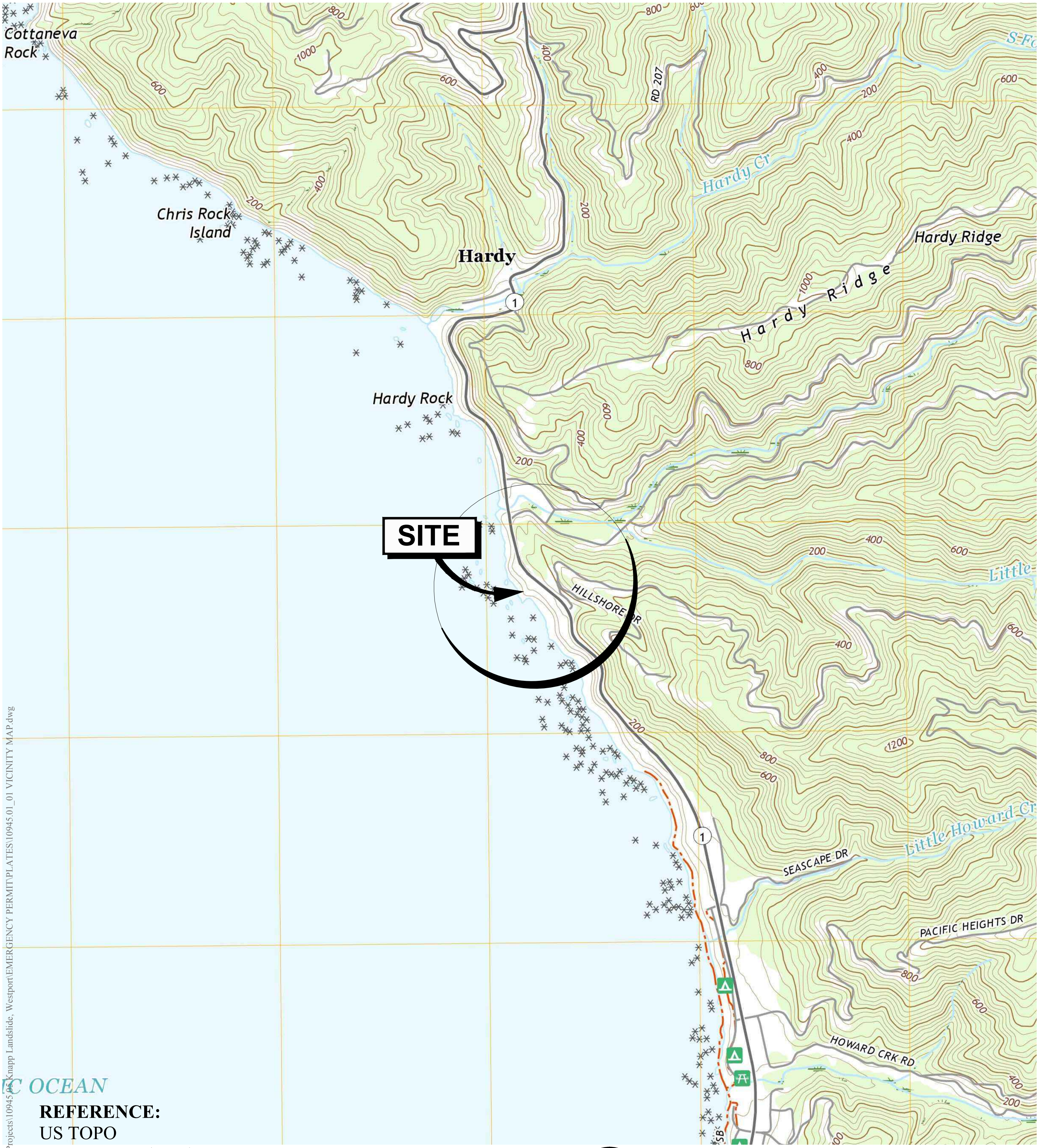
Respectfully submitted,

Thomas P. Brunsing
Principal Engineer

Erik E. Olsborg
Principal Engineering Geologist

TPB/KAC/EEO/ces

PLATES



REFERENCE:
US TOPO
Westport Quadrangle
California - Mendocino County
7.5-Minute Series, USGS, 2021

Latitude: 39.699404
Longitude: -123.802582

NORTH

APPROXIMATE SCALE (FEET)
0 1000 2000 4000

Brunsing Associates, Inc.
5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: KAC
Date: 02/14/24

VICINITY MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
1

REFERENCE:
Google Earth Pro, accessed 2/8/24

Brunsing Associates, Inc.
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Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: EEO
Date: 02/14/24

OVERALL SITE MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
2

REFERENCE:
Drone image and Topographic Map
by Mendocino Surveyors, Inc.

Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108	Job No.: 10945.05 Appr.: KKC Date: 02/14/24	**SITE MAP** KNAPP RESIDENCE 43026 Highway 1 Westport, California	**PLATE** **3**

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2/14/2024 2:53:43 PM save date
2/14/2024 3:25:50 PM plot date

APPENDIX A

Brunsing Associates, Inc.

GEOTECHNICAL INVESTIGATION

KNAPP RESIDENCE
43026 NORTH HIGHWAY 1
WESTPORT, CALIFORNIA

Project Number 10945.05

February 14, 2024

Engineers and Geologists

GEOTECHNICAL INVESTIGATION

KNAPP RESIDENCE
43026 NORTH HIGHWAY 1
WESTPORT, CALIFORNIA

Project Number 10945.05

prepared for

Bill Knapp

prepared by

Brunsing Associates, Inc.

5468 Skylane Blvd. Suite 201
Santa Rosa, CA 95403
(707) 528-6108

February 14, 2024

Keith A. Colorado
Geotechnical Engineer - 2894
kcolorado@brunsing.com

Erik E. Olsborg
Engineering Geologist - 1072
eolsborg@brunsing.com

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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation that Brunsing Associates, Inc. (BAI) has performed for the emergency mitigation of the Knapp residence, 43026 North Highway 1, Westport, California. The site is approximately 4.25 miles north-northwest of the town of Westport, California. The approximate location of the site is shown on the Vicinity Map, Plate 1.

The purpose of our services was to evaluate the site soil and bedrock conditions and the geologic hazards at the site (bluff erosion and slope stability) in order to provide recommendations to stabilize the area. Our approach to providing the geotechnical guidelines for the design of the project utilized our knowledge of the soil, bedrock and geologic conditions in the site vicinity and experience with similar projects in the area. Field exploration for this investigation was directed toward confirming anticipated soil, bedrock and geologic conditions, in order to provide the basis for our conclusions and recommendations.

The scope of our services, as outlined in our Change/Extra Service Order dated April 19, 2023 consisted of field reconnaissance, subsurface exploration, laboratory testing, engineering and geologic analyses, and the preparation of this report.

2.0 INVESTIGATION AND LABORATORY TESTING

2.1 Document Review and Research

As part of our investigation, we reviewed published geotechnical literature, including geologic, fault, and seismic hazard maps for the site and vicinity. We also reviewed previous geotechnical reports prepared by BAI on this property. A list of selected published references reviewed for this investigation is presented in Appendix A.

2.2 Field Reconnaissance

Our Principal Engineering Geologist performed an engineering geologic reconnaissance of the project site on March 29, 2023. The reconnaissance consisted of observing site geomorphology and bedrock outcrops, and soil exposures. The site was photographed during our reconnaissance.

Our Senior Engineering Geologist performed an additional reconnaissance and mapped the project site on April 5, 2023. Mapping the project site provided us with vertical and horizontal dimensions of the road embankment and nearby creek channel.

2.3 Subsurface Exploration

BAI conducted subsurface exploration to supplement our previous investigation which consisted of drilling, logging and sampling one test boring B-4, with a track-mounted drill rig. The approximate locations of the test borings, previous and current, are shown on the Site Map, Plate 2.

Our engineering geologist logged the test boring and obtained relatively undisturbed tube and bulk samples of the soil and bedrock materials encountered for visual classification and laboratory testing. Relatively undisturbed samples were obtained using 3.0-inch (CA), 2.5-inch (CM) and 2.0-inch (SPT) outside diameter modified California split-barrel samplers. The inside of the sampler barrels contained liners for retaining the soil and bedrock samples. Samplers were driven by a 140-pound drop hammer falling 30 inches per blow. Blows required to drive the CA and CM samplers were converted to Standard Penetration Test (SPT) blow counts[1] for correlation with empirical test data, using conversion factors of 0.64 and 0.79, respectively. Blow counts are presented on the boring logs.

The logs of the test borings showing the various soil and bedrock materials encountered and the depths at which samples were obtained are presented in Appendix B. The soils are classified in accordance with the Unified Soil Classification System in Appendix B. The soil and bedrock descriptive properties are presented in Appendix B. Our previous boring logs B-1, B-2, and B-3 are presented in Appendix B.

2.4 Laboratory Testing

Soil and bedrock samples obtained during our subsurface exploration were transported to our laboratory and examined to confirm field classifications. Laboratory tests were performed on selected samples to estimate their pertinent geotechnical engineering characteristics. Laboratory testing consisted of moisture content, dry density, sieve analysis, and unconsolidated-undrained triaxial compression tests. The test results are presented opposite the samples tested on the test boring logs. A key to test data is provided in Appendix B. A summary of laboratory testing and test results are presented in Appendix C.

3.0 SITE CONDITIONS

The property is situated on the southwest side of Highway 1 on an elevated terrace bordered by an ocean bluff. The existing residence is on the landward side of a south-southwest trending point. The driveway to the building area enters the property off Highway 1 near the north end of the terrace level.

The upper terrace level above the ocean bluff slopes very gently, about 20 horizontal to one vertical (20H:1V) to the southwest. The heavily brush-covered north-easterly edge of the terrace level slopes up steeply to Highway 1. The ocean bluff at the property is approximately 70 feet in vertical height. The lower portion, approximate half, of the bluff has very steep slope gradients that vary from near vertical to about 1/2H:1V. The upper portion of the bluff has slope gradients that vary from about 1/2H to 3/4H:1V. Logs, steel stakes, and pipes, evidence of old fill, project from the upper approximately 15 feet to 20 feet of the bluff slopes.

The upper terrace level at the property is covered by weeds and brush, except for landscaping around the residence. The bluff faces are mostly bare soil or bedrock with scattered weeds. The slope uphill of the terrace level that leads up to the highway, is covered with a dense growth of brush with some trees.

[1] SPT blow counts provide a relative measure of soil consistency and strength, and are utilized in our engineering analyses.

4.0 SITE GEOLOGY AND SOIL CONDITIONS

The site bedrock consists of gray to brown sandstone and shale of the Cretaceous-Tertiary Franciscan complex. The bedrock are generally moderately hard to hard, with local areas that are friable. The Franciscan bedrock is closely fractured, and little to moderately weathered. Where exposed on the bluff face, the friable portions of the bedrock are erodible. The orientation of the bedrock bedding at this site, as is typical of the Franciscan Complex, is somewhat chaotic. No prominent bedding or jointing orientations were observed at the site.

Pleistocene terrace deposits which overlie the bedrock, are at least 10 to 12 feet in thickness, or more. The terrace deposits consist of red-brown, orange, and olive sandy silts and blue-gray silty sands. The silts are medium stiff to hard, and the sands are medium dense to very dense.

Approximately 13 to 18 feet of fill cover the terrace deposits at our boring locations. The fill soils consist of a mixture of light brown to brown sandy silt, dark brown sandy gravelly silt, dark brown clayey silt, brown to reddish-brown silty sandy gravel, dark brown clayey silt, and orange to light red sandy silty clay. The silts and clays are generally soft to hard and the silty, sandy gravel is medium dense. The fill soils appear to be generally low in expansion potential (tendency for volume change with changes in moisture content); isolated portions of the fill soils are medium to high in expansion potential, as encountered in boring B-3 at a depth of about 13 feet. Glass and wood debris materials were encountered within the fill materials at a depth of 16 feet in boring B-2. As previously mentioned, logs, metal stakes and pipes were observed projecting from the lower fill materials north of the point. Moisturizing, and compaction procedures during the fill placement operations are unknown to BAI.

At the time of our 2001 report, the area of the recent landslide was mapped as a “slope creep” feature. A “sea cave” was mapped at the bluff toe in the vicinity of the slope creep area in 2001. The apparent “sea cave” is an erosional bluff indentation (not a cave). The indentation is due to erosion along an ancient fault. The fault may be millions of years old; the fault offsets the Cretaceous-Tertiary Franciscan rock bedding. The fault does not appear to be “active”, the fault does not offset the Pleistocene terrace deposits contact with the underlying Franciscan bedrock.

The recent landslide is 16 feet from the residence, as measured with a 100 foot tape. The landslide is comprised of old fill soils, terrace deposits and deeply weathered bedrock. The recent landslide is uphill of the bluff indentation. The indentation appears to funnel ocean storm waves up to the landslide toe and acts as a chute for the landslide debris drifting down to the beach.

No evidence of active faulting was observed at the site and none of the published references that we reviewed for this study show faults on, or trending towards, the property. The nearest active faults are the San Andreas Fault, located offshore, approximately 10.5 miles to the west, and the Maacama Fault, located approximately 13 miles to the northeast.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 General

Based upon the results of our investigation, we conclude that the site requires an engineered mitigation for the residence. The main geotechnical considerations affecting the design and construction of the project are potential settlement, groundwater, slope stability, slope retreat (erosion) rate, seismically induced settlement and the potential for strong seismic shaking and potential liquefaction. These constraints are discussed in the following subsections.

5.2 Tsunami Hazard

As typical of the Mendocino County coastal area, the site could be subject to large storm waves or tsunami waves. Damage from Tsunami waves, historically, has been limited to moored boats and docks in area coves and harbors. However, in February 1960, the Point Cabrillo Light House, located approximately 29 miles south of the subject property, was damaged by an approximately 65 feet high storm wave (meteorological tsunami, or "meteotsunami"). No such waves are recorded at the light house from 1909, the year it was built, to 1960. The light house was hit again by large storm waves on January 5, 2023. The back doors of the building were broken, and sea waters flooded the interior by a couple of feet. The storm waves overtopped the light station preserve bluffs throwing rocks and debris from the lower bluffs onto the terraces above. Since the adjacent bluffs are approximately 80 feet in vertical height, future impact or inundation from a severe storm surge or tsunami event is considered a low (unlikely) risk for the site.

5.3 Seismicity and Faulting

As is typical of the Mendocino County area, the site will be subject to strong ground shaking during future, nearby, large magnitude earthquakes. The intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the underlying earth materials.

No evidence of faulting was observed by BAI or shown in the site vicinity on the published geologic maps that we reviewed for this investigation. Therefore, the potential for fault rupture at the site is considered low.

5.4 Soil Liquefaction

To evaluate liquefaction[2] potential, we performed laboratory testing of the soils and a liquefaction analysis. The results of our analysis indicate the potential for liquefaction at the site during a design earthquake is high. This analysis was based on procedures by Idriss and Boulanger, 2008, with 2014 update.

[2] Liquefaction results in a loss of shear strength and potential soil volume reduction in saturated sandy, silty, silty/clayey, and also coarse gravelly soils below the groundwater table from earthquake shaking. The occurrence of this phenomenon is dependent on many factors, including the intensity and duration of ground shaking, the soil age, density, particle size distribution, and position of the groundwater table.

Where the factor of safety for liquefaction potential was 1.3 or less, we performed an analysis to estimate induced vertical settlement due to liquefaction. The results of our analysis indicate liquefaction induced settlement of 4.8-inches could occur at our boring location.

Lateral spreading is generally caused by liquefaction of marginally stable soils underlying gently to steeply-inclined slopes. In these cases, the saturated soils move toward an unsupported face, such as an incised river channel or roadway cut. The results of our analysis indicate lateral spreading of 49-inches could occur at our boring location.

Liquefaction and lateral spread analysis results are presented in Appendix D.

To mitigate the concern of liquefaction, the proposed engineered mitigation should be implemented as discussed below.

5.5 Slope Stability Analysis

Stability analyses were performed to correspond, as a minimum, to the guidelines prepared by (1) American Society of Civil Engineers (ASCE) and Southern California Earthquake Center (SC/EC) "Recommended Procedures for Implementation of Division of Mines and Geology Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California", dated June 2002 and (2) California Geological Survey (CGS) "Guidelines for Evaluating and Mitigating Seismic Hazards in California" dated 2008. These documents recommend a factor of safety greater than or equal to 1.5 for static conditions and 1.1 for pseudo-static conditions with a horizontal seismic coefficient of 0.15.

Cross Section A-A' as shown in Appendix E, was created from the topographic map, reconnaissance and data from our subsurface exploration. The location of the cross-section used for our stability analysis is shown on Plate 2.

From our test borings, five soil and bedrock units, with different density and strength parameters, were identified within the bluff for our stability analyses. Unit "1" is the upper sandy silt that is medium stiff to soft. Unit "2" is the silty/clayey sand that is loose. Unit "3" is the sandy clay that is medium stiff to stiff. Unit "4" is the deeply to moderately weathered sandstone. Unit "5" is debris deposits. Unit "6" is the proposed grouted material. Table 2 summarizes the soil and bedrock parameters used.

Table 1: Soil and Bedrock Parameters

Unit	Wet Density (pcf)	Cohesion (psf)	Friction Angle (ϕ)
1	124	350	35
2	125	50	16
3	120	225	26
4	135	1800	32
5	105	10	15
6	130	2500	0

The above assigned strengths were determined from strength test results obtained from this site, adjacent sites, as well as from back-analysis of the slope stability calculations.

The stability of the slope was analyzed using the computer program SLIDE by Rocscience, Inc. The results of our stability analyses are presented in Appendix E. The result of our stability analyses indicates that bluff is unstable in the current configuration and that the bluff would be stable with the proposed engineered mitigation.

6.0 RECOMMENDATIONS

6.1 Permeation Grouting

To provide lateral and vertical support and protection from landslide and erosion a grout curtain should be construction within the terrace deposits and old fill, as shown on Site Map, Plate 2.

Ultrafine portland cement (UFPC) grout should be injected within the matrix sands of the terrace deposit and old fill. If necessary, either sodium silicate (SS) grout or acrylate grout should be injected into silty sand lenses within this sand matrix. The first row of the grout curtain, the row closest to the bluff face should be grouted first. Due to the proximity to a free face, grout pressure in this row will be limited to 25 psi at the well head. Grout pressure can be increased to 35 psi at the well head in the second row and 50 psi at the well head in the third row. Based on an estimated porosity of 0.30 to 0.43, approximately 3.5 cubic feet of grout should be injected into each 2 foot vertical lifts on 3 feet spacing. The grouting contractor will need to provide a grout placement sequence which assures grout does not migrate into a previously grouted zone of the same borehole.

UFPC grout should be injected prior to injecting SS grout or acrylate grout. Grout injection should be limited to the 1.5-foot vertical zone of each bore by means of a packer and/or the tight fit of jetted tube of manchettes. A BAI observer should record the pressure, quantity of grout and grout mix injected at each 1.5-foot interval for each borehole. The grout mixes provided should achieve a minimum compressive strength in 28 days of 225 psi for the UFPC grout and 150 psi for the other grout mixes. Each mix design should be tested using the ASTM C1019 Method.

The initial grout curtain should be core drilled at 4 locations to confirm continuity of the grout penetration into the terrace deposits. Core samples should be collected from 10 feet, 15 feet and 25 feet depth below the ground surface. The samples should be subjected to triaxial compression testing.

6.2 Dewatering Gallery

The seepage at the bluff causing excessive bluff failure within the non-conforming fill can be intercepted by a series of extraction wells which pump the collected groundwater to an existing stormwater sump.

The pumping rate necessary in each well is estimated to be less than a gallon per minute due to the moderate permeability of the non-conforming fill and underlying terrace deposits. The current discharge rate from the referenced swale during a high rain event is estimated to be over

100 gallons per minute. Consequently, the steady state added flow from the interceptor wells would be negligible compared to the flow in the swale during rain events.

The dewatering gallery should include six 4-inch diameter extraction wells extending to a depth of 35 feet below ground surface as shown on Plate 2.

7.0 ADDITIONAL SERVICES

Prior to grouting and well installation, BAI should review the final plans and soil related specifications for conformance with the intent of our recommendations. During grouting and well installation, BAI should provide observations, together with the appropriate field and laboratory testing during the work. Our observations and tests would allow us to check that the work is being performed in accordance with project guidelines, confirm that the soil conditions are as anticipated, and to modify our recommendations, if necessary.

8.0 LIMITATIONS

This geotechnical investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report. Our conclusions are based upon reasonable geological and engineering interpretation of available data.

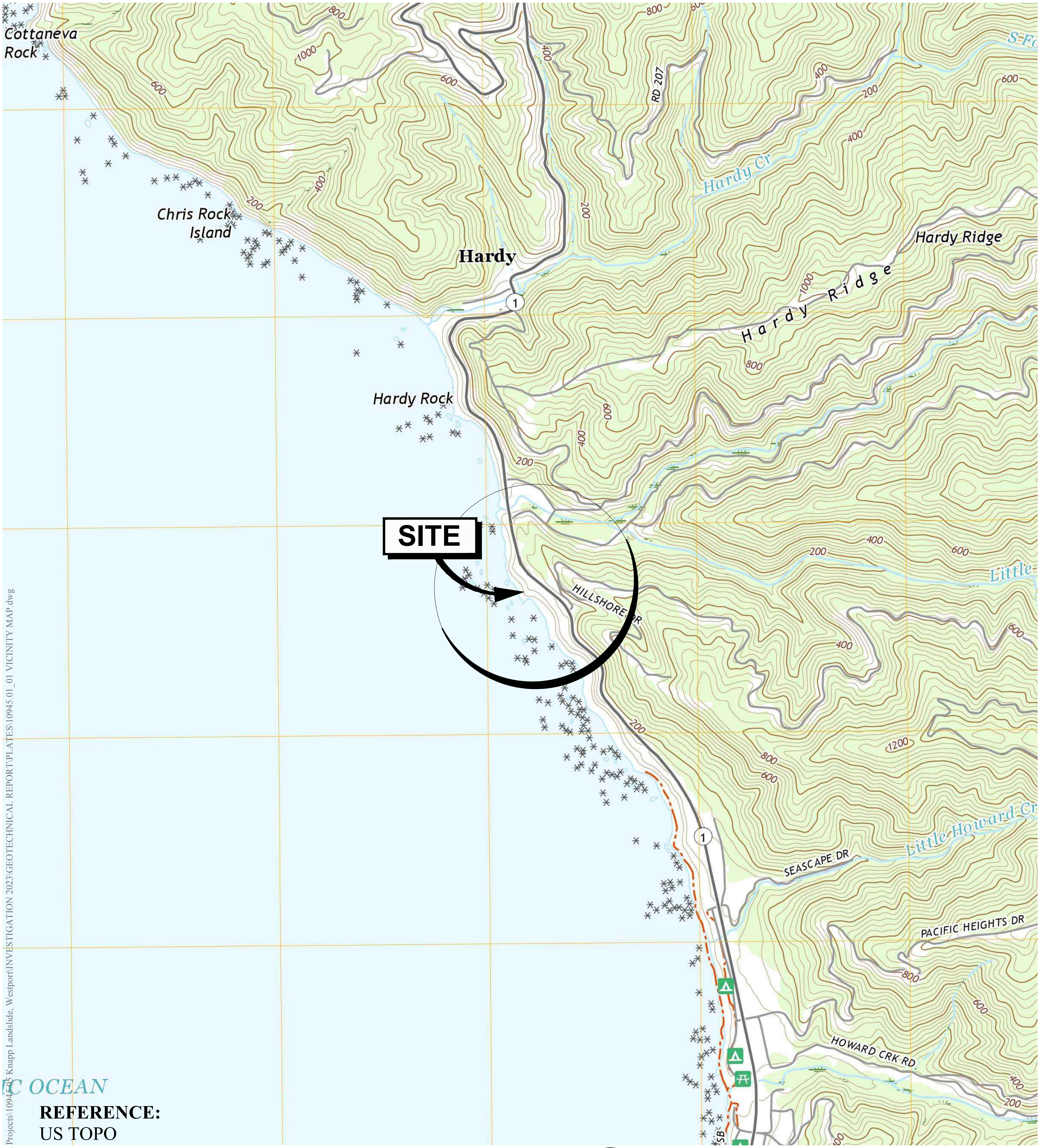
The samples taken and tested, and the observations made, are considered to be representative of the site; however, soil and geologic conditions may vary significantly between test borings and across the site. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by BAI, and revised recommendations be provided as required.

This report is issued with the understanding that it is the responsibility of the Owner, or his/her representative, to insure that the information and recommendations contained herein are brought to the attention of all other design professionals for the project, and incorporated into the plans, and that the Contractor and Subcontractors implement such recommendations in the field. The safety of others is the responsibility of the Contractor. The Contractor should notify the owner and BAI if he/she considers any of the recommended actions presented herein to be unsafe or otherwise impractical.

Changes in the condition of a site can occur with the passage of time, whether they are due to natural events or to human activities on this, or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The recommendations contained in this report are based on certain specific project information regarding type of construction and current structure locations, which have been made available to us. If conceptual changes are undertaken during final project design, we should be allowed to review them in light of this report to determine if our recommendations are still applicable.

PLATES



REFERENCE:
US TOPO
Westport Quadrangle
California - Mendocino County
7.5-Minute Series, USGS, 2021

Latitude: 39.699404
Longitude: -123.802582

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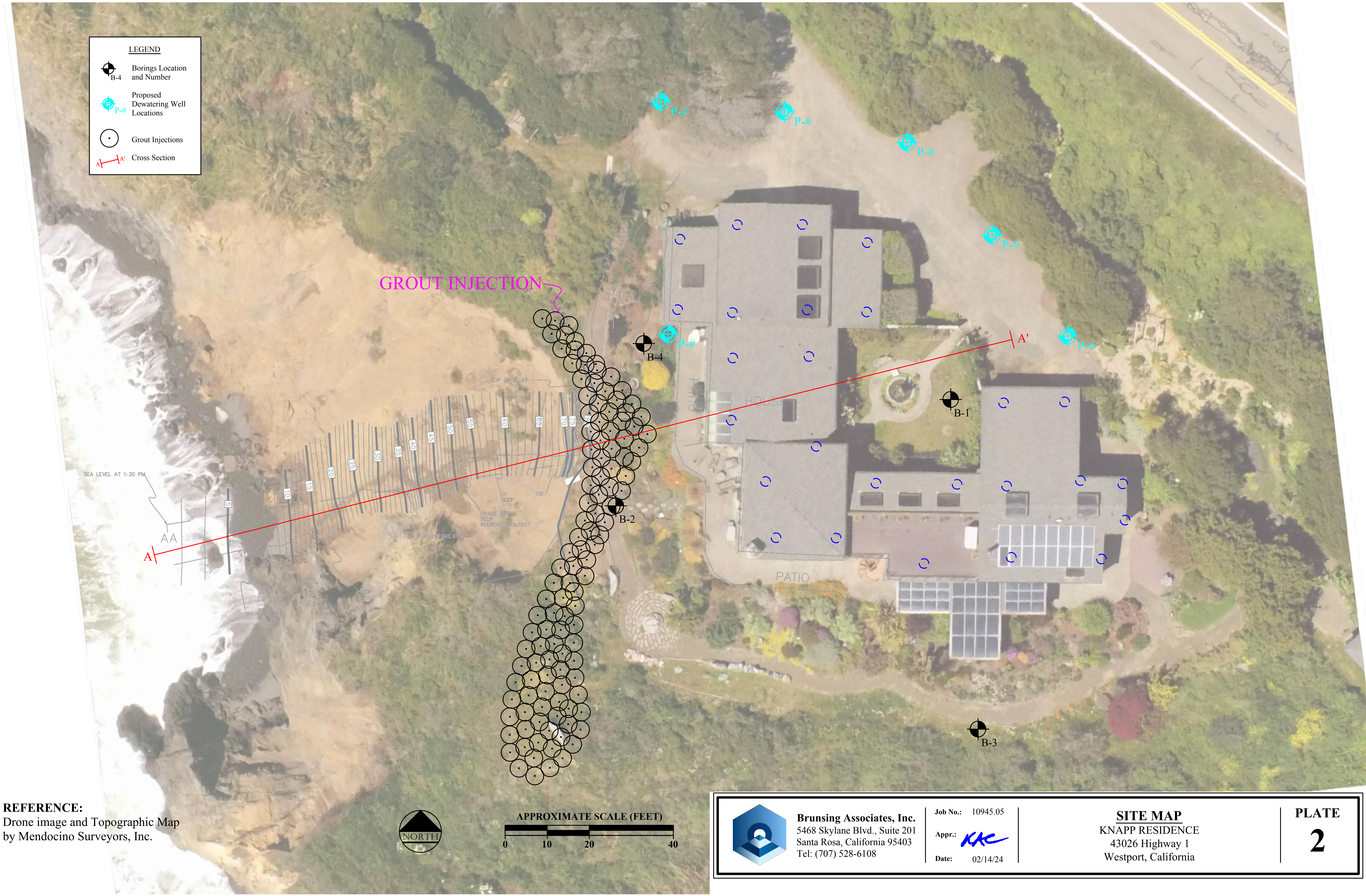
VICINITY MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
1



REFERENCE:
Drone image and Topographic Map by Mendocino Surveyors, Inc.

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SITE MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
2

APPENDIX A - References

- California Division of Mines and Geology (CDMG), 1960, Geologic Map of California, Ukiah Sheet.
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APPENDIX B

Boring Logs

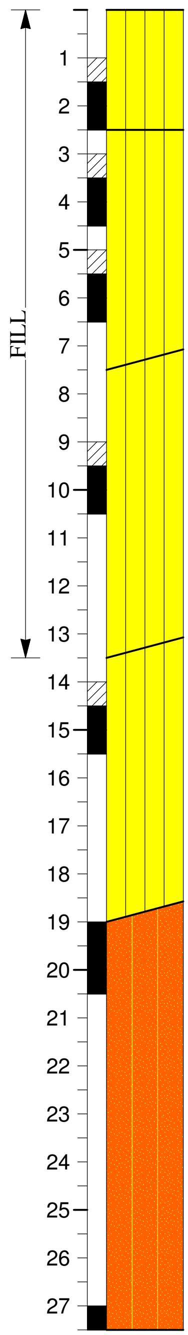
Log of Boring B-1

Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699445 **Longitude:** -123.802299

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)
	CA			28 **	2
	CA	15.8	105	5 **	4
Tx 941 (720)	CA	15.1	102	6 **	6
Tx 2765 (1296)	CA	25.6	91	42 **	10
68% Passing #200	CA	28.6	93	28 **	15
	CA			23 **	20
	CA			42/6" **	27



BROWN SANDY SILT (ML)
medium stiff to stiff, damp, porous, with gravels and roots

driller reports easy drilling at 2.5 feet
BROWN SANDY SILT (ML)
soft, damp to moist

DARK BROWN CLAYEY SILT (ML)
stiff to hard, moist, with small roots

color change to BROWN at 12 feet

RED-BROWN SANDY SILT (ML)
stiff, moist

BLUE-GRAY SILTY SAND (SM)
medium dense to very dense, moist

driller reports harder drilling at 22.5 feet

color change to BLUE at 24 feet

NOTES:
(1) No Caving Encountered
(2) No Free Water Encountered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-1
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B1

SHEET 1 of 1

Log of Boring B-2

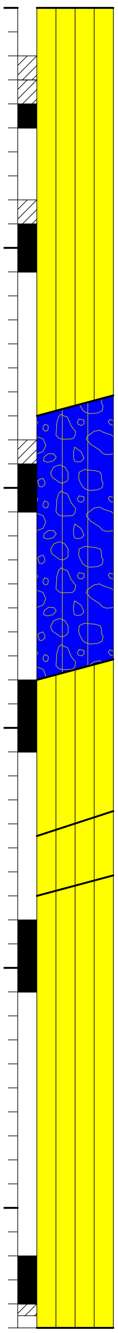
Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699376 **Longitude:** -123.802574

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)
	CA			27 **	2
Tx 1448 (576)		10.9	111		
	CA			12 **	5
	CA			13 **	10
Tx 3143 (1872)	CA	21.0	101	35 **	15
73% Passing #200					19
	CA			27 **	20
	CA			30/9" **	27

FILL



LIGHT-BROWN SANDY SILT (ML)
stiff, damp, porous, wtith small gravels and roots

color change to DARK BROWN at 1.5 feet

BROWN TO REDDISH BROWN SILTY SANDY GRAVEL (GM)
medium dense, moist to wet

DARK BROWN CLAYEY SILT (ML)
hard, moist, with small rock fragments

glass and burnt wood encountered at about 16 feet

DARK BROWN CLAYEY SILT (ML)
hard, moist

BLUE-GRAY TO ORANGE-BROWN SANDY SILT (ML)
stiff to hard, damp to moist

color change to BLUE-GRAY at 24 feet
change in moisture to moist to wet at 24 feet, saturated at 26 feet

NOTES:
(1) No Caving Encountered
(2) Free Water Encountered at 26.75 feet

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-2
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B2

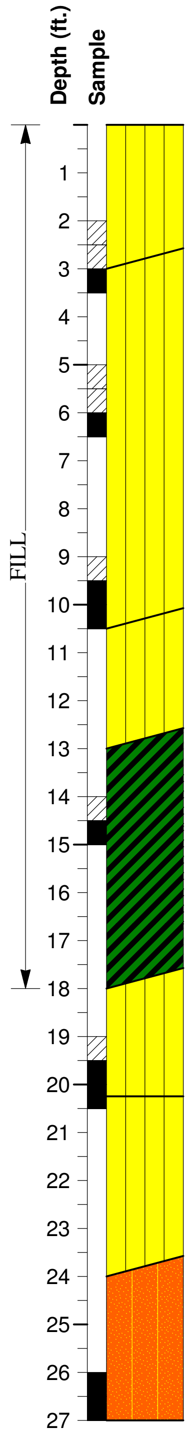
Log of Boring B-3

Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699204 **Longitude:** -123.802268

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot
	CA			12 **
	CA	9.9	109	15 **
	CA			22 **
Tx 3865 (1728) LL=75, PI = 50	CA	26.0	96	43 **
Tx 1882 (2592)	CA	23.9	95	25 **
	CA			32/6" **



LIGHT BROWN SANDY SILT (ML)
medium stiff, damp

DARK BROWN SANDY GRAVELLY SILT (ML)
medium stiff, moist

DARK BROWN CLAYEY SILT (ML)
stiff, damp, porous, with roots

color change to RED-BROWN at 12 feet

ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH)
hard, moist

OLIVE TO LIGHT ORANGE CLAYEY SANDY SILT (ML)
medium stiff to stiff, moist

ORANGE TO OLIVE SANDY SILT (ML)
stiff, moist

BLUE-GRAY SILTY SAND (SM)
dense, moist

NOTES:
(1) No Caving Encountered
(2) No Free Water Encountered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-3
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

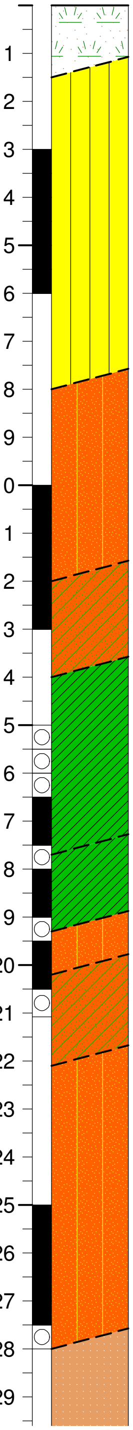
PLATE B3
SHEET 1 of 1

Log of Boring B-4

Equipment: Deeprock DR7KTrack w/ 4-inch solid stem flight auger

Date: 4/25/23 **Logged By:** JNK

Elevation: Not Surveyed **Latitude:** 39.699473 **Longitude:** -123.802555



Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)	Description
					0	TOPSOIL/GARDEN
					1.5	BROWN SANDY SILT (ML) medium stiff to soft, moist few gravels
Tx 1533 (432) 55% Passing #200	CA	14.9	108	7 **	3–4.5	
	CM			2 **	4.5–6	
					8	BROWN SILTY SAND (SM) with gravel loose, moist few gravels
Tx 554 (1152) 27% Passing #200 67% Passing #4	CA	18.8	106	2 **	10–11.5	
					12	DARK BROWN CLAYEY SAND (SC) very loose, wet to saturated bedrock fragments
	CM			3 **	11.5–13	
					14	LIGHT ORANGE-BROWN SANDY CLAY (CL) medium stiff to stiff, saturated
	CA			8 **	15.5–17	
	CM			12 **	17–18	
					18	ORANGE-BROWN SANDY CLAY (CL) stiff, saturated
Tx 2113 (2160) 65% Passing #200 95% Passing #4	CA	28.2	94	10 **	18–19	
					19.5	ORANGE-BROWN SILTY SAND (SM) loose, saturated
	CM			8 **	19.5–20.5	ORANGE-BROWN CLAYEY SAND (SC) loose, saturated
					22	BLUE-GRAY SILTY SAND (SM) moist some mottled orange at 25 feet
Tx 2476 (3024) 24% Passing #200 96% Passing #4	CA	14.1	118	12 **	25–26.5	
	CM			21 **	26.5–27.5	
					28	GRAY SANDSTONE crushed, friable to low hardness, deeply weathered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

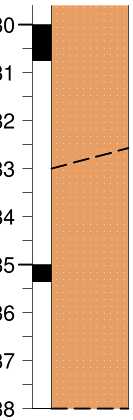
Log of Boring B-4

Equipment: Deeprock DR7KTrack w/ 4-inch solid stem flight auger

Date: 4/25/23 **Logged By:** JNK

Elevation: Not Surveyed **Latitude:** 39.699473 **Longitude:** -123.802555

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)
	CA			32/4" **	30
	CM			40/5" **	
					31
					32
					33
					34
	CA			32/3" **	35
	SPT			50/1"	
					36
					37
	SPT			50/0"	38



GRAY SANDSTONE
crushed, low hardness to hard, moderately weathered

Notes:
1. Free water encountered at 15 feet during drilling
2. Free water measured at 18.3 feet at completion of drilling
3. No caving
4. Practical drilling refusal at 38 feet

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-4
KNAPP RESIDENCE
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Wesport, California

PLATE B4

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			SYMBOLS GRAPHIC	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS	GRAVELS AND GRAVELLY SOILS	CLEAN GRAVELS (Less than 5% fines)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (Greater than 12% fines)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (Less than 5% fines)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	SANDS WITH FINES (Greater than 12% fines)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMOUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

LL - Liquid Limit
PI - Plasticity Index
■ Sample Retained
▨ Sample Recovered, Not Retained
☒ Bulk Sample
◯ Sample Not Recovered
CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
SH - Shelby Tube
RC - Rock Coring
Recovery - Percent Core Recovered
RQD - Rock Quality Designation (length of core pieces >= 4-inches / core length)

Consol - Consolidation
EI - Expansion Index
SA - Sieve Analysis

Shear Strength, psf **Confining Pressure, psf**

Tx	1564	(1440)	- Unconsolidated Undrained Triaxial
TxCU	1564	(1440)	- Consolidated Undrained Triaxial
DS	2020	(1440)	- Consolidated Drained Direct Shear
FVS	520		- Field Vane Shear
UC	1500		- Unconfined Compression
PP	1500		- Field Pocket Penetrometer
Sat			- Sample saturated prior to test

▽ Initial Groundwater Level Reading
▼ Second Groundwater Level Reading

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SOIL CLASSIFICATION CHART & KEY TO TEST DATA
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B5

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
Very loose	4 or less
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	More than 50

CONSISTENCY OF FINE-GRAINED SOILS

Consistency	Identification Procedure	Approximate Shear Strength (psf)
Very soft	Easily penetrated several inches with fist	Less than 250
Soft	Easily penetrated several inches with thumb	250 to 500
Medium stiff	Penetrated several inches by thumb with moderate effort	500 to 1000
Stiff	Readily indented by thumb, but penetrated only with great effort	1000 to 2000
Very stiff	Readily indented by thumb nail	2000 to 4000
Hard	indented with difficulty by thumb nail	More than 4000

NATURAL MOISTURE CONTENT

Dry	**No noticeable moisture content. Requires considerable moisture to obtain optimum moisture content* for compaction.**
Damp	**Contains some moisture, but is on the dry side of optimum.**
Moist	**Near optimum moisture content for compaction.**
Wet	**Requires drying to obtain optimum moisture content for compaction.**
Saturated	**Near or below the water table, from capillarity, or from perched or ponded water. All void spaces filled with water.**

* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

Where laboratory test data are not available, the above field classifications provide a general indication of material properties; the classifications may require modification based upon laboratory tests.

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SOIL DESCRIPTIVE PROPERTIES
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B6

Generalized Graphic Bedrock Symbols

Claystone	Siltstone	Tuff (Volcanic Ash)
Shale	Chert	Andesite
Sandstone	Serpentine	Basalt
Conglomerate	Greenstone	Schist

Stratification

Bedding of Sedimentary Rocks	Thickness of Beds
Massive	No apparent bedding
Very thick bedded	Greater than 4 feet
Thick bedded	2 feet to 4 feet
Thin bedded	2 inches to 2 feet
Very thin bedded	0.5 inches to 2 inches
Laminated	0.125 inches to 0.5 inches
Thinly laminated	less than 0.125 inches

Fracturing

Fracturing Intensity	Fracture Spacing
Little	Greater than 4 feet
Occasional	1 foot to 4 feet
Moderate	6 inches to 1 foot
Close	1 inch to 6 inches
Intense	0.5 inches to 1 inch
Crushed	less than 0.5 inches

Strength

Soft	Plastic or very low strength.
Friable	Crumbles by hand.
Low hardness	Crumbles under light hammer blows.
Moderate hardness	Crumbles under a few heavy hammer blows.
Hard	Breaks into large pieces under heavy, ringing hammer blows.
Very hard	Resists heavy, ringing hammer blows and will yield with difficulty only dust and small flying fragments.

Weathering

Deep	Moderate to complete mineral decomposition, extensive disintegration, deep and thorough discoloration, many extensively coated fractures.
Moderate	Slight decomposition of minerals, little disintegration, moderate discoloration, moderately coated fractures.
Little	No megascopic decomposition of minerals, slight to no effect on cementation, slight and intermittent, or localized discoloration, few stains on fracture surfaces.
Fresh	Unaffected by weathering agents, no disintegration or discoloration, fractures usually less numerous than joints.

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BEDROCK DESCRIPTIVE PROPERTIES
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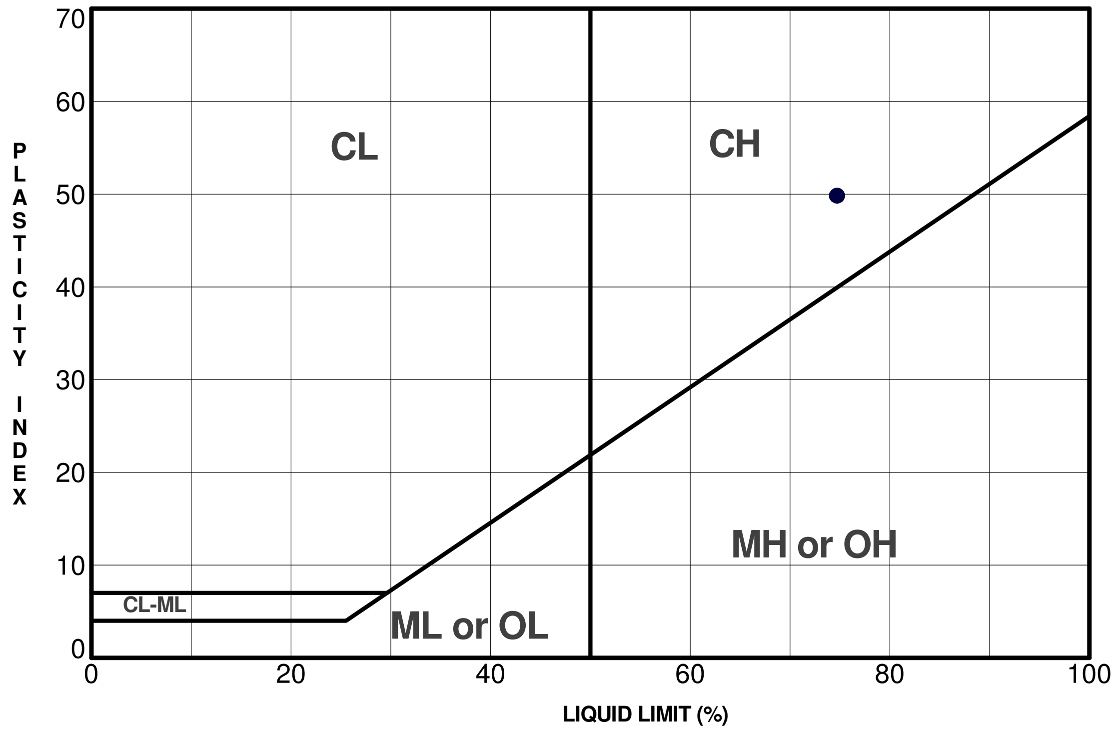
PLATE B7

APPENDIX C

Laboratory Testing



SYMBOL	CLASSIFICATION AND SOURCE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX	% PASSING No. 200 SIEVE
●	**ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH)** **B-3 @ 14.5 feet**	**75**	**25**	**50**	

ASTM D4318

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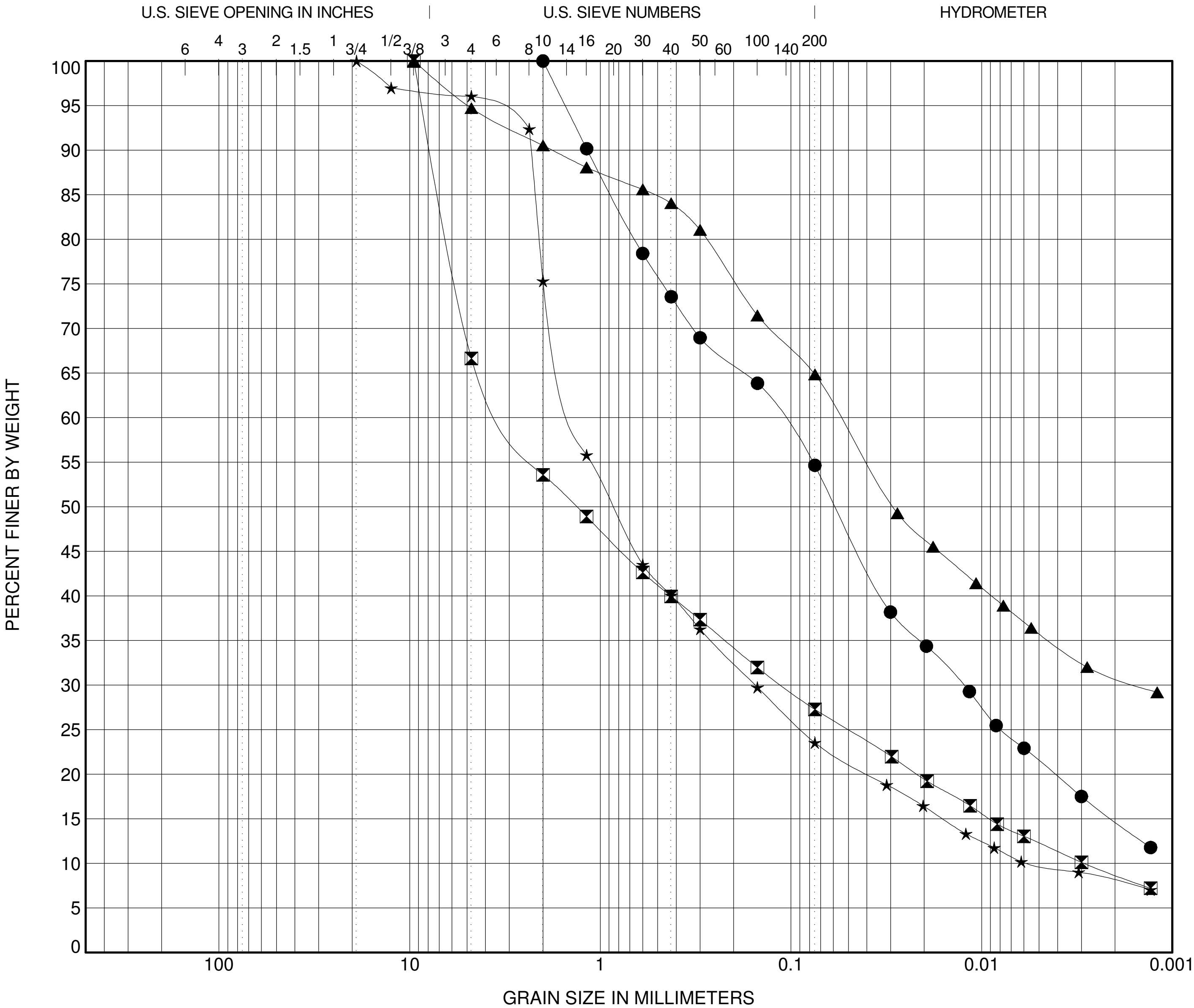
ATTERBERG LIMITS TEST RESULTS
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE
C1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-4	3.5 ft	BROWN SANDY SILT (ML)					
⧗	B-4	10.0 ft	BROWN SILTY SAND (SM) with gravel				1.42	1055.83
▲	B-4	18.5 ft	ORANGE-BROWN SANDY CLAY (CL)					
★	B-4	25.5 ft	BLUE-GRAY SILTY SAND (SM)				3.24	238.30

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4	3.5 ft	2	0.112	0.012			45.4	33.2	21.5
⧗	B-4	10.0 ft	9.5	3.06	0.112	0.003	33.4	39.4	15.0	12.3
▲	B-4	18.5 ft	9.5	0.055	0.002		5.3	29.9	29.1	35.8
★	B-4	25.5 ft	19	1.322	0.154	0.006	3.9	72.5	13.7	9.8

GRAIN_SIZE 10945.05 GINT.GPJ 2/14/24

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GRAIN SIZE DISTRIBUTION
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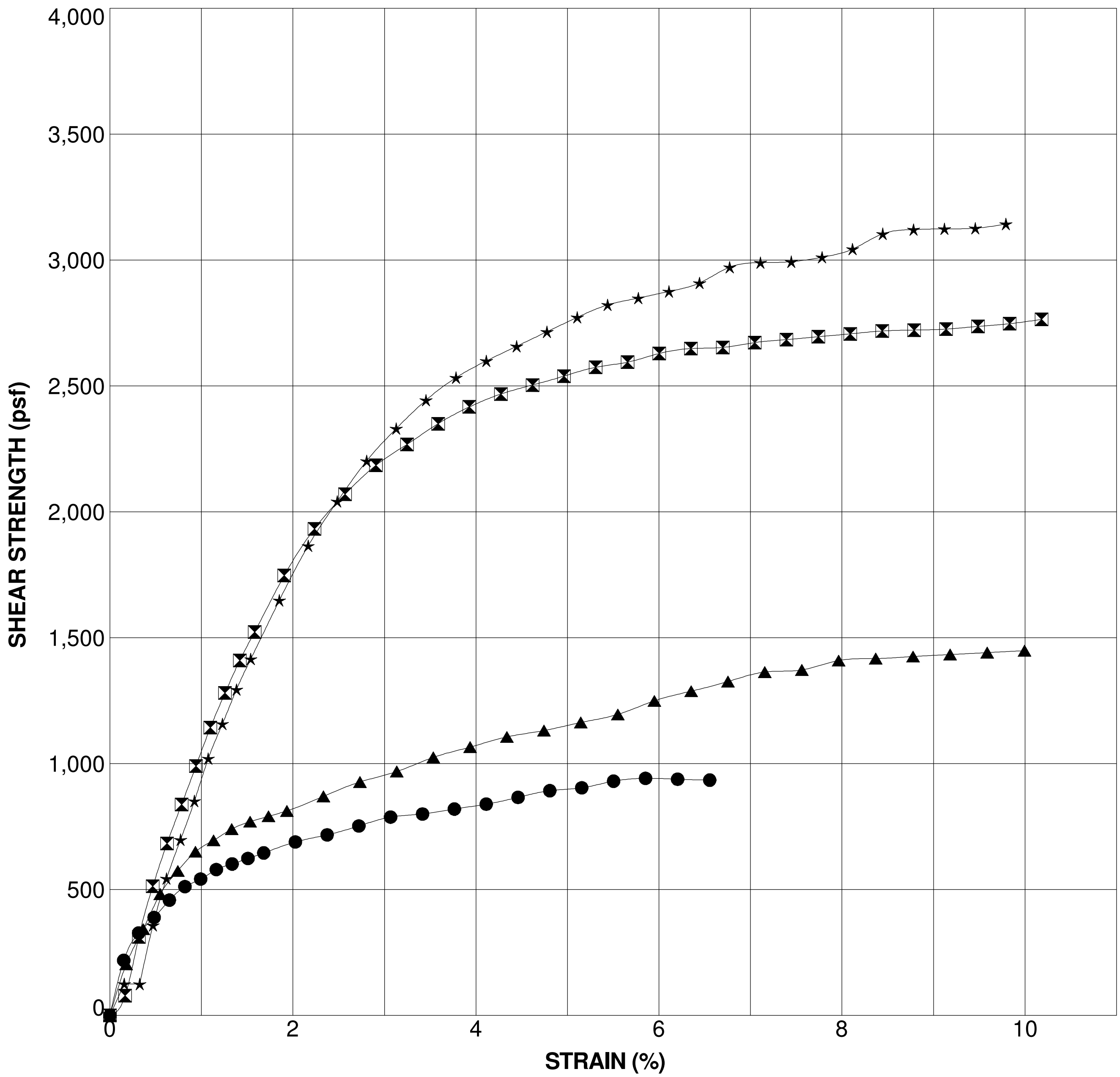
PLATE C2



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-1 at 6 ft	BROWN SANDY SILT (ML)	720	941	5.9	102	15.1
⧗ B-1 at 10 ft	DARK BROWN CLAYEY SILT (ML)	1296	2765	10.2	91	25.6
▲ B-2 at 4.5 ft	LIGHT-BROWN SANDY SILT (ML)	576	1448	10.0	111	10.9
★ B-2 at 15 ft	DARK BROWN CLAYEY SILT (ML)	1872	3143	9.8	101	21.0

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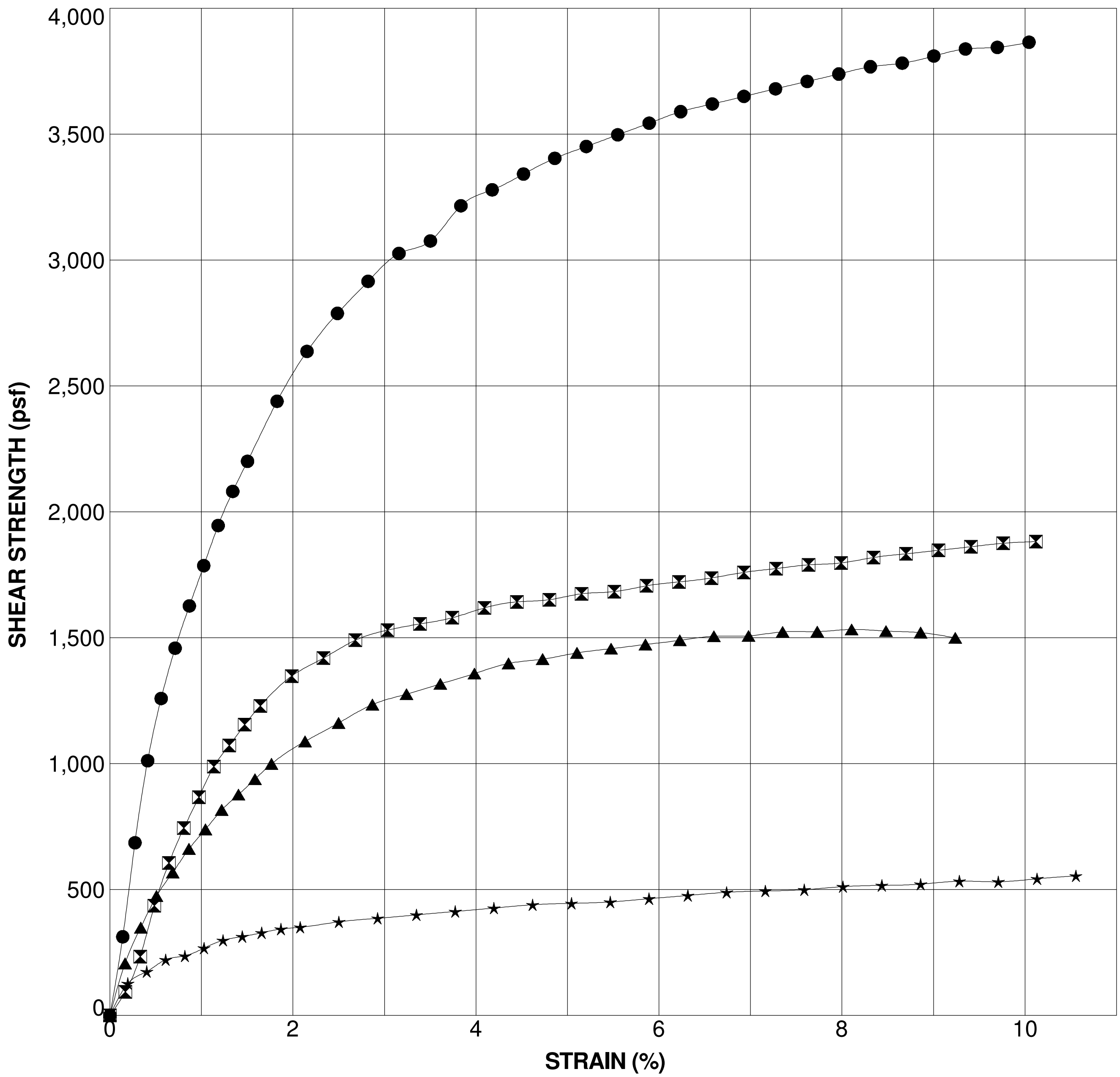
5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: EEO
Date: 02/14/24

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE C3



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-3 at 14.5 ft	ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH)	1728	3865	10.0	96	26.0
⧗ B-3 at 20 ft	OLIVE TO LIGHT ORANGE CLAYEY SANDY SILT (ML)	2592	1882	10.1	95	23.9
▲ B-4 at 3.5 ft	BROWN SANDY SILT (ML)	432	1533	8.1	108	14.9
★ B-4 at 10 ft	BROWN SILTY SAND (SM) with gravel	1152	554	10.6	106	18.8

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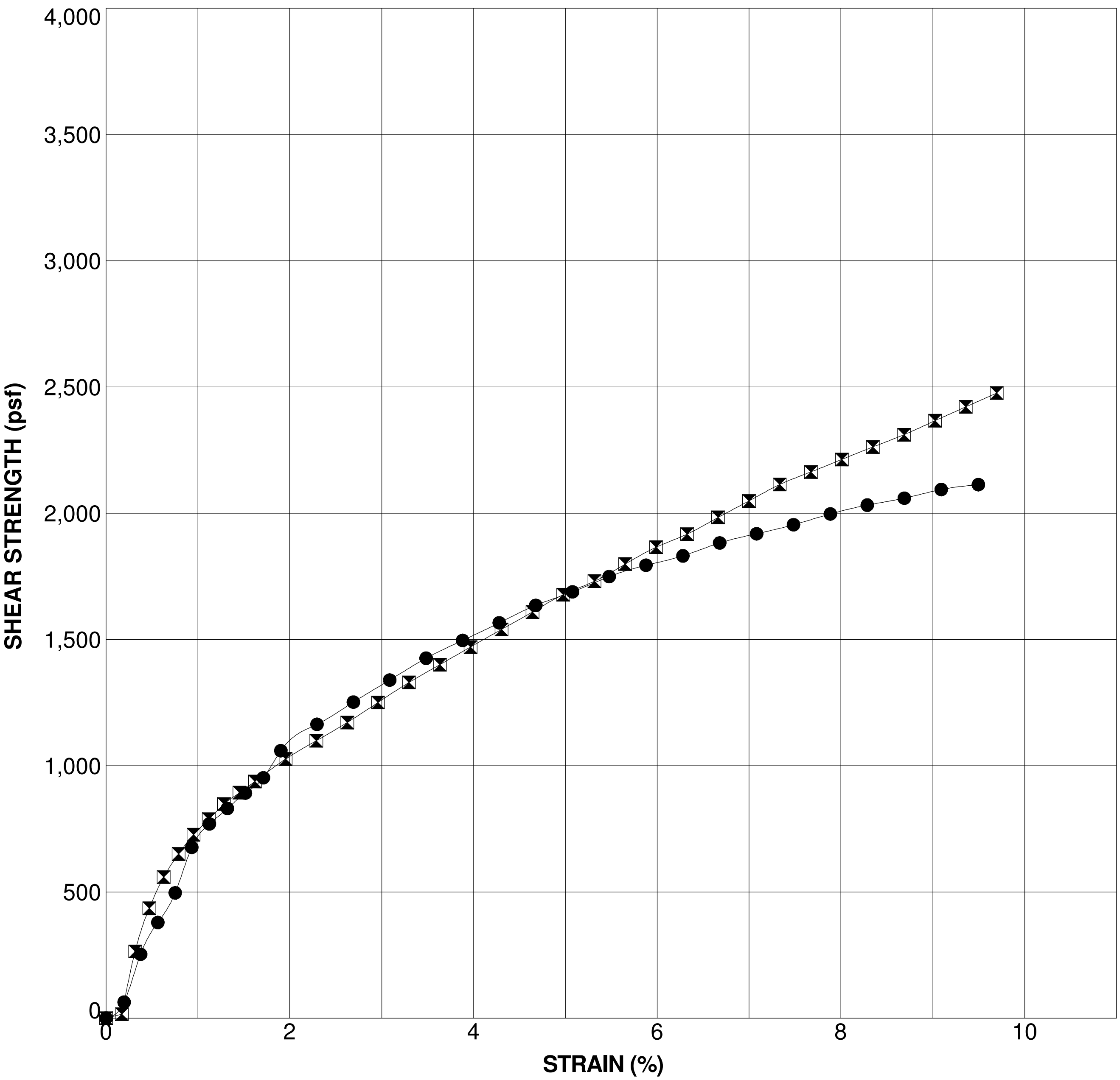
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE C4



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-4 at 18.5 ft	ORANGE-BROWN SANDY CLAY (CL)	2160	2113	9.5	94	28.2
⧗ B-4 at 25.5 ft	BLUE-GRAY SILTY SAND (SM)	3024	2476	9.7	118	14.1

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Date: 02/14/24

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE C5

APPENDIX D

Liquefaction Analysis

Project:	Knapp
Project #:	10945.05
Date:	2/14/2024
Boring:	B-4

Input Parameters:

Peak Ground Accel (g) =		0.515	
Earthquake Magnitude, M =		7.9	
Water Table Depth (m) =	3.0	10.00	(ft)
Average γ Above Water Table (kN/m^3) =	19.6	125.0	(lb/ft^3)
Average γ Below Water Table (kN/m^3) =	19.6	125.0	(lb/ft^3)
Borehole Diameter (mm) =	101.60	4	(in)
Requires Correction for Sample Liners (YES/NO):		no	
Rod Lengths Assumed Equal to the Depth Plus	1.5	m (for the above ground extension)	
Gravilty Acceleration (m/sec^2)	9.81		
Height of Exposed Face (m)	9	28	(ft)
Boring Distance from Exposed Face (m)	6	20	(ft)

Ko = 0.5
Nc = 19.2

Liquefaction Potential

SPT Sample Number	Depth (m)	Depth (ft)	Layer Thickness (m)	Midpoint of Layer (m)	Measured N	Soil Type (USCS)	Flag "nlp"	Sat/Unsat	Fines Content (%)	Energy Ratio, ER (%)	C_E	C_B	C_R	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	ΔN for Fines Content	$(N_1)_{60-cs}$	Stress Reduct, Coeff, r_d	CSR	MSF_{max}	MSF for Sand	K_σ for Sand	CRR for M=7.5 & σ_{vc}'=1atm	CRR	Factor of Safety
1	1.37	4.50	1.37	0.69	7	ML		0	55	90	1.50	1	0.75	1.00	7.9	27	27	1.70	13.39	5.6	19.00	1.00	0.334	1.5	0.94	1.10	0.194	N.A.	N.A.
2	2.44	8.00	1.07	1.91	2	ML		0	55	90	1.50	1	0.8	1.00	2.4	48	48	1.51	3.62	5.6	9.23	0.99	0.332	1.2	0.98	1.07	0.113	N.A.	N.A.
3	3.66	12.00	1.22	3.05	2	SM		1	27	90	1.50	1	0.85	1.00	2.6	70	64	1.29	3.28	5.2	8.50	0.98	0.360	1.2	0.98	1.04	0.108	0.11	0.31
4	4.27	14.00	0.61	3.96	3	SC		1	25	90	1.50	1	0.85	1.00	3.8	88	76	1.17	4.46	5.1	9.53	0.98	0.379	1.2	0.98	1.03	0.115	0.12	0.30
5	5.03	16.50	0.76	4.65	8	CL	nlp	1	50	90	1.50	1	0.95	1.00	11.4	102	82	1.06	N.A.	N.A.	N.A.	0.97	0.402	--	--	1.06	N.A.	N.A.	N.A.
6	5.49	18.00	0.46	5.26	8	CL	nlp	1	60	90	1.50	1	0.95	1.00	11.4	114	90	1.03	N.A.	N.A.	N.A.	0.97	0.411	--	--	1.03	N.A.	N.A.	N.A.
7	5.94	19.50	0.46	5.72	12	CL	nlp	1	65	90	1.50	1	0.95	1.00	17.1	123	94	1.02	N.A.	N.A.	N.A.	0.96	0.420	--	--	1.02	N.A.	N.A.	N.A.
8	6.25	20.50	0.30	6.10	10	SM		1	30	90	1.50	1	0.95	1.00	14.3	130	99	1.01	14.39	5.4	19.75	0.96	0.424	1.5	0.94	1.00	0.203	0.19	0.45
9	6.71	22.00	0.46	6.48	8	SC		1	30	90	1.50	1	0.95	1.00	11.4	138	102	1.00	11.36	5.4	16.72	0.96	0.433	1.4	0.95	1.00	0.171	0.16	0.38
10	8.08	26.50	1.37	7.39	12	SM		1	24	90	1.50	1	0.95	1.00	17.1	156	106	0.98	16.73	5.0	21.72	0.94	0.463	1.6	0.93	0.99	0.229	0.21	0.46
11	8.53	28.00	0.46	8.31	21	SM		1	24	90	1.50	1	1	1.00	31.5	174	120	0.95	29.77	5.0	34.76	0.94	0.456	2.2	0.85	0.96	1.054	0.86	1.88
12	10.06	33.00	1.52	9.30	100	sandstone		1	30	90	1.50	1	1	1.00	150.0	193	124	0.95	142.04	5.4	147.40	0.92	0.480	2.2	0.85	0.94	2.000	1.59	2.00
13	11.58	38.00	1.52	10.82	100	sandstone		1	30	90	1.50	1	1	1.00	150.0	223	139	0.92	137.85	5.4	143.21	0.91	0.486	2.2	0.85	0.91	2.000	1.54	2.00

Liquefaction Induced Settlement and Lateral Spreading

Depth (m)	Depth (ft)	Limiting Shear Strain γ_{lim}	Parameter F_α	Maximum Shear Strain γ_{max}	ΔH_i (m)	ΔLDI_i (m)	ΔLDI_i (in)	Vertical Reconsol. Strain ε_v	ΔS_i (m)	ΔS_i (in)
1.37	4.50	0.178	0.570	0.000	1.37	0.000	0.0	0.000	0.000	0.00
2.44	8.00	0.500	0.928	0.000	1.07	0.000	0.0	0.000	0.000	0.00
3.66	12.00	0.500	0.939	0.500	1.22	0.610	24.0	0.041	0.050	1.96
4.27	14.00	0.498	0.923	0.498	0.61	0.304	12.0	0.038	0.023	0.92
5.03	16.50	0.000	0.000	0.000	0.76	0.000	0.0	0.000	0.000	0.00
5.49	18.00	0.000	0.000	0.000	0.46	0.000	0.0	0.000	0.000	0.00
5.94	19.50	0.000	0.000	0.000	0.46	0.000	0.0	0.000	0.000	0.00
6.25	20.50	0.163	0.531	0.163	0.30	0.050	2.0	0.023	0.007	0.28
6.71	22.00	0.228	0.680	0.228	0.46	0.104	4.1	0.027	0.012	0.48
8.08	26.50	0.131	0.424	0.131	1.37	0.179	7.1	0.021	0.029	1.16
8.53	28.00	0.023	-0.418	0.000	0.46	0.000	0.0	0.000	0.000	0.00
10.06	33.00	0.000	-10.753	0.000	1.52	0.000	0.0	0.000	0.000	0.00
11.58	38.00	0.000	-10.328	0.000	1.52	0.000	0.0	0.000	0.000	0.00
					LD =	1.25 (m)	49.1 (in)	S=	0.073 (m)	4.80 (in)

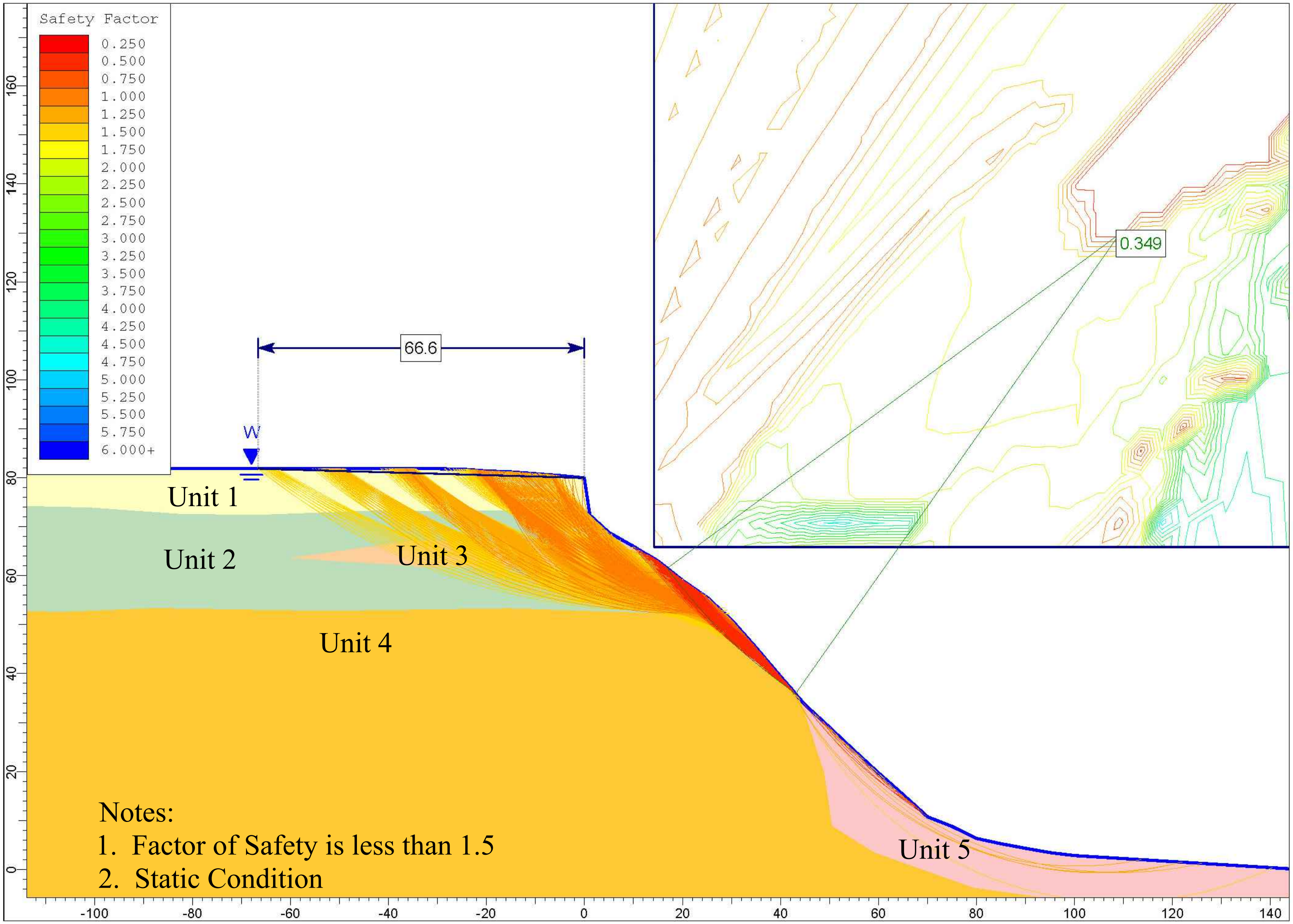
Dry Sand Settlement

τ_{avg} (tsf)	Average Stress (p) (tsf)	Max Shear Modulus (Gmax) (tsf)	a	b	γ (%)	ε_{15} (%)	ε_{Nc} (%)	Dry Sand Settlement (in)
0.094	0.19	516.5	0.131	17473	0.07	0.073	0.082	0.1
0.166	0.33	541.4	0.137	12372	0.19	0.493	0.550	0.5
0.242	0.50	645.0	0.143	9700.6	0.00	0.000	0.000	0.0
0.302	0.58	723.8	0.147	8843.6	0.00	0.000	0.000	0.0
0.346	0.69	0.0	0.151	8013.4	0.00	0.000	0.000	0.0
0.385	0.75	0.0	0.153	7605.8	0.00	0.000	0.000	0.0
0.414	0.81	0.0	0.156	7249.1	0.00	0.000	0.000	0.0
0.438	0.85	1116.8	0.157	7034.8	0.00	0.000	0.000	0.0
0.461	0.92	1094.4	0.160	6743	0.00	0.000	0.000	0.0
0.514	1.10	1310.5	0.167	6030.6	0.00	0.000	0.000	0.0
0.570	1.17	1575.7	0.169	5834.6	0.00	0.000	0.000	0.0
0.623	1.38	2768.8	0.177	5286.9	0.00	0.000	0.000	0.0
0.706	1.58	2942.8	0.186	4857.8	0.00	0.000	0.000	0.0
							S=	0.55 (in)

Liquefaction Potential
Dry Settlement
(1) Flag "nlp" – based on laboratory testing of fine content, plasticity index, liquid limits and potential intact moisture content.
"nlp" - no liquefacton potential

APPENDIX E

Slope Stability Analysis



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2/14/2024 12:13:41 PM save date
2/14/2024 4:51:52 PM plot date

APPROXIMATE SCALE (FEET)

0 15 30 60

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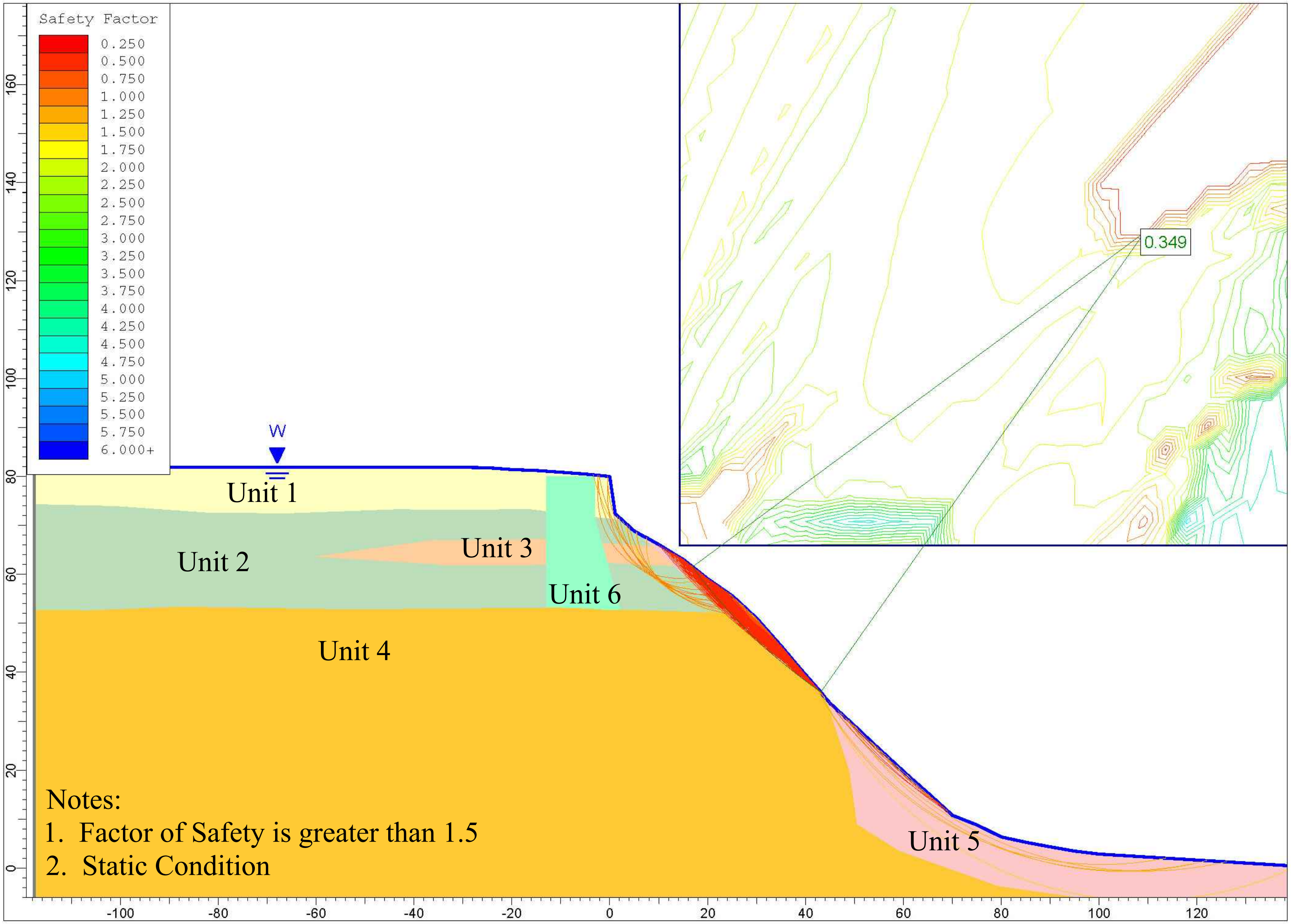
Job No.: 10945.05

Appr.: KAC

Date: 02/14/24

STATIC SLOPE STABILITY CROSS SECTION A-A'
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
E1



APPROXIMATE SCALE (FEET)

0 15 30 60

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5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05

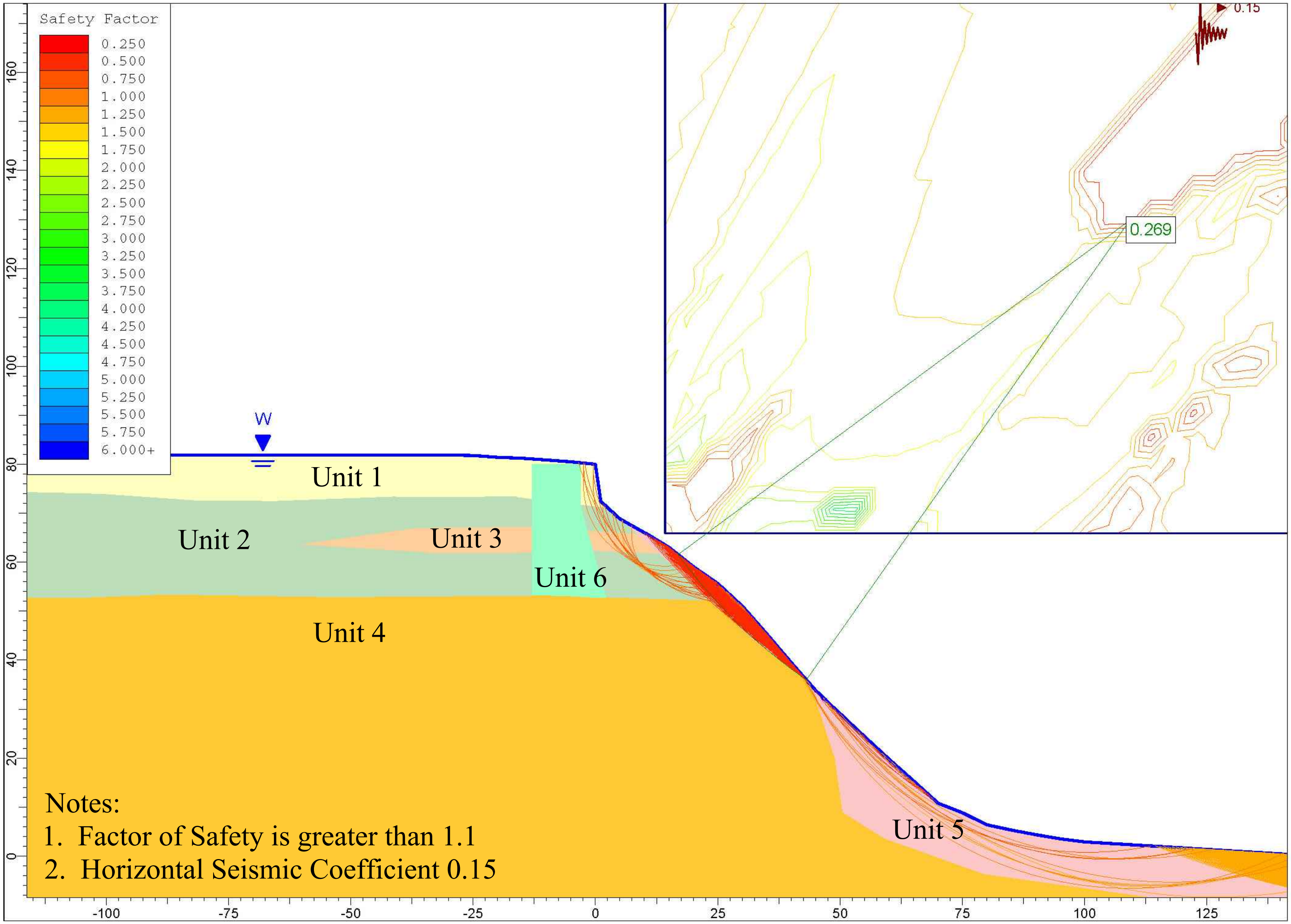
Appr.: KAC

Date: 02/14/24

STATIC SLOPE STABILITY CROSS SECTION A-A'

KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
E2



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2/14/2024 12:13:41 PM save date
2/14/2024 4:51:27 PM plot date

APPROXIMATE SCALE (FEET)

0 15 30 60

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Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: KAC
Date: 02/14/24

SEISMIC SLOPE STABILITY CROSS SECTION A-A'
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
E3

DISTRIBUTION

One Electronic Copy	Bill Knapp bill@netwidget.com

February 5th, 2024

County of Mendocino
Planing & Building Services
Mark Cliser, Interim Senior Planner

Dear Mr. Cliser,

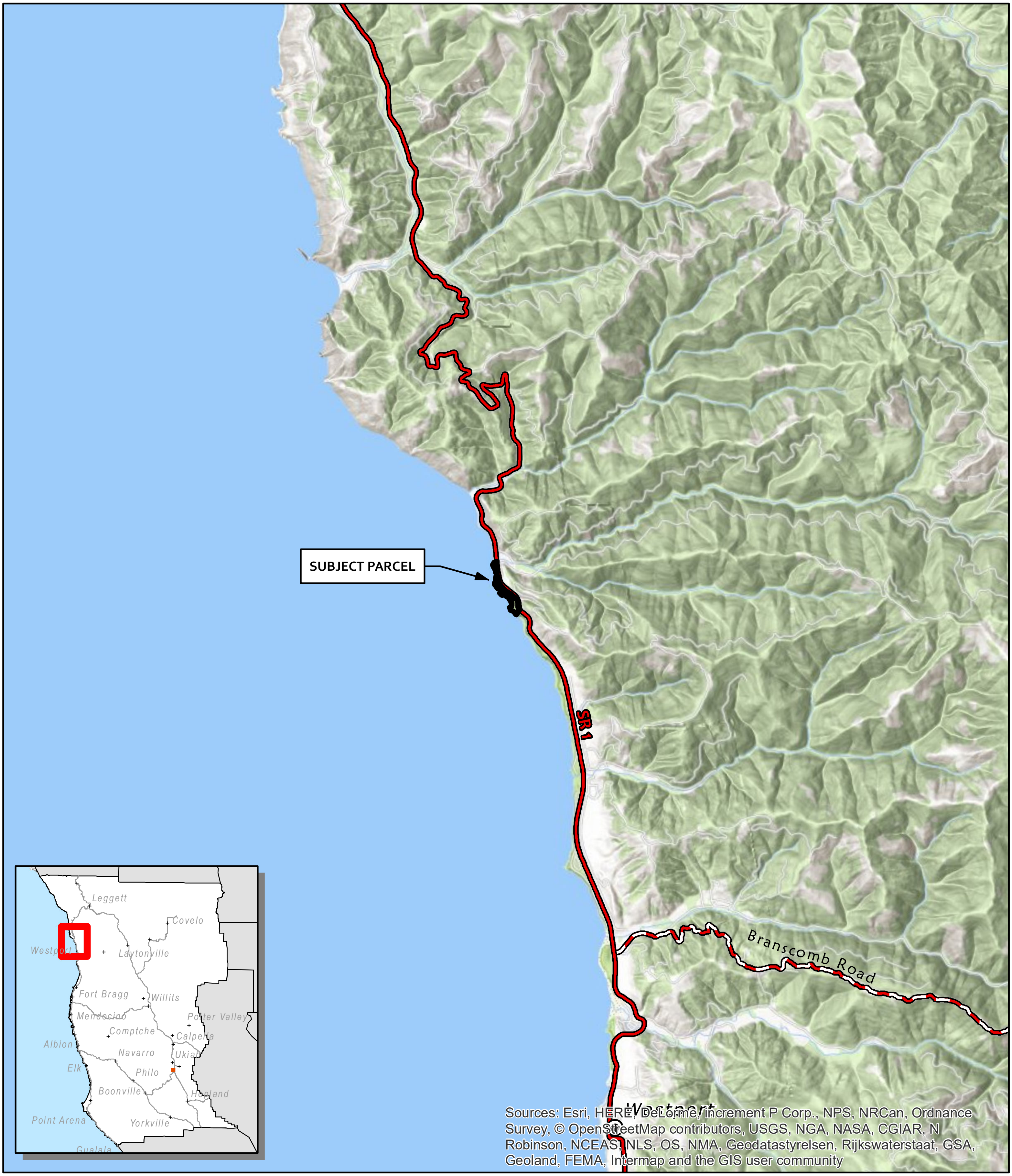
We would like to include a few words concerning our situation at **Union Landing**, 43026 North Highway 1, Westport, CA. As you are aware, we have had at least 3 winters of very bad rain which caused extreme erosion on our property. Previously, when we had the first slide, we tried netting and planting deep rooted native coastal plants and grasses. When we first saw the new, extreme damage so close to our home we were very upset and and were at a loss as to how to mitigate it. We both were at a pretty low level emotionally. But I remember my husband asking "Have you enjoyed living here?". I said yes and he said, "Well then we will find a way to fix this."

Last April of 2023 when we discovered the damage, Bill contacted Erik Olsborg of Brunsing Associates Inc. Eric was our original geologist when building the house in 2003 (moved in 2005). He and Tom Brunsing in the company were very helpful in finding a solution to our problem. They made us feel hopeful.

Our outlook/philosophy about this piece of land is that we are stewards. Our intention is to turn it over to the Mendocino Land Trust. We would like to have it available as a scenic stop for the public so they can enjoy this little bit of Paradise. So we would like to preserve it, not just for ourselves (we are both close to 80), but for the time after we are gone. Another reason is to pass on the history of this place. **Union Landing** was a major place to load lumber onto ships and we have lots of photos of that period. There's a lot of controversy about the exploitation of the redwoods around the turn of the century, but the logging history of Mendocino & of the coastal area particularly is important. This could be an educational stop as well as a scenic one.

Last, but not least, it is our belief that our home and this location is in immanent danger of being severely damaged, but feel that the solution recommended by BAI is a way of stabilizing the soil without harming neighbor's properties or the environment. This technique is becoming well known and improved on constantly. There are several people locally and up & down the coast who we believe can benefit from this technique as well.

Thank you for your attention to this matter. Bobbie & Bill Knapp



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Major Towns & Places
Highways
Major Roads

0 2,800 5,600 Feet
0 0.5 1 Miles
1:63,360

N E S W

LOCATION

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CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Highways (2017) — Driveways/Unnamed Roads
Public Roads
Private Roads

0 450 900 Feet
0 0.075 0.15 Miles
N W E S
1:10,000

AERIAL IMAGERY

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CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Highways (2017)
Driveways/Unnamed Roads
Public Roads
Private Roads

0 140 280 Feet
0 0.025 0.05 Miles
1:3,176.77

AERIAL IMAGERY

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CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Assessors Parcels

0 270 540 Feet
0 0.05 0.1 Miles
N S E W

1:6,000

TOPOGRAPHIC MAP

CONTOUR INTERVAL IS 40 FEET

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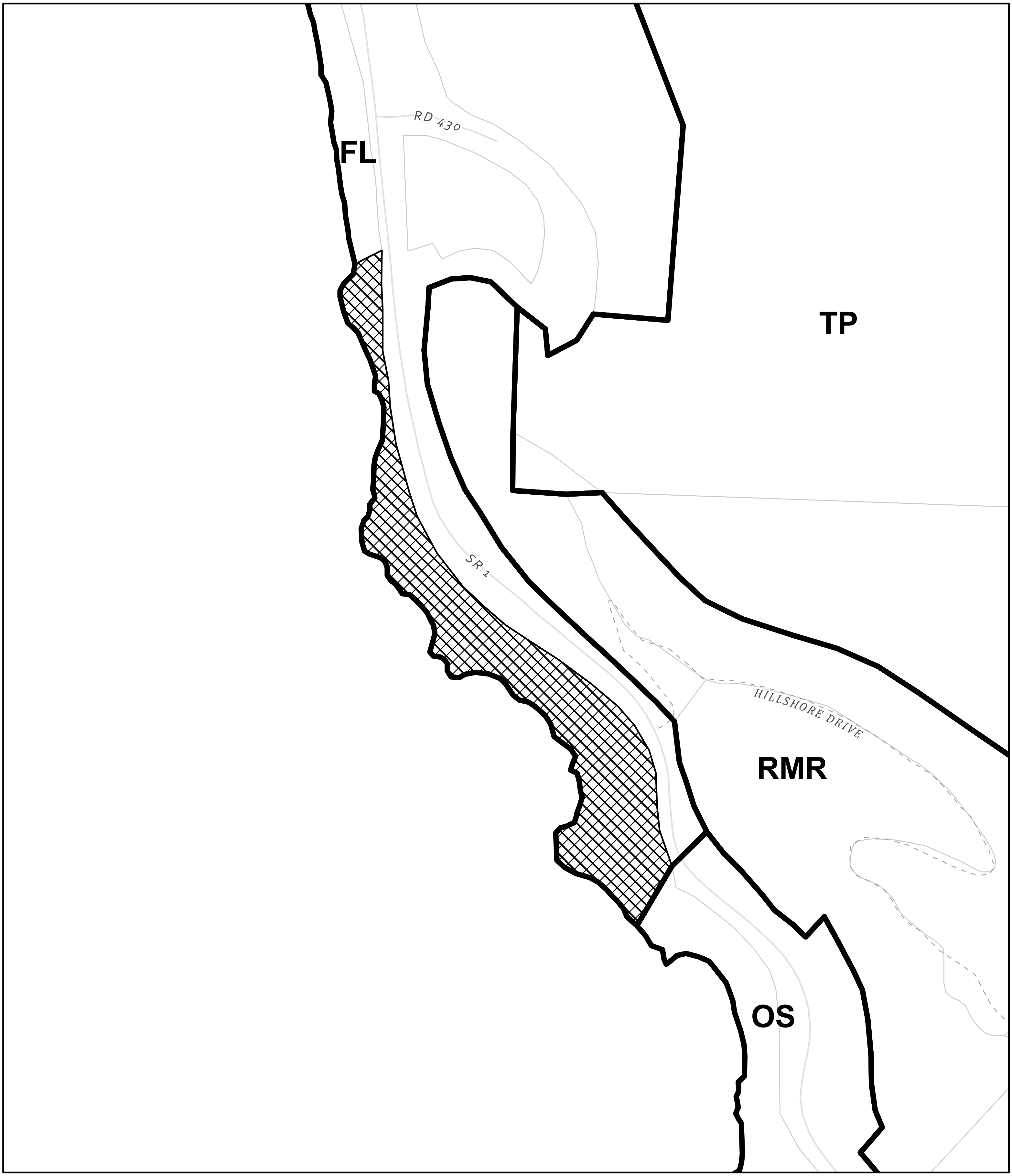

CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Zoning Districts
Assessors Parcels
Public Roads
Private Roads

0 225 450 Feet
0 0.04 0.08 Miles
1:5,000

ZONING

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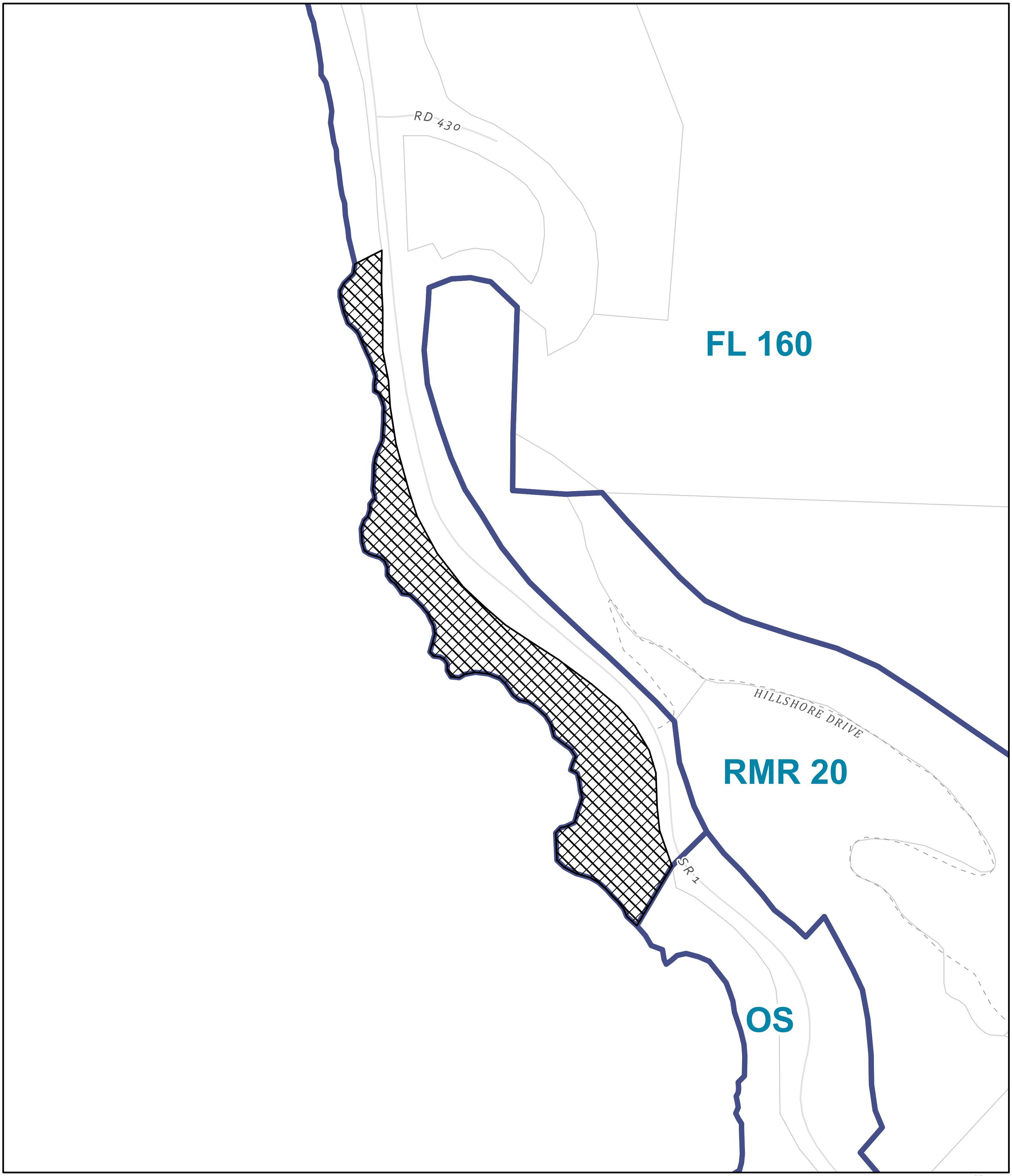
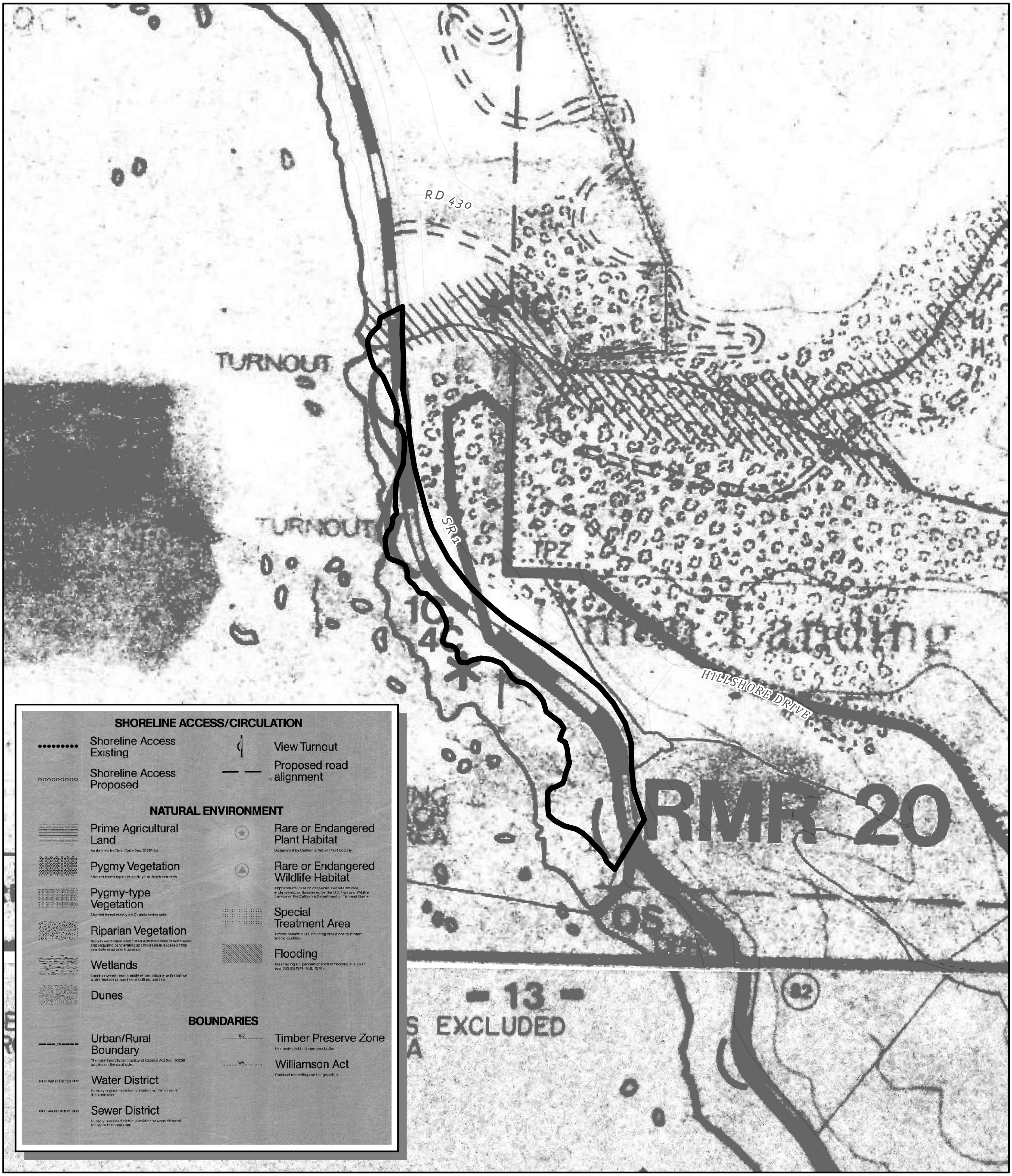


CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Public Roads
Private Roads
Assessors Parcels

0 225 450 Feet
0 0.04 0.08 Miles
N W E S
1:5,000

GENERAL PLAN



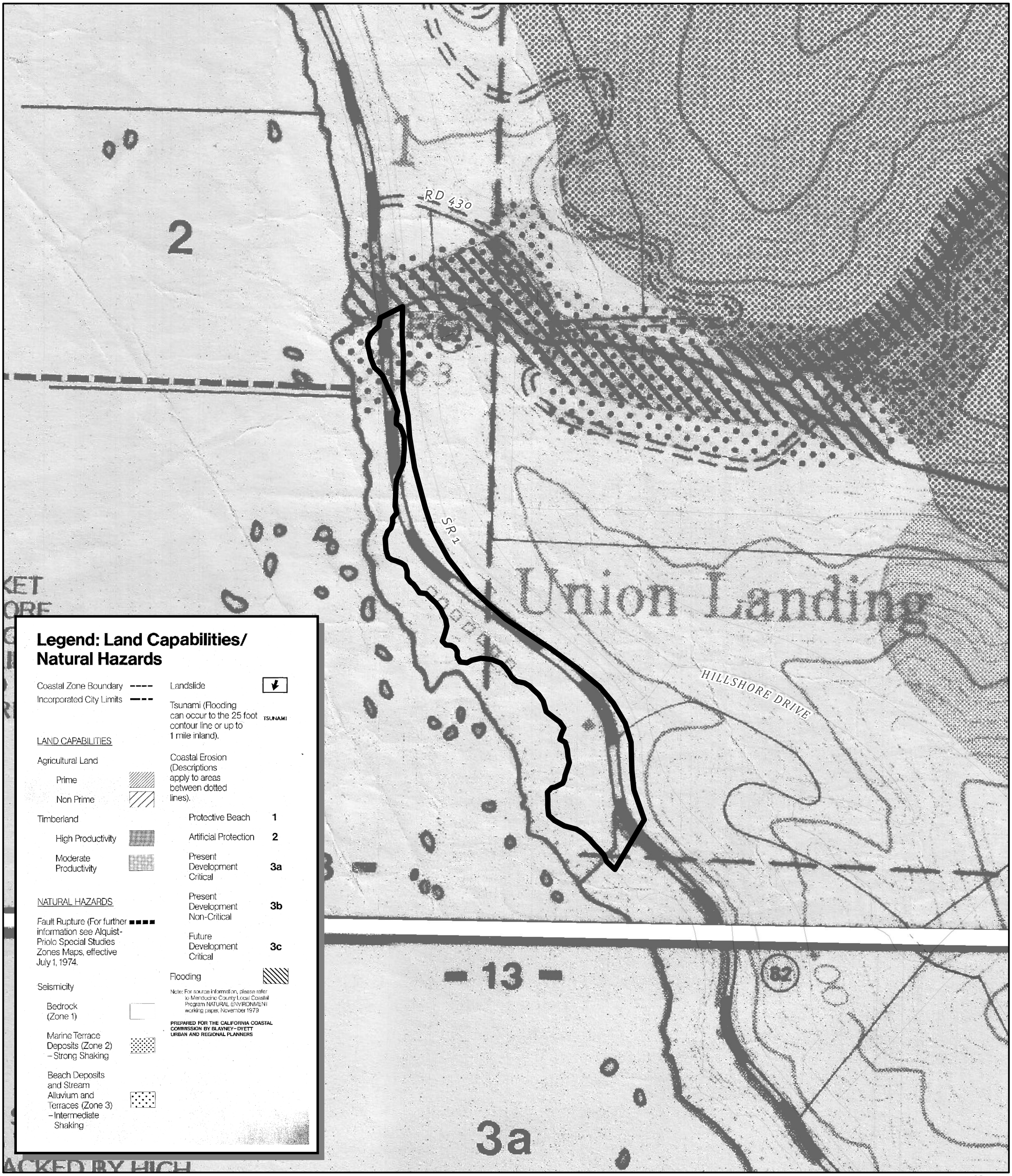
CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Public Roads
Private Roads
Assessors Parcels

0 270 540 Feet
0 0.05 0.1 Miles
1:6,000

N S E W

LCP LAND USE MAP 6: ROCKPORT



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Public Roads

Private Roads

Assessors Parcels

0 270 540 Feet

0 0.05 0.1 Miles

1:6,000

N W E S

LCP LAND CAPABILITIES & NATURAL HAZARDS

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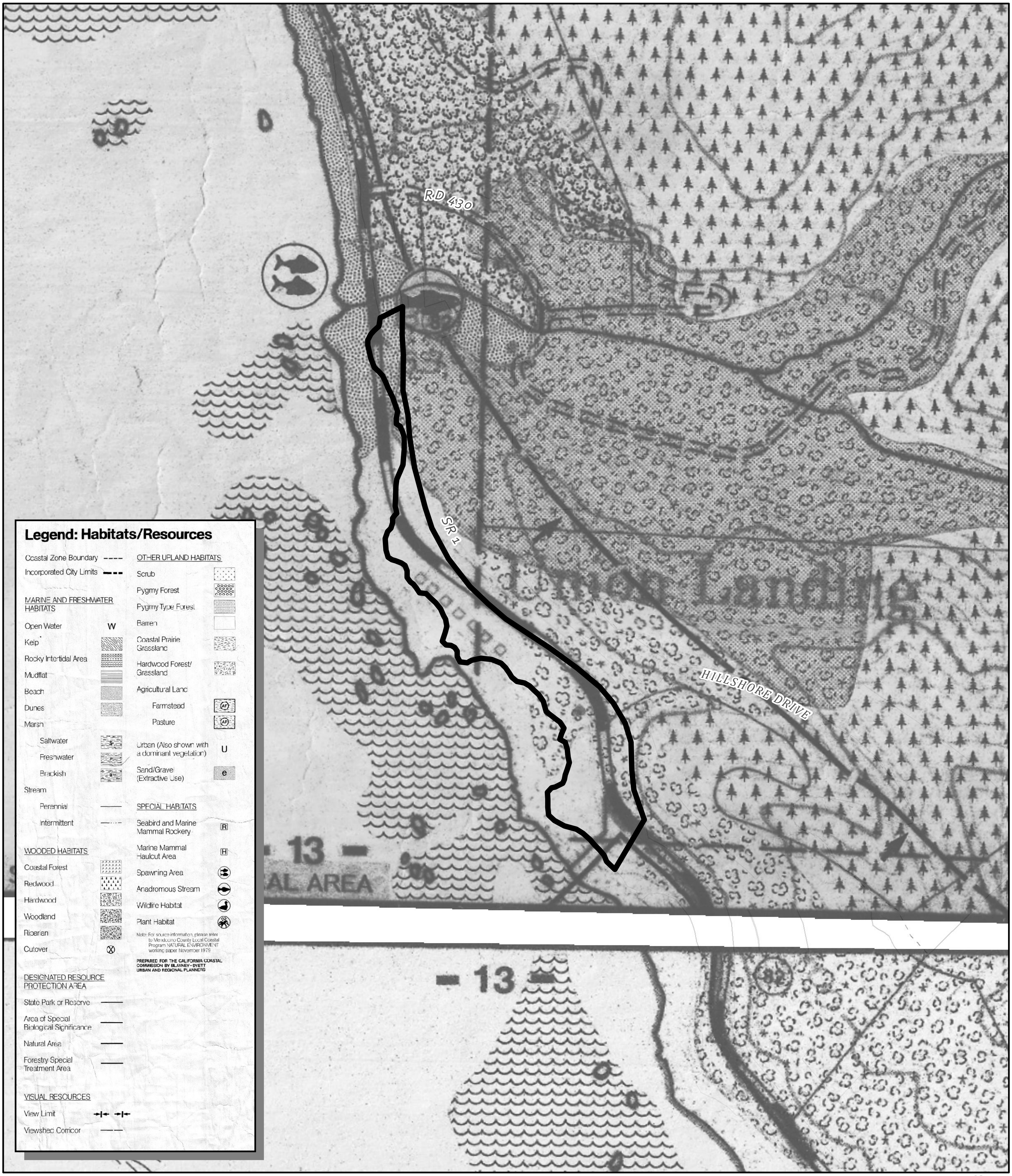

CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Public Roads
Private Roads
Assessors Parcels

0 270 540 Feet
0 0.05 0.1 Miles
N W E S
1:6,000

LCP HABITATS & RESOURCES

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CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Public Roads
Private Roads
Assessors Parcels

0 270 540 Feet
0 0.05 0.1 Miles
1:6,000
N E S W

POST LCP CERTIFICATION & APPEAL JURISDICTION

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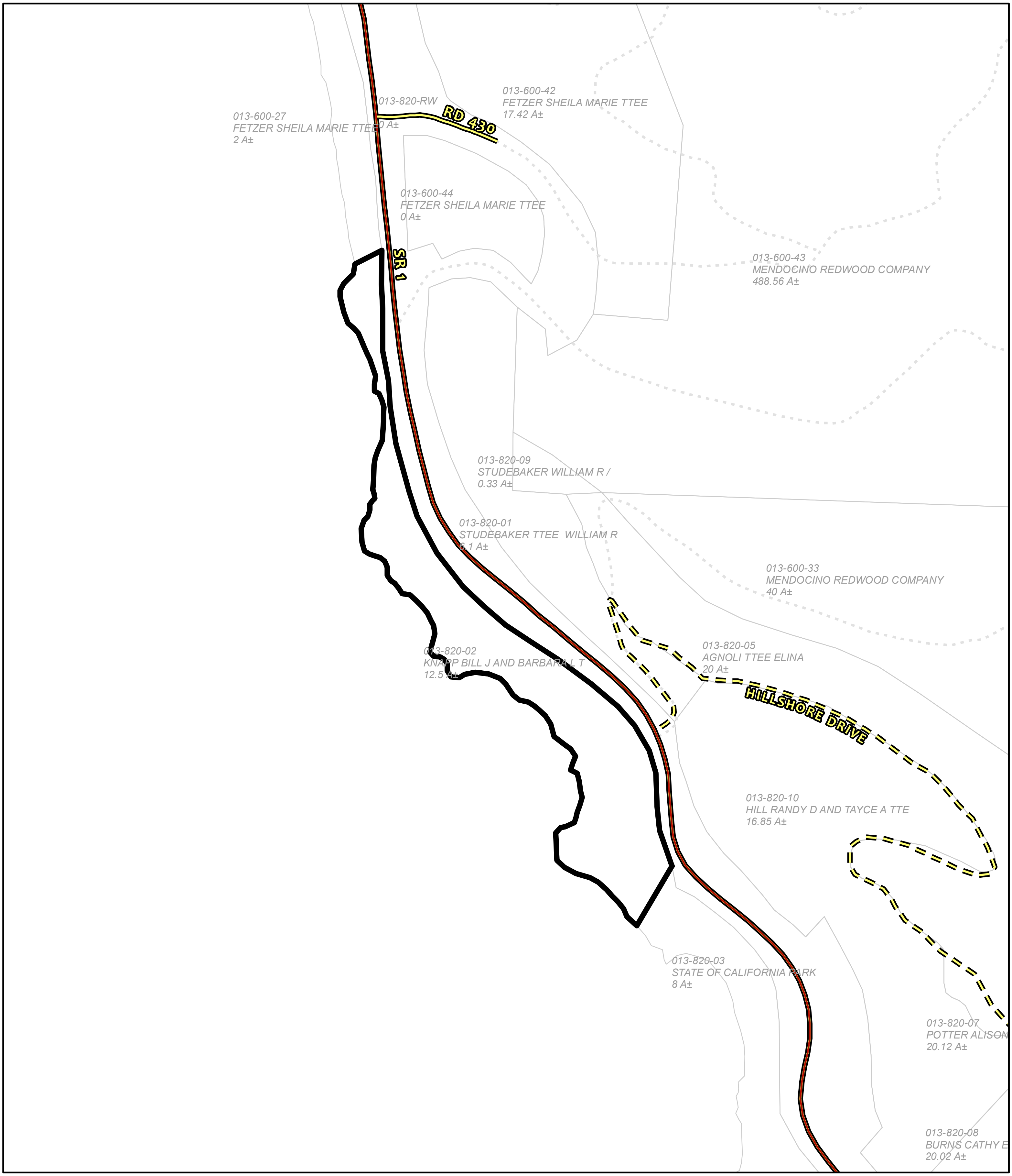

CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Highways (2017) | Driveways/Unnamed Roads
Public Roads | Assessors Parcels
Private Roads

0 225 450 Feet
0 0.04 0.08 Miles
N W E S
1:5,000

ADJACENT PARCELS

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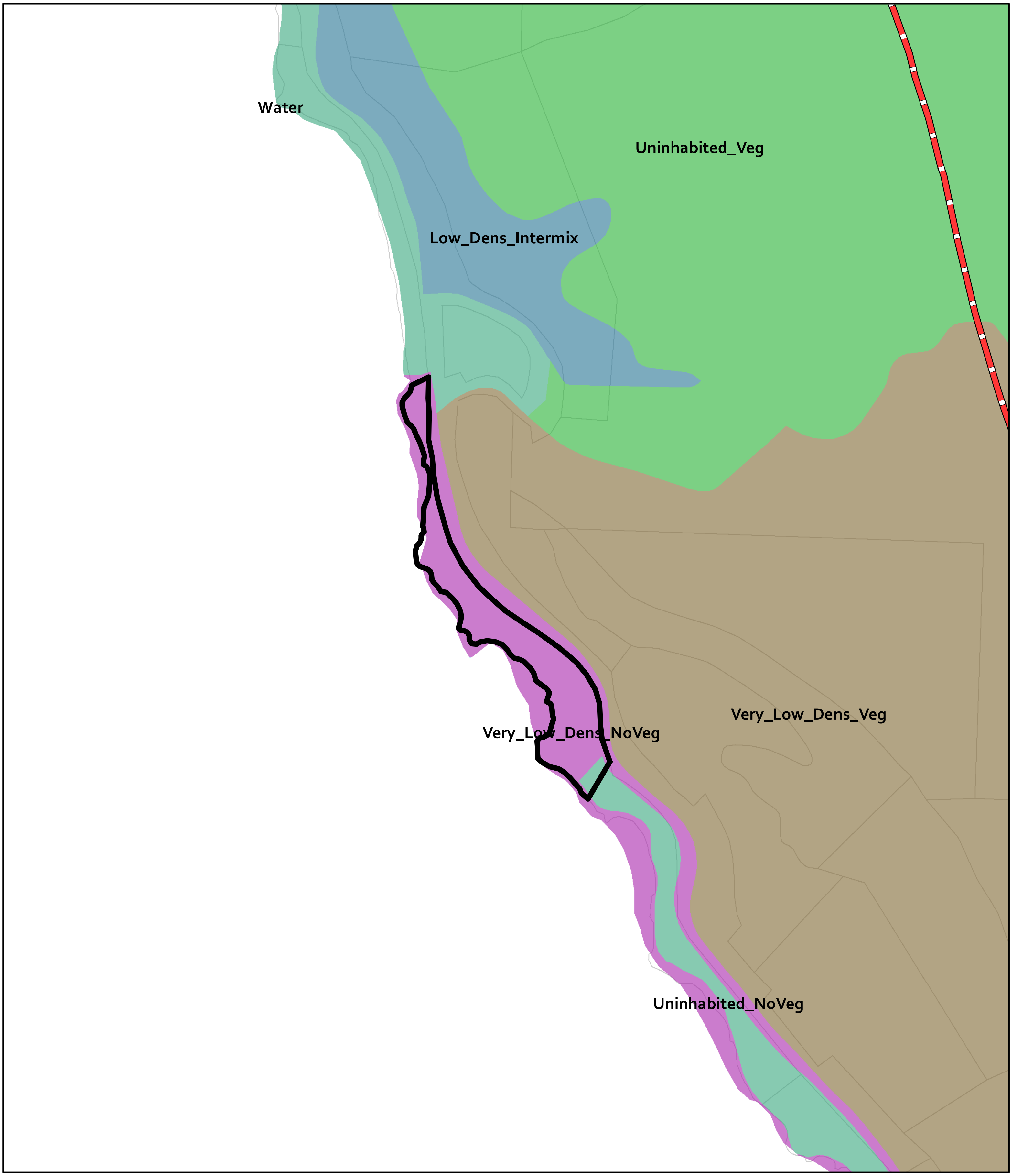


CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Coastal Zone Boundary

Assessors Parcels

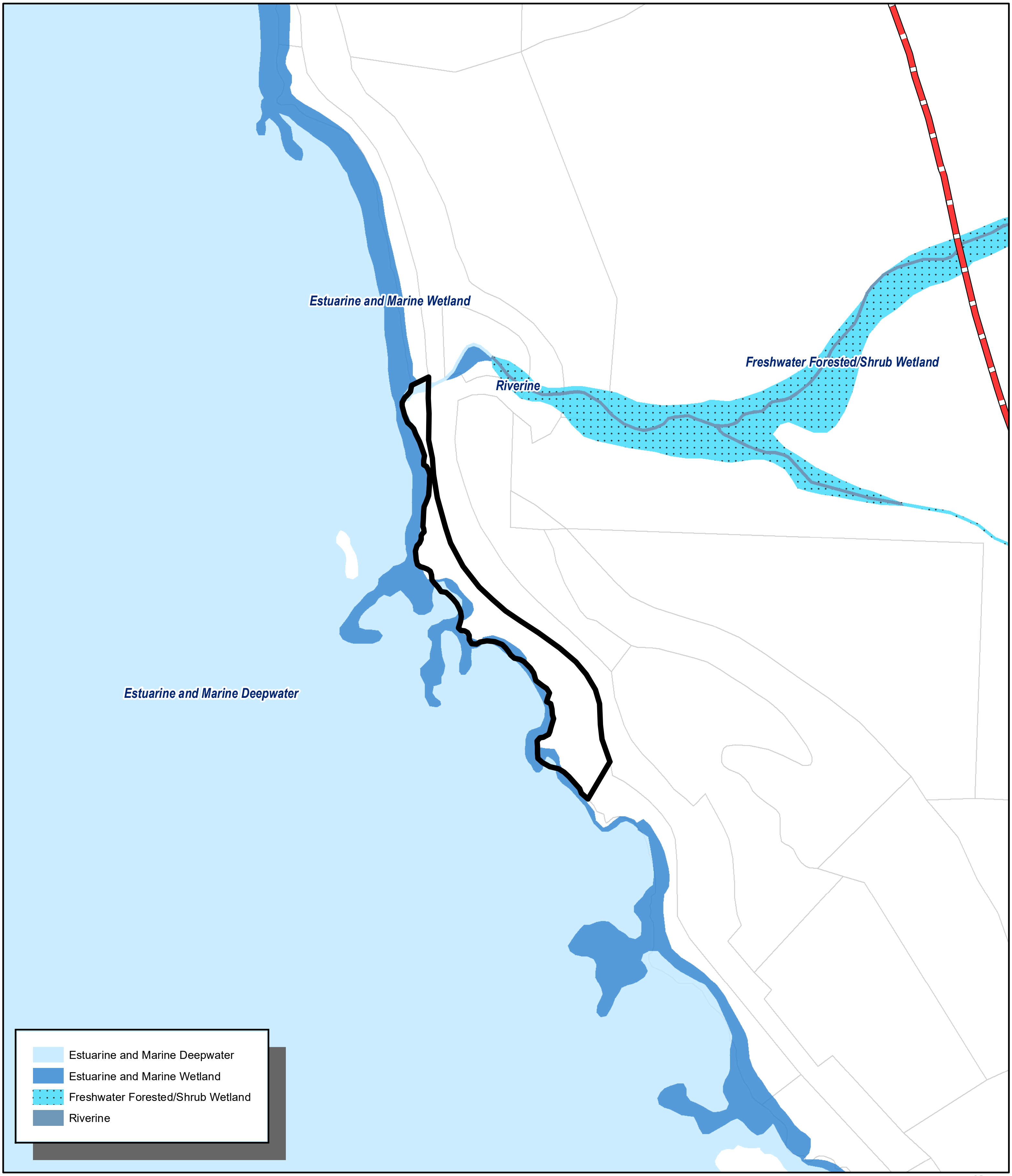
0 362.5 725 Feet

0 0.05 0.1 Miles

1:8,000

N W E S

WILDLAND-URBAN INTERFACE



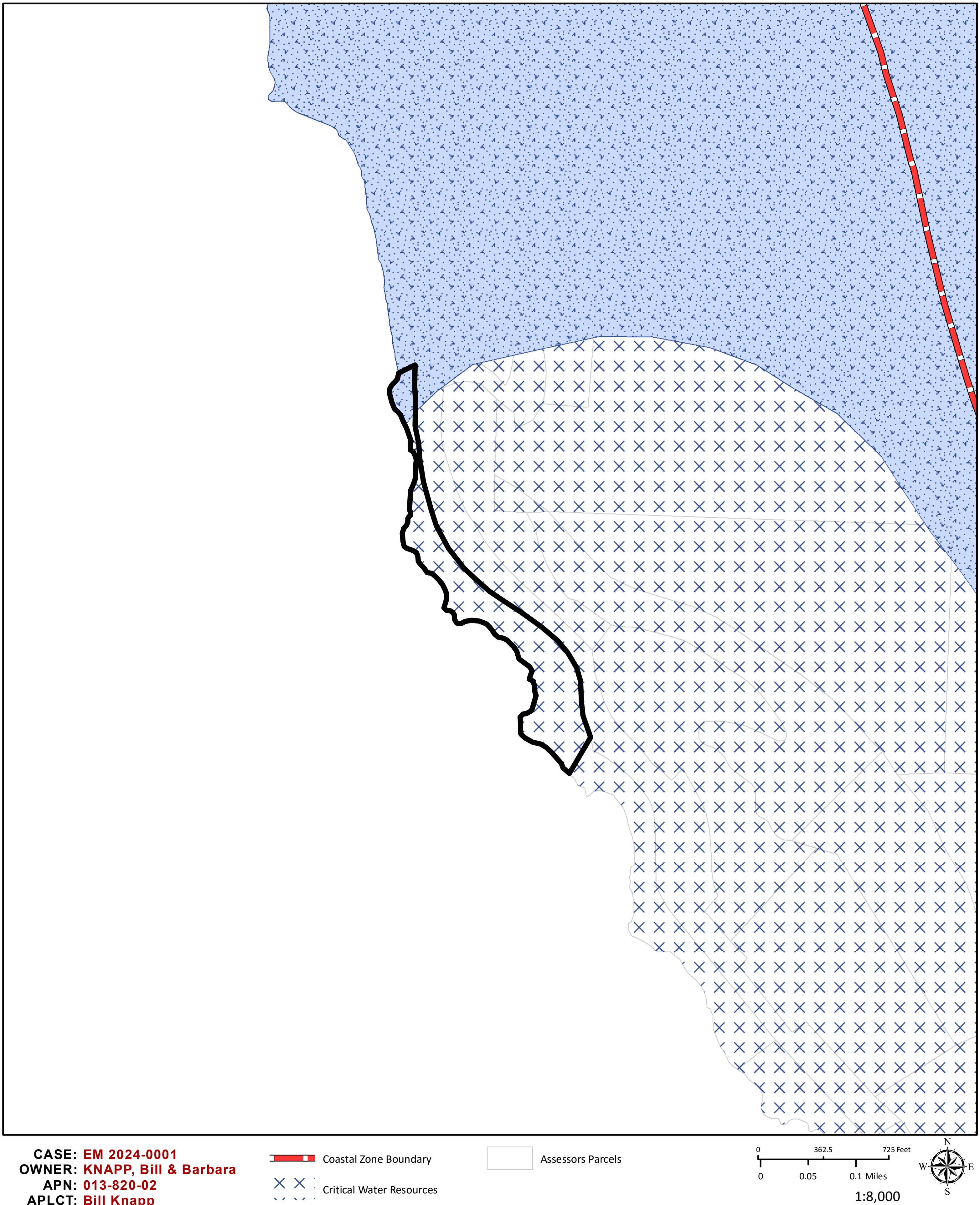
CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Coastal Zone Boundary

Assessors Parcels

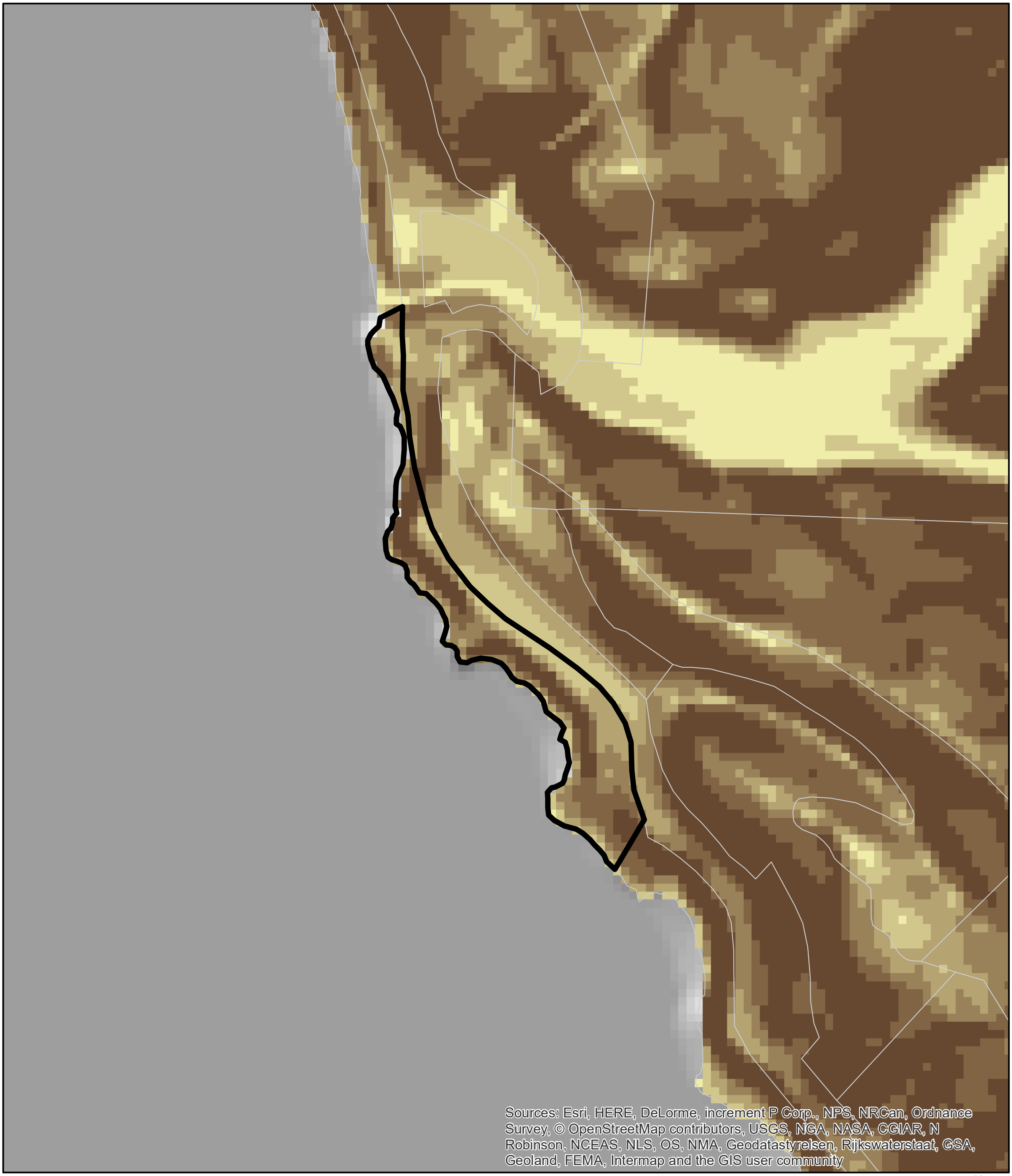
1:8,000

WETLANDS



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

COASTAL GROUND WATER RESOURCES



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Assessors Parcels
0° - 14°
14° - 30°
30° - 42°
42° - 52°
52° - 61°
61° - 86°

0 270 540 Feet
0 0.05 0.1 Miles
N W E S
1:6,000

ESTIMATED SLOPE

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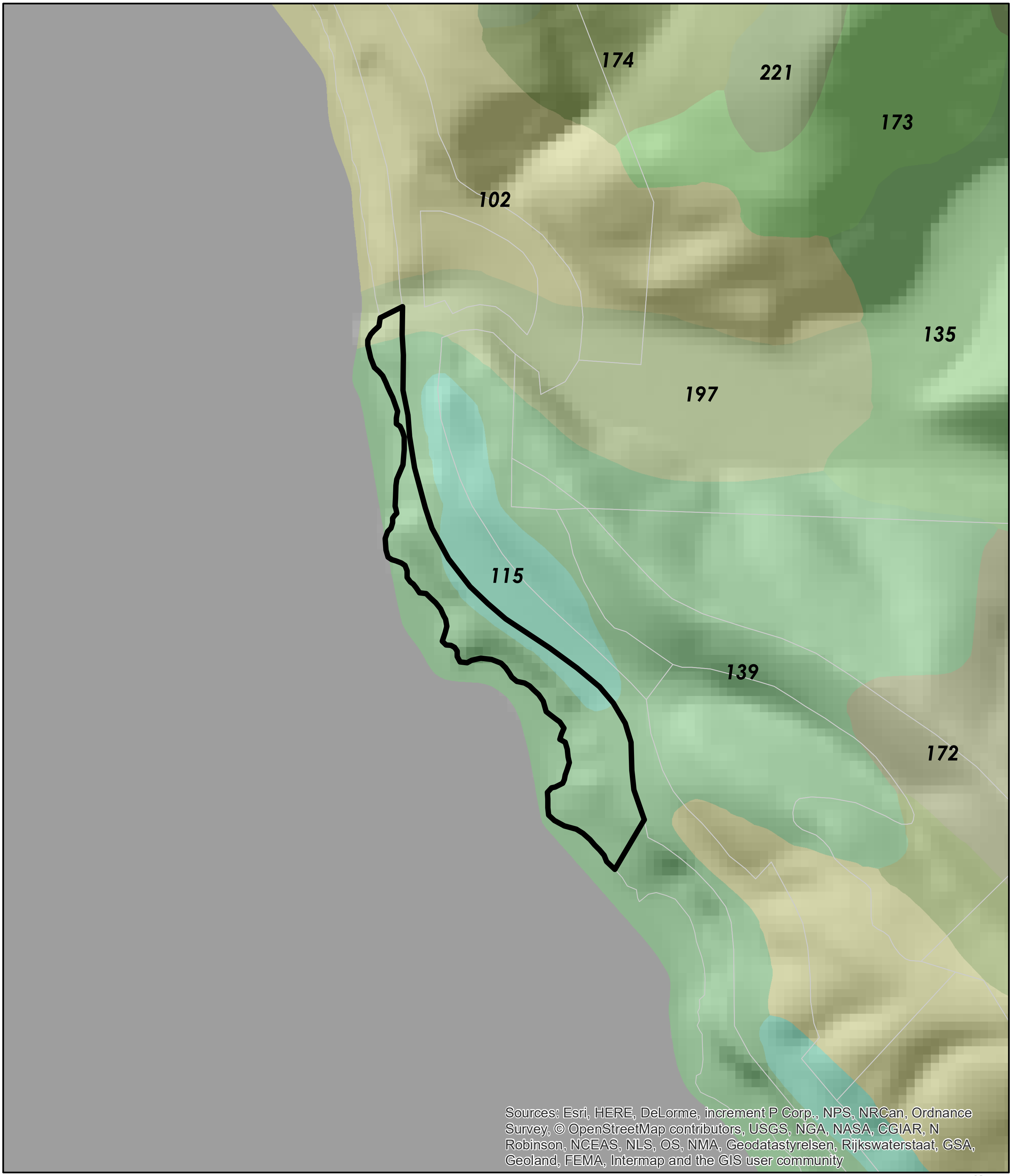
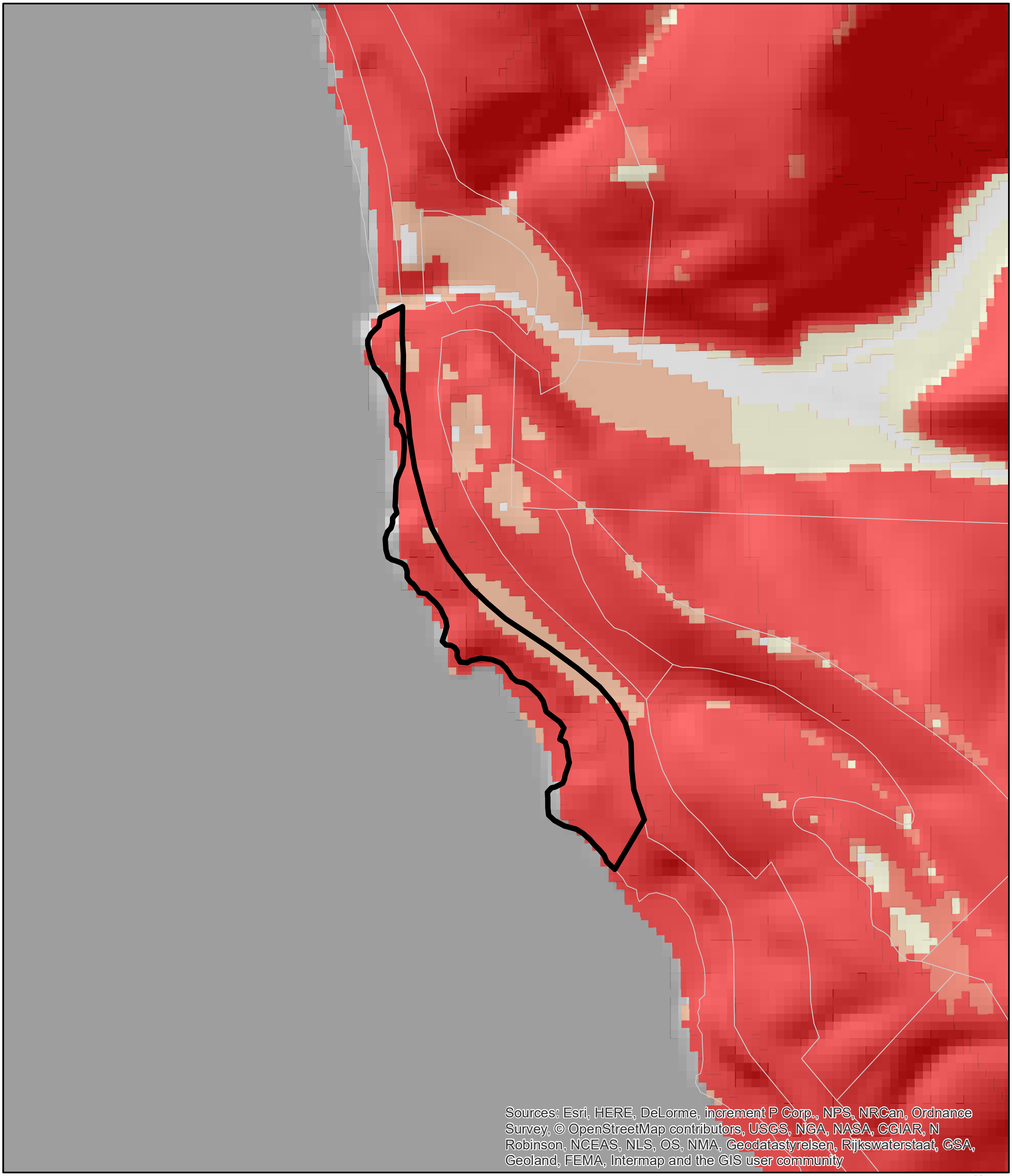


1:6,000

CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Assessors Parcels

WESTERN SOIL CLASSIFICATIONS

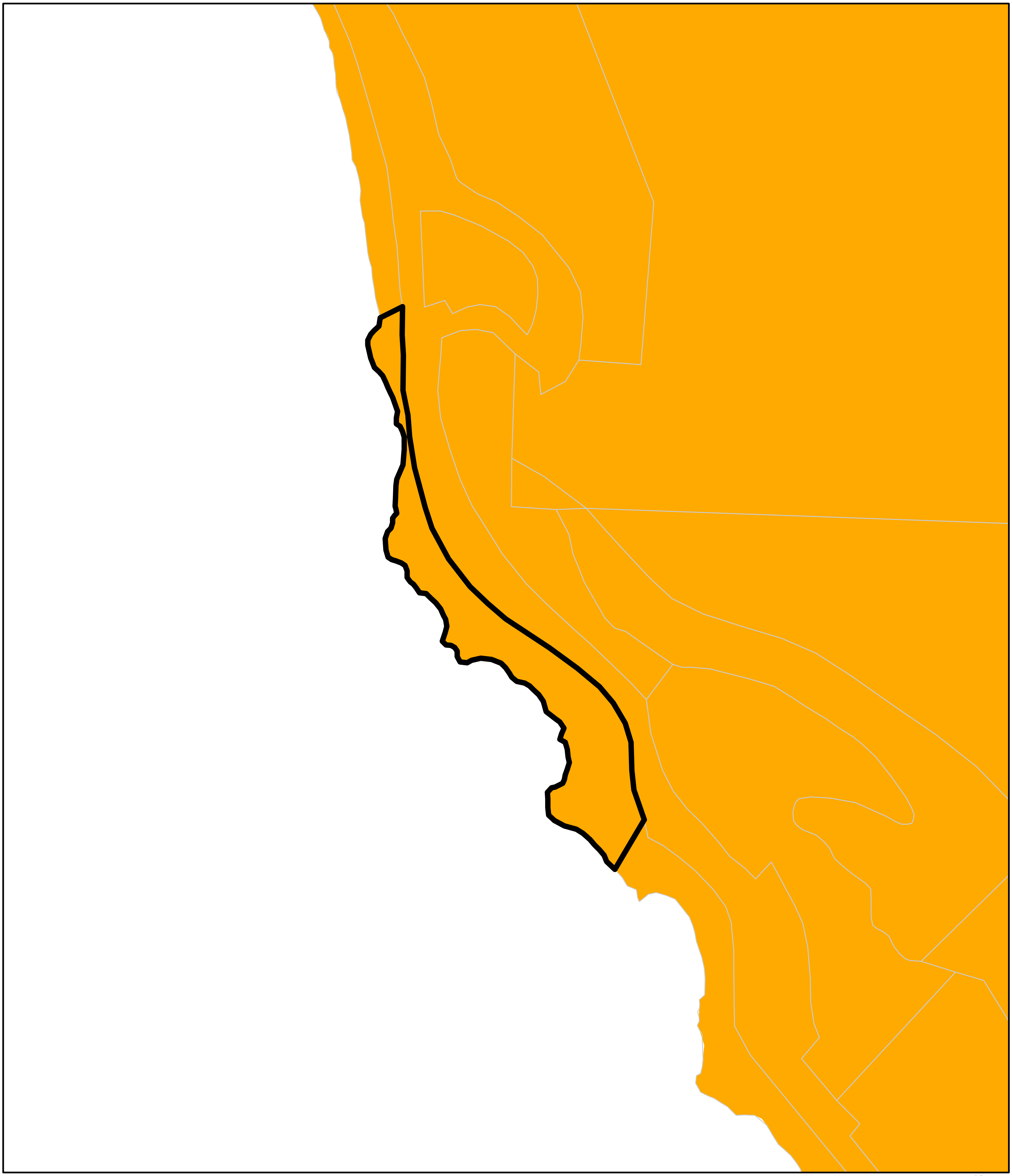


CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Assessors Parcels
0
0 - 5
5 - 7
7 - 8
8 - 10

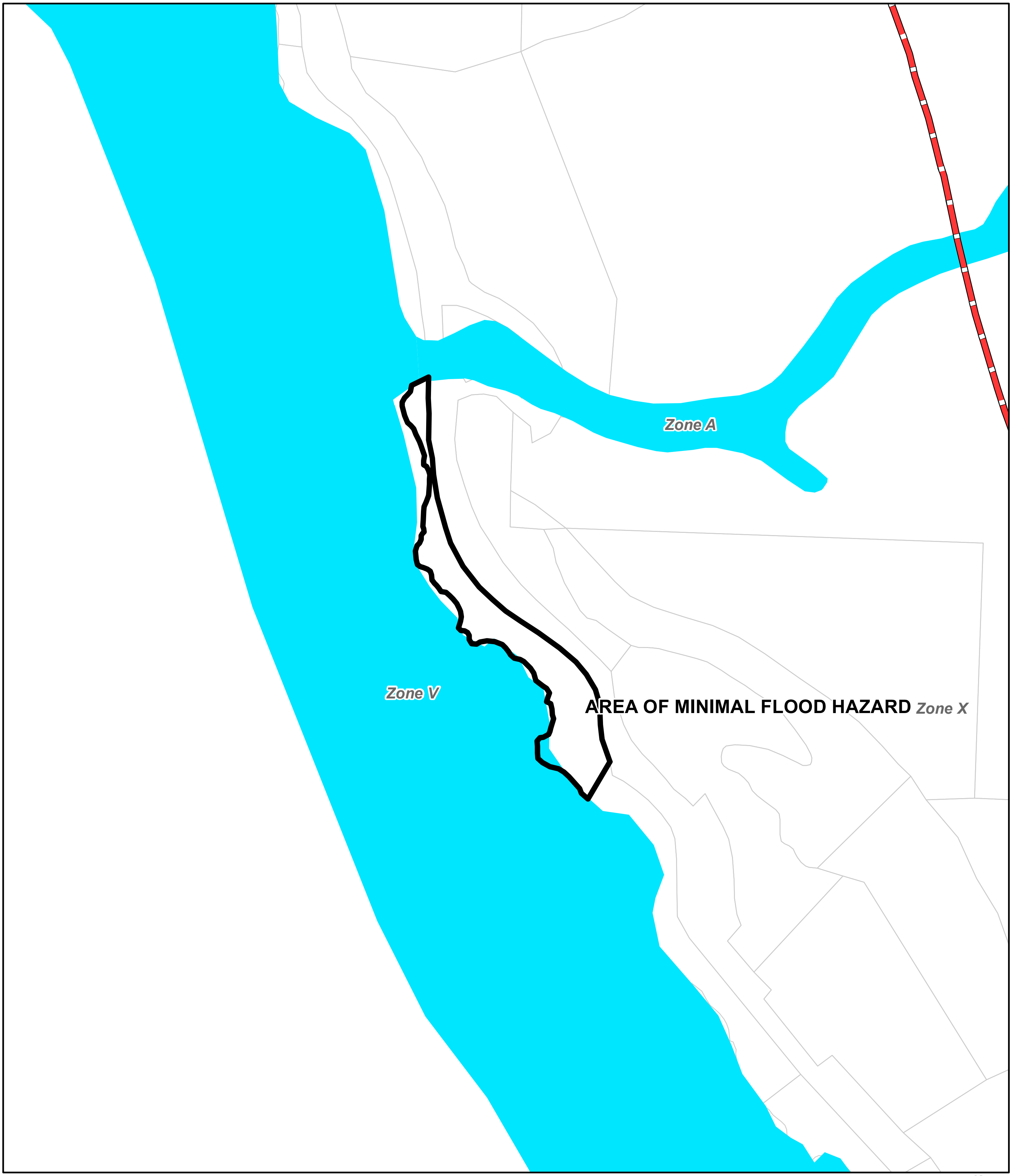
0 270 540 Feet
0 0.05 0.1 Miles
N W E S
1:6,000

LANDSLIDE HAZARDS



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

WESTPORT MUNICIPAL ADVISORY COUNCIL



CASE: EM 2024-0001
OWNER: KNAPP, Bill & Barbara
APN: 013-820-02
APLCT: Bill Knapp
AGENT:
ADDRESS: 43026 N Hwy 1, Westport

Coastal Zone Boundary
1% Annual Chance Flood Hazard
Assessors Parcels

0 362.5 725 Feet
0 0.05 0.1 Miles
1:8,000

FLOOD ZONES

Brunsing Associates, Inc.

5468 Skylane Blvd., Suite 201
Santa Rosa, CA 95403
707-528-6108
www.brunsing.com

February 14, 2024 10945.05

County of Mendocino
Planning & Building Services
860 N. Bush Street
Ukiah, CA 95483
Attn: Mark Cliser, Interim Senior Planner

RE: 43026 North Highway, 1, Westport, California

Dear Mr. Cliser;

Brunsing Associates Inc. (BAI) has been retained to evaluate a landslide that occurred recently at 43026 North Highway 1, Westport California, Plate 1. The landslide is near to and approaching the residence on the ocean side of the property, Plate 2. A geotechnical investigation completed prior to construction of the residence in 2001 reported a non-conforming fill had been placed on the property by Caltrans in the 1950s when Caltrans was improving Highway 1 that abuts the property. The non-conforming fill was placed over the native terrace deposits which overlie bedrock. Based on the geotechnical investigation and subsequent drawings and specifications that were prepared and permitted for construction of the house, the house was constructed on drilled piers, which extend through the non-conforming fill and into competent bedrock.

Groundwater migrating beneath Highway 1 flows southwest beneath the residence and daylights, seeping out of the bluff face adjacent to the residence. This discharge has been observed at several locations. Runoff water from Highway 1 and ground water seepage collect at the toe of the slope on the uphill side of the Knapp driveway. This water seeps into the ground and saturates the underlying fill and terrace deposits in the Knapp residence vicinity. To mitigate the water runoff/seepage concerns, a drainage system was designed by a structural/civil engineer and permitted by the County of Mendocino. The drainage system consists of an uphill ditch that empties into a culvert under the driveway about 250 feet northwest of the residence. The culvert water is carried by an unlined ditch over to an outfall over the bluff edge, Plate 2.

Currently, the roof drains and a driveway drain collect surface water that is then piped to a sump shown on the construction drawings. The water accumulating in the sump is pumped to an existing swale which also conveys surface water and collected seepage from Caltrans Highway 1. The swale discharges collected water to the ocean at the previously permitted discharge location shown on Plate 2.

During high flow conditions, typically after an extended period of high precipitation these seeps cause instability in the bluff face leading to slope failure in the non-conforming fill and eroding the underlying terrace deposit. This accelerated bluff retreat is imposing an immediate threat to the stability of the ground surrounding the residence which will lead to loss of lateral support of the drilled piers if not mitigated.

BAI completed an updated geotechnical investigation for the purpose of evaluating emergency mitigation measures, Appendix A. BAI has evaluated the following options for mitigating the problem created by the excessive erosion created by high groundwater flow seeping out of the bluff through the non-conforming fill.

Option 1 is to construct a series of drilled piers, a grade beam and tie backs between the residence and bluff after grouting the non-conforming fill in the same location.

Option 2 is to redirect groundwater that is seeping out of the bluff face to a safe discharge at the existing outfall shared by Caltrans and the residence.

Option 3 is to place an impermeable liner within the ditch that outlets over the bluff edge. Standing water in the ditch is seeping into the subsurface fill soils. Too much of the water is soaking into the ground before it reaches the bluff edge outfall.

Option 4 is stabilizing the non-conforming fill by permeation grouting the high void content reported in the geotechnical documents available for the property.

BAI recommends Options 2, 3, and 4 because they are less intrusive and more effective over a broader region of the bluff face partially surrounding the residence.

The high void ratio reported in the non-conforming fill would be significantly reduced by a properly designed grouting program. The seepage at the bluff causing excessive bluff failure within the non-conforming fill can be intercepted by a series of extraction wells which pump the collected groundwater to the existing stormwater sump.

The pumping rate necessary is estimated to be less than a gallon per minute due to the moderate permeability of the non-conforming fill and underlying terrace deposits. The current discharge rate from the referenced swale during a high rain event is estimated to be over 100 gallons per minute. Consequently, the steady state added flow from the interceptor wells would be negligible compared to the flow in the swale during rain events.

The proposed mitigation measures include four 4-inch diameter extraction wells extending to a depth of 35 feet below ground surface as shown on Plate 3. The area to be grouted is approximately 1000 square feet. The permeation grout should extend from near surface to bedrock within the recommended grouted area shown on Plate 3.

Grouting will ensure that both the non-conforming fill and underlying terrace deposit are more resistant to failure caused by seepage. The shape of the grout area is designed to deflect any groundwater that is not intercepted by the wells parallel to the bluff face so that it will seep out of the bluff face away from the residence. Due to the gradation of soils to be grouted, BAI recommends permeation grouting using an ultra-fine cement. This type of grout does not pose any environmental threats to the property or to the ocean.

BAI proposes to complete the installation of the extraction wells as shown on Plate 3 and the permeation grout of the area as soon as permitting allows in order to arrest further advance of the recent landslide also shown on Plate 3.

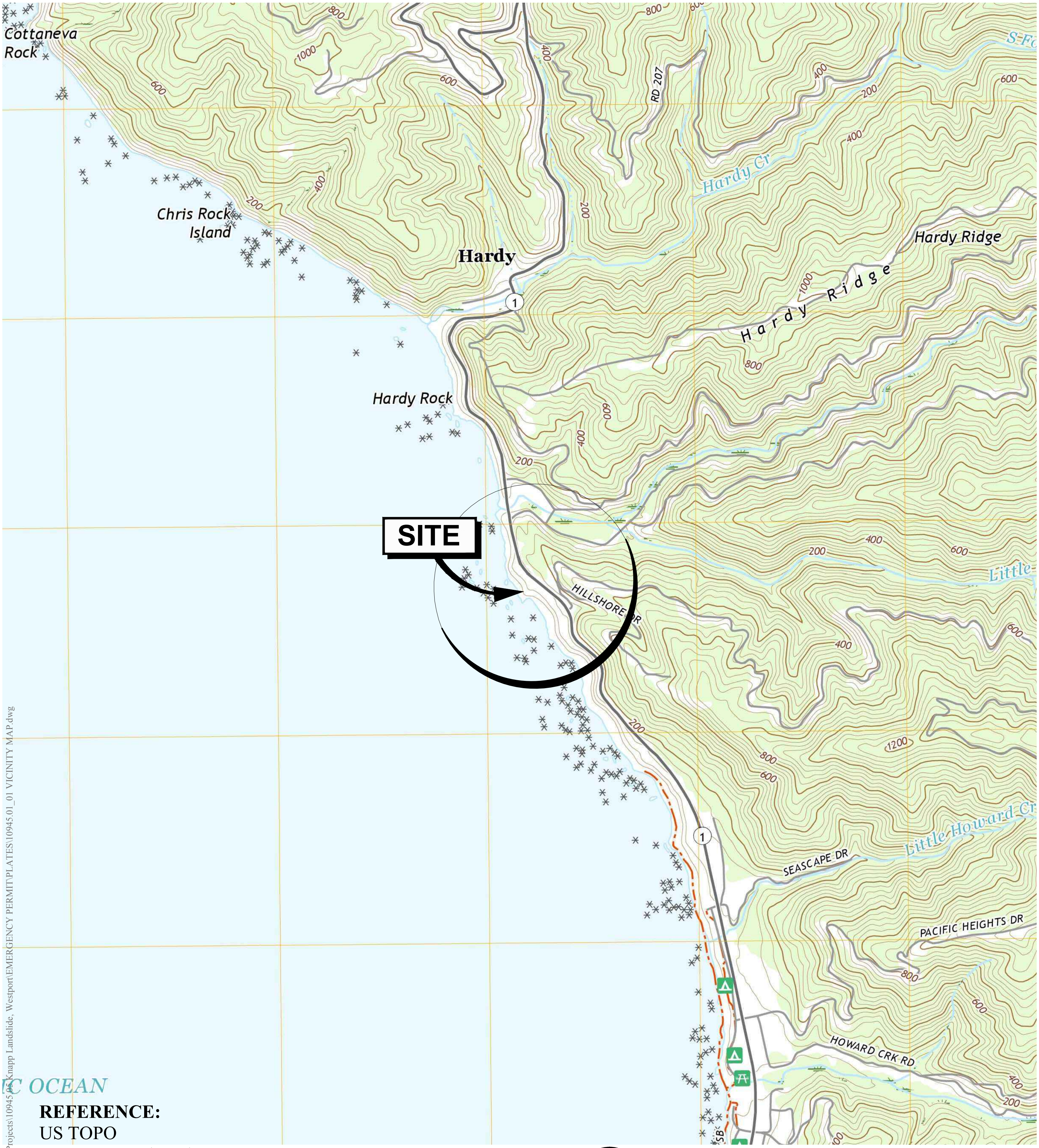
Respectfully submitted,

Thomas P. Brunsing
Principal Engineer

Erik E. Olsborg
Principal Engineering Geologist

TPB/KAC/EEO/ces

PLATES



REFERENCE:
US TOPO
Westport Quadrangle
California - Mendocino County
7.5-Minute Series, USGS, 2021

Latitude: 39.699404
Longitude: -123.802582

NORTH

APPROXIMATE SCALE (FEET)
0 1000 2000 4000

Brunsing Associates, Inc.
5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: KAC
Date: 02/14/24

VICINITY MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
1

Brunsing Associates, Inc.
5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: EEO
Date: 02/14/24

OVERALL SITE MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
2

REFERENCE:
Drone image and Topographic Map
by Mendocino Surveyors, Inc.

NORTH

APPROXIMATE SCALE (FEET)
0 10 20 40

Brunsing Associates, Inc.
5468 Skylane Blvd., Suite 201
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: KKC
Date: 02/14/24

SITE MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
3

L:\Geotech Projects\10945.05 Knapp Landslide, Westport\EMERGENCY PERMIT\PLATES\10945.05_03 SITE MAP.dwg
2/14/2024 2:53:43 PM save date
2/14/2024 3:25:50 PM plot date

APPENDIX A

Brunsing Associates, Inc.

GEOTECHNICAL INVESTIGATION

KNAPP RESIDENCE
43026 NORTH HIGHWAY 1
WESTPORT, CALIFORNIA

Project Number 10945.05

February 14, 2024

Engineers and Geologists

GEOTECHNICAL INVESTIGATION

KNAPP RESIDENCE
43026 NORTH HIGHWAY 1
WESTPORT, CALIFORNIA

Project Number 10945.05

prepared for

Bill Knapp

prepared by

Brunsing Associates, Inc.

5468 Skylane Blvd. Suite 201
Santa Rosa, CA 95403
(707) 528-6108

February 14, 2024

Keith A. Colorado
Geotechnical Engineer - 2894
kcolorado@brunsing.com

Erik E. Olsborg
Engineering Geologist - 1072
eolsborg@brunsing.com

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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation that Brunsing Associates, Inc. (BAI) has performed for the emergency mitigation of the Knapp residence, 43026 North Highway 1, Westport, California. The site is approximately 4.25 miles north-northwest of the town of Westport, California. The approximate location of the site is shown on the Vicinity Map, Plate 1.

The purpose of our services was to evaluate the site soil and bedrock conditions and the geologic hazards at the site (bluff erosion and slope stability) in order to provide recommendations to stabilize the area. Our approach to providing the geotechnical guidelines for the design of the project utilized our knowledge of the soil, bedrock and geologic conditions in the site vicinity and experience with similar projects in the area. Field exploration for this investigation was directed toward confirming anticipated soil, bedrock and geologic conditions, in order to provide the basis for our conclusions and recommendations.

The scope of our services, as outlined in our Change/Extra Service Order dated April 19, 2023 consisted of field reconnaissance, subsurface exploration, laboratory testing, engineering and geologic analyses, and the preparation of this report.

2.0 INVESTIGATION AND LABORATORY TESTING

2.1 Document Review and Research

As part of our investigation, we reviewed published geotechnical literature, including geologic, fault, and seismic hazard maps for the site and vicinity. We also reviewed previous geotechnical reports prepared by BAI on this property. A list of selected published references reviewed for this investigation is presented in Appendix A.

2.2 Field Reconnaissance

Our Principal Engineering Geologist performed an engineering geologic reconnaissance of the project site on March 29, 2023. The reconnaissance consisted of observing site geomorphology and bedrock outcrops, and soil exposures. The site was photographed during our reconnaissance.

Our Senior Engineering Geologist performed an additional reconnaissance and mapped the project site on April 5, 2023. Mapping the project site provided us with vertical and horizontal dimensions of the road embankment and nearby creek channel.

2.3 Subsurface Exploration

BAI conducted subsurface exploration to supplement our previous investigation which consisted of drilling, logging and sampling one test boring B-4, with a track-mounted drill rig. The approximate locations of the test borings, previous and current, are shown on the Site Map, Plate 2.

Our engineering geologist logged the test boring and obtained relatively undisturbed tube and bulk samples of the soil and bedrock materials encountered for visual classification and laboratory testing. Relatively undisturbed samples were obtained using 3.0-inch (CA), 2.5-inch (CM) and 2.0-inch (SPT) outside diameter modified California split-barrel samplers. The inside of the sampler barrels contained liners for retaining the soil and bedrock samples. Samplers were driven by a 140-pound drop hammer falling 30 inches per blow. Blows required to drive the CA and CM samplers were converted to Standard Penetration Test (SPT) blow counts[1] for correlation with empirical test data, using conversion factors of 0.64 and 0.79, respectively. Blow counts are presented on the boring logs.

The logs of the test borings showing the various soil and bedrock materials encountered and the depths at which samples were obtained are presented in Appendix B. The soils are classified in accordance with the Unified Soil Classification System in Appendix B. The soil and bedrock descriptive properties are presented in Appendix B. Our previous boring logs B-1, B-2, and B-3 are presented in Appendix B.

2.4 Laboratory Testing

Soil and bedrock samples obtained during our subsurface exploration were transported to our laboratory and examined to confirm field classifications. Laboratory tests were performed on selected samples to estimate their pertinent geotechnical engineering characteristics. Laboratory testing consisted of moisture content, dry density, sieve analysis, and unconsolidated-undrained triaxial compression tests. The test results are presented opposite the samples tested on the test boring logs. A key to test data is provided in Appendix B. A summary of laboratory testing and test results are presented in Appendix C.

3.0 SITE CONDITIONS

The property is situated on the southwest side of Highway 1 on an elevated terrace bordered by an ocean bluff. The existing residence is on the landward side of a south-southwest trending point. The driveway to the building area enters the property off Highway 1 near the north end of the terrace level.

The upper terrace level above the ocean bluff slopes very gently, about 20 horizontal to one vertical (20H:1V) to the southwest. The heavily brush-covered north-easterly edge of the terrace level slopes up steeply to Highway 1. The ocean bluff at the property is approximately 70 feet in vertical height. The lower portion, approximate half, of the bluff has very steep slope gradients that vary from near vertical to about 1/2H:1V. The upper portion of the bluff has slope gradients that vary from about 1/2H to 3/4H:1V. Logs, steel stakes, and pipes, evidence of old fill, project from the upper approximately 15 feet to 20 feet of the bluff slopes.

The upper terrace level at the property is covered by weeds and brush, except for landscaping around the residence. The bluff faces are mostly bare soil or bedrock with scattered weeds. The slope uphill of the terrace level that leads up to the highway, is covered with a dense growth of brush with some trees.

[1] SPT blow counts provide a relative measure of soil consistency and strength, and are utilized in our engineering analyses.

4.0 SITE GEOLOGY AND SOIL CONDITIONS

The site bedrock consists of gray to brown sandstone and shale of the Cretaceous-Tertiary Franciscan complex. The bedrock are generally moderately hard to hard, with local areas that are friable. The Franciscan bedrock is closely fractured, and little to moderately weathered. Where exposed on the bluff face, the friable portions of the bedrock are erodible. The orientation of the bedrock bedding at this site, as is typical of the Franciscan Complex, is somewhat chaotic. No prominent bedding or jointing orientations were observed at the site.

Pleistocene terrace deposits which overlie the bedrock, are at least 10 to 12 feet in thickness, or more. The terrace deposits consist of red-brown, orange, and olive sandy silts and blue-gray silty sands. The silts are medium stiff to hard, and the sands are medium dense to very dense.

Approximately 13 to 18 feet of fill cover the terrace deposits at our boring locations. The fill soils consist of a mixture of light brown to brown sandy silt, dark brown sandy gravelly silt, dark brown clayey silt, brown to reddish-brown silty sandy gravel, dark brown clayey silt, and orange to light red sandy silty clay. The silts and clays are generally soft to hard and the silty, sandy gravel is medium dense. The fill soils appear to be generally low in expansion potential (tendency for volume change with changes in moisture content); isolated portions of the fill soils are medium to high in expansion potential, as encountered in boring B-3 at a depth of about 13 feet. Glass and wood debris materials were encountered within the fill materials at a depth of 16 feet in boring B-2. As previously mentioned, logs, metal stakes and pipes were observed projecting from the lower fill materials north of the point. Moisturizing, and compaction procedures during the fill placement operations are unknown to BAI.

At the time of our 2001 report, the area of the recent landslide was mapped as a “slope creep” feature. A “sea cave” was mapped at the bluff toe in the vicinity of the slope creep area in 2001. The apparent “sea cave” is an erosional bluff indentation (not a cave). The indentation is due to erosion along an ancient fault. The fault may be millions of years old; the fault offsets the Cretaceous-Tertiary Franciscan rock bedding. The fault does not appear to be “active”, the fault does not offset the Pleistocene terrace deposits contact with the underlying Franciscan bedrock.

The recent landslide is 16 feet from the residence, as measured with a 100 foot tape. The landslide is comprised of old fill soils, terrace deposits and deeply weathered bedrock. The recent landslide is uphill of the bluff indentation. The indentation appears to funnel ocean storm waves up to the landslide toe and acts as a chute for the landslide debris drifting down to the beach.

No evidence of active faulting was observed at the site and none of the published references that we reviewed for this study show faults on, or trending towards, the property. The nearest active faults are the San Andreas Fault, located offshore, approximately 10.5 miles to the west, and the Maacama Fault, located approximately 13 miles to the northeast.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 General

Based upon the results of our investigation, we conclude that the site requires an engineered mitigation for the residence. The main geotechnical considerations affecting the design and construction of the project are potential settlement, groundwater, slope stability, slope retreat (erosion) rate, seismically induced settlement and the potential for strong seismic shaking and potential liquefaction. These constraints are discussed in the following subsections.

5.2 Tsunami Hazard

As typical of the Mendocino County coastal area, the site could be subject to large storm waves or tsunami waves. Damage from Tsunami waves, historically, has been limited to moored boats and docks in area coves and harbors. However, in February 1960, the Point Cabrillo Light House, located approximately 29 miles south of the subject property, was damaged by an approximately 65 feet high storm wave (meteorological tsunami, or "meteotsunami"). No such waves are recorded at the light house from 1909, the year it was built, to 1960. The light house was hit again by large storm waves on January 5, 2023. The back doors of the building were broken, and sea waters flooded the interior by a couple of feet. The storm waves overtopped the light station preserve bluffs throwing rocks and debris from the lower bluffs onto the terraces above. Since the adjacent bluffs are approximately 80 feet in vertical height, future impact or inundation from a severe storm surge or tsunami event is considered a low (unlikely) risk for the site.

5.3 Seismicity and Faulting

As is typical of the Mendocino County area, the site will be subject to strong ground shaking during future, nearby, large magnitude earthquakes. The intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the underlying earth materials.

No evidence of faulting was observed by BAI or shown in the site vicinity on the published geologic maps that we reviewed for this investigation. Therefore, the potential for fault rupture at the site is considered low.

5.4 Soil Liquefaction

To evaluate liquefaction[2] potential, we performed laboratory testing of the soils and a liquefaction analysis. The results of our analysis indicate the potential for liquefaction at the site during a design earthquake is high. This analysis was based on procedures by Idriss and Boulanger, 2008, with 2014 update.

[2] Liquefaction results in a loss of shear strength and potential soil volume reduction in saturated sandy, silty, silty/clayey, and also coarse gravelly soils below the groundwater table from earthquake shaking. The occurrence of this phenomenon is dependent on many factors, including the intensity and duration of ground shaking, the soil age, density, particle size distribution, and position of the groundwater table.

Where the factor of safety for liquefaction potential was 1.3 or less, we performed an analysis to estimate induced vertical settlement due to liquefaction. The results of our analysis indicate liquefaction induced settlement of 4.8-inches could occur at our boring location.

Lateral spreading is generally caused by liquefaction of marginally stable soils underlying gently to steeply-inclined slopes. In these cases, the saturated soils move toward an unsupported face, such as an incised river channel or roadway cut. The results of our analysis indicate lateral spreading of 49-inches could occur at our boring location.

Liquefaction and lateral spread analysis results are presented in Appendix D.

To mitigate the concern of liquefaction, the proposed engineered mitigation should be implemented as discussed below.

5.5 Slope Stability Analysis

Stability analyses were performed to correspond, as a minimum, to the guidelines prepared by (1) American Society of Civil Engineers (ASCE) and Southern California Earthquake Center (SC/EC) "Recommended Procedures for Implementation of Division of Mines and Geology Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California", dated June 2002 and (2) California Geological Survey (CGS) "Guidelines for Evaluating and Mitigating Seismic Hazards in California" dated 2008. These documents recommend a factor of safety greater than or equal to 1.5 for static conditions and 1.1 for pseudo-static conditions with a horizontal seismic coefficient of 0.15.

Cross Section A-A' as shown in Appendix E, was created from the topographic map, reconnaissance and data from our subsurface exploration. The location of the cross-section used for our stability analysis is shown on Plate 2.

From our test borings, five soil and bedrock units, with different density and strength parameters, were identified within the bluff for our stability analyses. Unit "1" is the upper sandy silt that is medium stiff to soft. Unit "2" is the silty/clayey sand that is loose. Unit "3" is the sandy clay that is medium stiff to stiff. Unit "4" is the deeply to moderately weathered sandstone. Unit "5" is debris deposits. Unit "6" is the proposed grouted material. Table 2 summarizes the soil and bedrock parameters used.

Table 1: Soil and Bedrock Parameters

Unit	Wet Density (pcf)	Cohesion (psf)	Friction Angle (ϕ)
1	124	350	35
2	125	50	16
3	120	225	26
4	135	1800	32
5	105	10	15
6	130	2500	0

The above assigned strengths were determined from strength test results obtained from this site, adjacent sites, as well as from back-analysis of the slope stability calculations.

The stability of the slope was analyzed using the computer program SLIDE by Rocscience, Inc. The results of our stability analyses are presented in Appendix E. The result of our stability analyses indicates that bluff is unstable in the current configuration and that the bluff would be stable with the proposed engineered mitigation.

6.0 RECOMMENDATIONS

6.1 Permeation Grouting

To provide lateral and vertical support and protection from landslide and erosion a grout curtain should be construction within the terrace deposits and old fill, as shown on Site Map, Plate 2.

Ultrafine portland cement (UFPC) grout should be injected within the matrix sands of the terrace deposit and old fill. If necessary, either sodium silicate (SS) grout or acrylate grout should be injected into silty sand lenses within this sand matrix. The first row of the grout curtain, the row closest to the bluff face should be grouted first. Due to the proximity to a free face, grout pressure in this row will be limited to 25 psi at the well head. Grout pressure can be increased to 35 psi at the well head in the second row and 50 psi at the well head in the third row. Based on an estimated porosity of 0.30 to 0.43, approximately 3.5 cubic feet of grout should be injected into each 2 foot vertical lifts on 3 feet spacing. The grouting contractor will need to provide a grout placement sequence which assures grout does not migrate into a previously grouted zone of the same borehole.

UFPC grout should be injected prior to injecting SS grout or acrylate grout. Grout injection should be limited to the 1.5-foot vertical zone of each bore by means of a packer and/or the tight fit of jetted tube of manchettes. A BAI observer should record the pressure, quantity of grout and grout mix injected at each 1.5-foot interval for each borehole. The grout mixes provided should achieve a minimum compressive strength in 28 days of 225 psi for the UFPC grout and 150 psi for the other grout mixes. Each mix design should be tested using the ASTM C1019 Method.

The initial grout curtain should be core drilled at 4 locations to confirm continuity of the grout penetration into the terrace deposits. Core samples should be collected from 10 feet, 15 feet and 25 feet depth below the ground surface. The samples should be subjected to triaxial compression testing.

6.2 Dewatering Gallery

The seepage at the bluff causing excessive bluff failure within the non-conforming fill can be intercepted by a series of extraction wells which pump the collected groundwater to an existing stormwater sump.

The pumping rate necessary in each well is estimated to be less than a gallon per minute due to the moderate permeability of the non-conforming fill and underlying terrace deposits. The current discharge rate from the referenced swale during a high rain event is estimated to be over

100 gallons per minute. Consequently, the steady state added flow from the interceptor wells would be negligible compared to the flow in the swale during rain events.

The dewatering gallery should include six 4-inch diameter extraction wells extending to a depth of 35 feet below ground surface as shown on Plate 2.

7.0 ADDITIONAL SERVICES

Prior to grouting and well installation, BAI should review the final plans and soil related specifications for conformance with the intent of our recommendations. During grouting and well installation, BAI should provide observations, together with the appropriate field and laboratory testing during the work. Our observations and tests would allow us to check that the work is being performed in accordance with project guidelines, confirm that the soil conditions are as anticipated, and to modify our recommendations, if necessary.

8.0 LIMITATIONS

This geotechnical investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report. Our conclusions are based upon reasonable geological and engineering interpretation of available data.

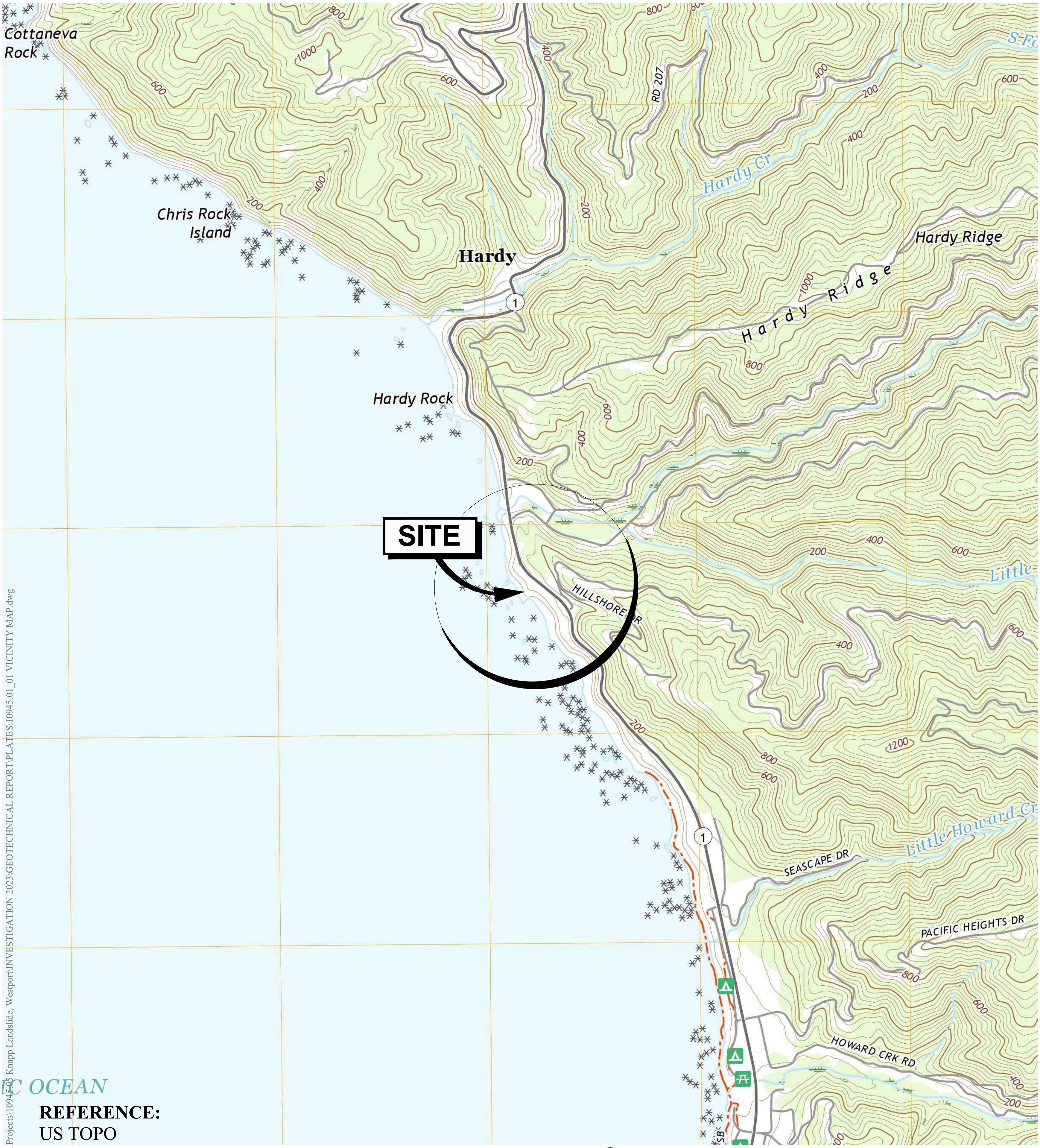
The samples taken and tested, and the observations made, are considered to be representative of the site; however, soil and geologic conditions may vary significantly between test borings and across the site. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by BAI, and revised recommendations be provided as required.

This report is issued with the understanding that it is the responsibility of the Owner, or his/her representative, to insure that the information and recommendations contained herein are brought to the attention of all other design professionals for the project, and incorporated into the plans, and that the Contractor and Subcontractors implement such recommendations in the field. The safety of others is the responsibility of the Contractor. The Contractor should notify the owner and BAI if he/she considers any of the recommended actions presented herein to be unsafe or otherwise impractical.

Changes in the condition of a site can occur with the passage of time, whether they are due to natural events or to human activities on this, or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The recommendations contained in this report are based on certain specific project information regarding type of construction and current structure locations, which have been made available to us. If conceptual changes are undertaken during final project design, we should be allowed to review them in light of this report to determine if our recommendations are still applicable.

PLATES



REFERENCE:
US TOPO
Westport Quadrangle
California - Mendocino County
7.5-Minute Series, USGS, 2021

Latitude: 39.699404
Longitude: -123.802582

NORTH

APPROXIMATE SCALE (FEET)
0 1000 2000 4000

L:\Geotech Projects\10945.05 Knapp Landslide, Westport\INVESTIGATION 2023\GEOTECHNICAL REPORT\PLATES\10945.01_01 VICINITY MAP.dwg

2/14/2024 11:25:10 AM save date
2/14/2024 4:27:19 PM plot date

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Job No.: 10945.05
Appr.: KAC
Date: 02/14/24

VICINITY MAP
KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE
1

REFERENCE:
Drone image and Topographic Map
by Mendocino Surveyors, Inc.

NORTH

APPROXIMATE SCALE (FEET)
0 10 20 40

Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108	Job No.: 10945.05 Appr.: KKC Date: 02/14/24	**SITE MAP** KNAPP RESIDENCE 43026 Highway 1 Westport, California	**PLATE** **2**

APPENDIX A - References

- California Division of Mines and Geology (CDMG), 1960, Geologic Map of California, Ukiah Sheet.
- CDMG, 1983, Geology and Geomorphic Features Related to Landsliding, Fort Bragg 7.5 Minute Quadrangle, Mendocino County, California, Open File Report 83-5.
- Dickinson, W. R., et. al., 2005, Net Dextral Slip, Neogene San Gregorio – Hosgri Fault Zone, Coastal California: Geologic Evidence and Tectonic Implications" Geological Society of America (GSA), Special Paper 391.
- Hampton, M. A. and Griggs, G. B., 2004, "Formation, Evolution, and Stability of Coastal Cliffs – Status and Trends", USGS Professional Paper 1693.
- Hapke, C. J. and Reid, D., 2007, "National Assessment of Shoreline Change, Part 4: Historical Coastal Cliff Retreat along the California Coast": USGS. Open File Report 2007-1133.
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- Kilbourne, R.T., 1983, Geology and Geomorphic Features Related to Landsliding, Fort Bragg 7.5 Minute Quadrangle, Mendocino County, California: California Division of Mines and Geology (CDMG), Open File Report 83-5.
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- United States Geological Survey and California Geological Survey, 2014, Quaternary fault and fold database for the United States, accessed August 29, 2016 from http://earthquake.usgs.gov/hazards/qfaults/.
- United States Geological Survey (USGS), 2015, Fort Bragg Quadrangle, California, 7.5-Minute Series: Scale 1:24,000.
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APPENDIX B

Boring Logs

Log of Boring B-1

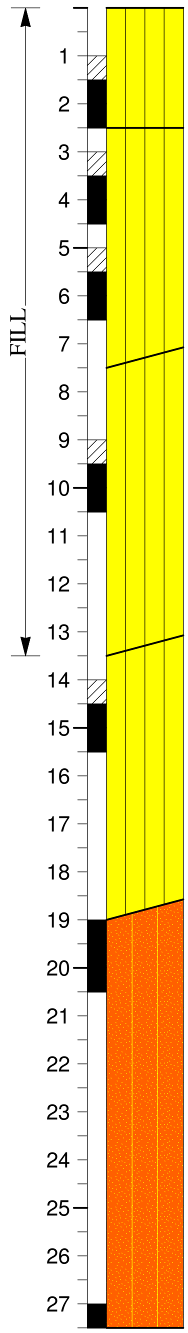
Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699445 **Longitude:** -123.802299

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)	Description
					0	BROWN SANDY SILT (ML) medium stiff to stiff, damp, porous, with gravels and roots
	CA			28 **	2	
					2.5	driller reports easy drilling at 2.5 feet BROWN SANDY SILT (ML) soft, damp to moist
	CA	15.8	105	5 **	4	
Tx 941 (720)	CA	15.1	102	6 **	6	
					7.5	DARK BROWN CLAYEY SILT (ML) stiff to hard, moist, with small roots
Tx 2765 (1296)	CA	25.6	91	42 **	10	
					12	color change to BROWN at 12 feet
					13.5	RED-BROWN SANDY SILT (ML) stiff, moist
68% Passing #200	CA	28.6	93	28 **	15	
					19	BLUE-GRAY SILTY SAND (SM) medium dense to very dense, moist
	CA			23 **	20	
					22.5	driller reports harder drilling at 22.5 feet
					24	color change to BLUE at 24 feet
	CA			42/6" **	27	

FILL (0 to 13.5 ft)



NOTES:
(1) No Caving Encountered
(2) No Free Water Encountered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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Appr.: EEO
Date: 02/14/24

LOG OF BORING B-1
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B1
SHEET 1 of 1

Log of Boring B-2

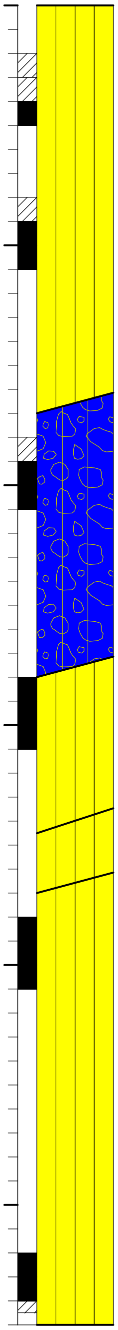
Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699376 **Longitude:** -123.802574

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)	Description
					0	LIGHT-BROWN SANDY SILT (ML) stiff, damp, porous, wtith small gravels and roots
	CA			27 **	2	color change to DARK BROWN at 1.5 feet
Tx 1448 (576)	CA	10.9	111	12 **	5	
					8.5	BROWN TO REDDISH BROWN SILTY SANDY GRAVEL (GM) medium dense, moist to wet
	CA			13 **	10	
					14	DARK BROWN CLAYEY SILT (ML) hard, moist, with small rock fragments
Tx 3143 (1872)	CA	21.0	101	35 **	15	
					16	glass and burnt wood encountered at about 16 feet
					17.5	DARK BROWN CLAYEY SILT (ML) hard, moist
73% Passing #200					19	BLUE-GRAY TO ORANGE-BROWN SANDY SILT (ML) stiff to hard, damp to moist
	CA			27 **	20	
					24	color change to BLUE-GRAY at 24 feet change in moisture to moist to wet at 24 feet, saturated at 26 feet
	CA			30/9" **	27	

FILL (0 to 17 ft.)



NOTES:
(1) No Caving Encountered
(2) Free Water Encountered at 26.75 feet

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-2
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE **B2**

SHEET 1 of 1

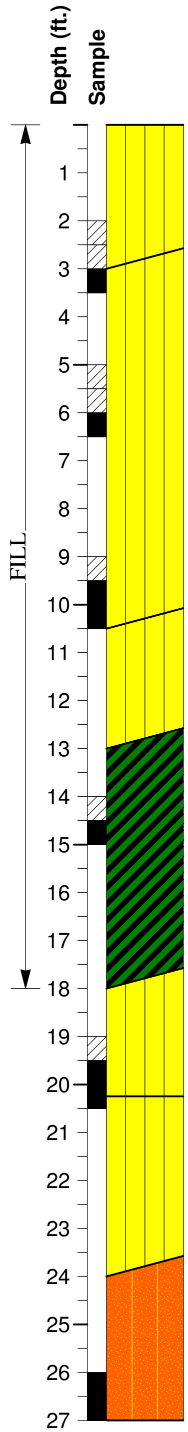
Log of Boring B-3

Equipment: Mobile B-40; 4-inch flight auger

Date: 1/4/01 **Logged By:** KAC

Elevation: Not Surveyed **Latitude:** 39.699204 **Longitude:** -123.802268

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Description
					LIGHT BROWN SANDY SILT (ML) medium stiff, damp
	CA			12 **	
					DARK BROWN SANDY GRAVELLY SILT (ML) medium stiff, moist
	CA	9.9	109	15 **	
	CA			22 **	
					DARK BROWN CLAYEY SILT (ML) stiff, damp, porous, with roots
					color change to RED-BROWN at 12 feet
					ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH) hard, moist
Tx 3865 (1728) LL=75, PI = 50	CA	26.0	96	43 **	
					OLIVE TO LIGHT ORANGE CLAYEY SANDY SILT (ML) medium stiff to stiff, moist
Tx 1882 (2592)	CA	23.9	95	25 **	
					ORANGE TO OLIVE SANDY SILT (ML) stiff, moist
					BLUE-GRAY SILTY SAND (SM) dense, moist
	CA			32/6" **	



NOTES:
(1) No Caving Encountered
(2) No Free Water Encountered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-3
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

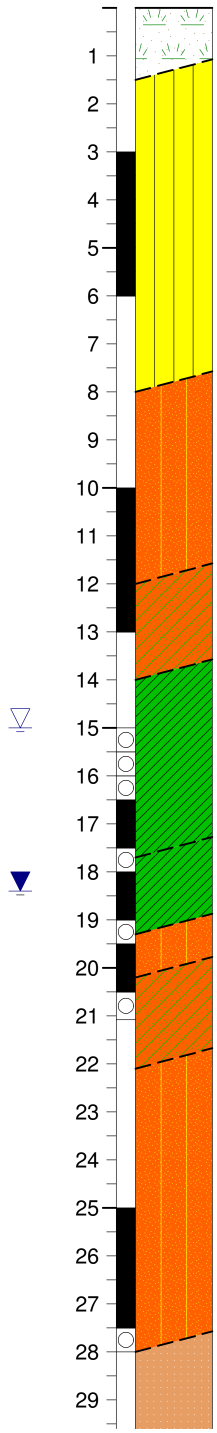
PLATE
B3

Log of Boring B-4

Equipment: Deeprock DR7KTrack w/ 4-inch solid stem flight auger

Date: 4/25/23 **Logged By:** JNK

Elevation: Not Surveyed **Latitude:** 39.699473 **Longitude:** -123.802555



Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)	Description
						TOPSOIL/GARDEN
					2	BROWN SANDY SILT (ML) medium stiff to soft, moist few gravels
Tx 1533 (432) 55% Passing #200	CA	14.9	108	7 **	4	
	CM			2 **	5	
					8	BROWN SILTY SAND (SM) with gravel loose, moist few gravels
Tx 554 (1152) 27% Passing #200 67% Passing #4	CA	18.8	106	2 **	11	
	CM			3 **	12	DARK BROWN CLAYEY SAND (SC) very loose, wet to saturated bedrock fragments
					14	LIGHT ORANGE-BROWN SANDY CLAY (CL) medium stiff to stiff, saturated
	CA			8 **	16	
	CM			12 **	17	
					18	ORANGE-BROWN SANDY CLAY (CL) stiff, saturated
Tx 2113 (2160) 65% Passing #200 95% Passing #4	CA	28.2	94	10 **	19	ORANGE-BROWN SILTY SAND (SM) loose, saturated
	CM			8 **	20	ORANGE-BROWN CLAYEY SAND (SC) loose, saturated
					22	BLUE-GRAY SILTY SAND (SM) moist some mottled orange at 25 feet
Tx 2476 (3024) 24% Passing #200 96% Passing #4	CA	14.1	118	12 **	26	
	CM			21 **	27	
					28	GRAY SANDSTONE crushed, friable to low hardness, deeply weathered

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-4
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B4

SHEET 1 of 2

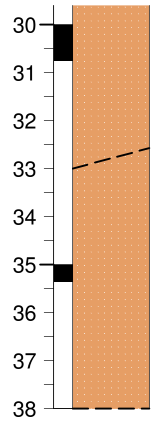
Log of Boring B-4

Equipment: Deeprock DR7KTrack w/ 4-inch solid stem flight auger

Date: 4/25/23 **Logged By:** JNK

Elevation: Not Surveyed **Latitude:** 39.699473 **Longitude:** -123.802555

Laboratory Tests	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot	Depth (ft.)
	CA			32/4" **	30
	CM			40/5" **	
	CA			32/3" **	35
	SPT			50/1"	
	SPT			50/0"	38



GRAY SANDSTONE
crushed, low hardness to hard, moderately weathered

Notes:
1. Free water encountered at 15 feet during drilling
2. Free water measured at 18.3 feet at completion of drilling
3. No caving
4. Practical drilling refusal at 38 feet

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 4'

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LOG OF BORING B-4
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			SYMBOLS GRAPHIC	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% fines)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (Greater than 12% fines)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS 50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	CLEAN SANDS (Less than 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 (Greater than 12% fines)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMOUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

LL - Liquid Limit
PI - Plasticity Index
■ Sample Retained
▨ Sample Recovered, Not Retained
☒ Bulk Sample
◻ Sample Not Recovered
CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
SH - Shelby Tube
RC - Rock Coring
Recovery - Percent Core Recovered
RQD - Rock Quality Designation (length of core pieces >= 4-inches / core length)

Consol - Consolidation
EI - Expansion Index
SA - Sieve Analysis

Shear Strength, psf **Confining Pressure, psf**

Tx	1564	(1440)	- Unconsolidated Undrained Triaxial
TxCU	1564	(1440)	- Consolidated Undrained Triaxial
DS	2020	(1440)	- Consolidated Drained Direct Shear
FVS	520		- Field Vane Shear
UC	1500		- Unconfined Compression
PP	1500		- Field Pocket Penetrometer
Sat			- Sample saturated prior to test

▽ Initial Groundwater Level Reading
▼ Second Groundwater Level Reading

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SOIL CLASSIFICATION CHART & KEY TO TEST DATA
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE B5

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
Very loose	4 or less
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	More than 50

CONSISTENCY OF FINE-GRAINED SOILS

Consistency	Identification Procedure	Approximate Shear Strength (psf)
Very soft	Easily penetrated several inches with fist	Less than 250
Soft	Easily penetrated several inches with thumb	250 to 500
Medium stiff	Penetrated several inches by thumb with moderate effort	500 to 1000
Stiff	Readily indented by thumb, but penetrated only with great effort	1000 to 2000
Very stiff	Readily indented by thumb nail	2000 to 4000
Hard	indented with difficulty by thumb nail	More than 4000

NATURAL MOISTURE CONTENT

Dry	**No noticeable moisture content. Requires considerable moisture to obtain optimum moisture content* for compaction.**
Damp	**Contains some moisture, but is on the dry side of optimum.**
Moist	**Near optimum moisture content for compaction.**
Wet	**Requires drying to obtain optimum moisture content for compaction.**
Saturated	**Near or below the water table, from capillarity, or from perched or ponded water. All void spaces filled with water.**

* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

Where laboratory test data are not available, the above field classifications provide a general indication of material properties; the classifications may require modification based upon laboratory tests.

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SOIL DESCRIPTIVE PROPERTIES
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

Generalized Graphic Bedrock Symbols

Claystone	Siltstone	Tuff (Volcanic Ash)
Shale	Chert	Andesite
Sandstone	Serpentine	Basalt
Conglomerate	Greenstone	Schist

Stratification

Bedding of Sedimentary Rocks	Thickness of Beds
Massive	No apparent bedding
Very thick bedded	Greater than 4 feet
Thick bedded	2 feet to 4 feet
Thin bedded	2 inches to 2 feet
Very thin bedded	0.5 inches to 2 inches
Laminated	0.125 inches to 0.5 inches
Thinly laminated	less than 0.125 inches

Fracturing

Fracturing Intensity	Fracture Spacing
Little	Greater than 4 feet
Occasional	1 foot to 4 feet
Moderate	6 inches to 1 foot
Close	1 inch to 6 inches
Intense	0.5 inches to 1 inch
Crushed	less than 0.5 inches

Strength

Soft	Plastic or very low strength.
Friable	Crumbles by hand.
Low hardness	Crumbles under light hammer blows.
Moderate hardness	Crumbles under a few heavy hammer blows.
Hard	Breaks into large pieces under heavy, ringing hammer blows.
Very hard	Resists heavy, ringing hammer blows and will yield with difficulty only dust and small flying fragments.

Weathering

Deep	Moderate to complete mineral decomposition, extensive disintegration, deep and thorough discoloration, many extensively coated fractures.
Moderate	Slight decomposition of minerals, little disintegration, moderate discoloration, moderately coated fractures.
Little	No megascopic decomposition of minerals, slight to no effect on cementation, slight and intermittent, or localized discoloration, few stains on fracture surfaces.
Fresh	Unaffected by weathering agents, no disintegration or discoloration, fractures usually less numerous than joints.

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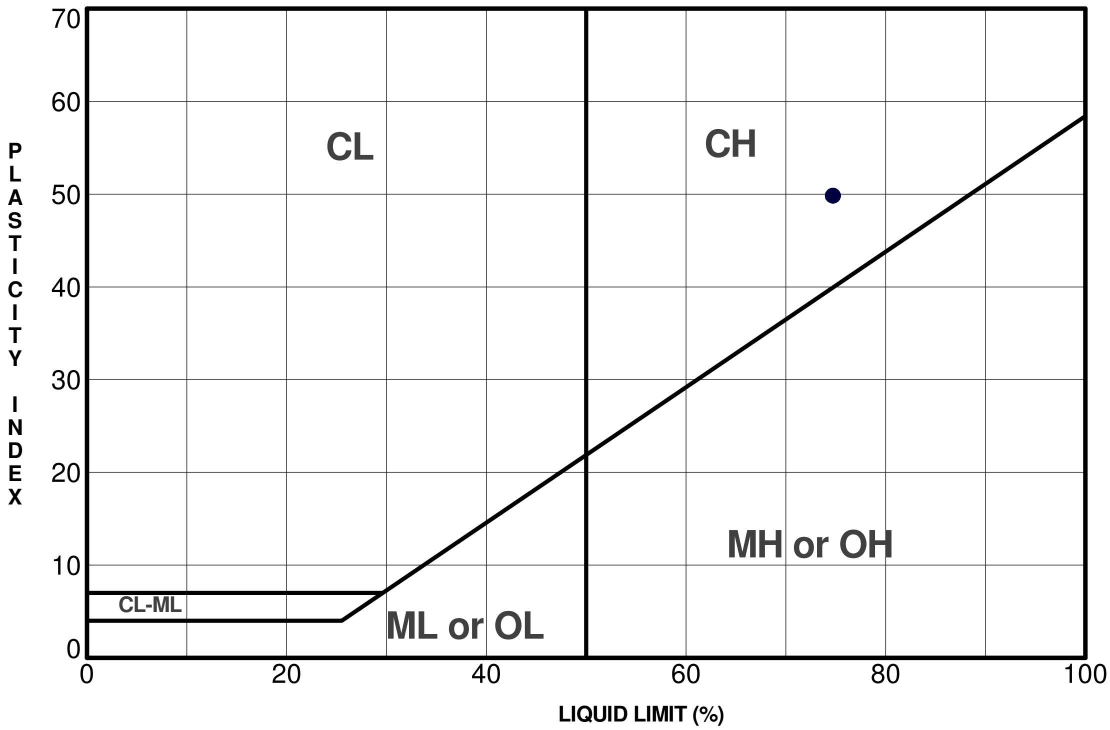
BEDROCK DESCRIPTIVE PROPERTIES
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE
B7

APPENDIX C

Laboratory Testing



SYMBOL	CLASSIFICATION AND SOURCE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX	% PASSING No. 200 SIEVE
●	**ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH)** **B-3 @ 14.5 feet**	**75**	**25**	**50**	

ASTM D4318

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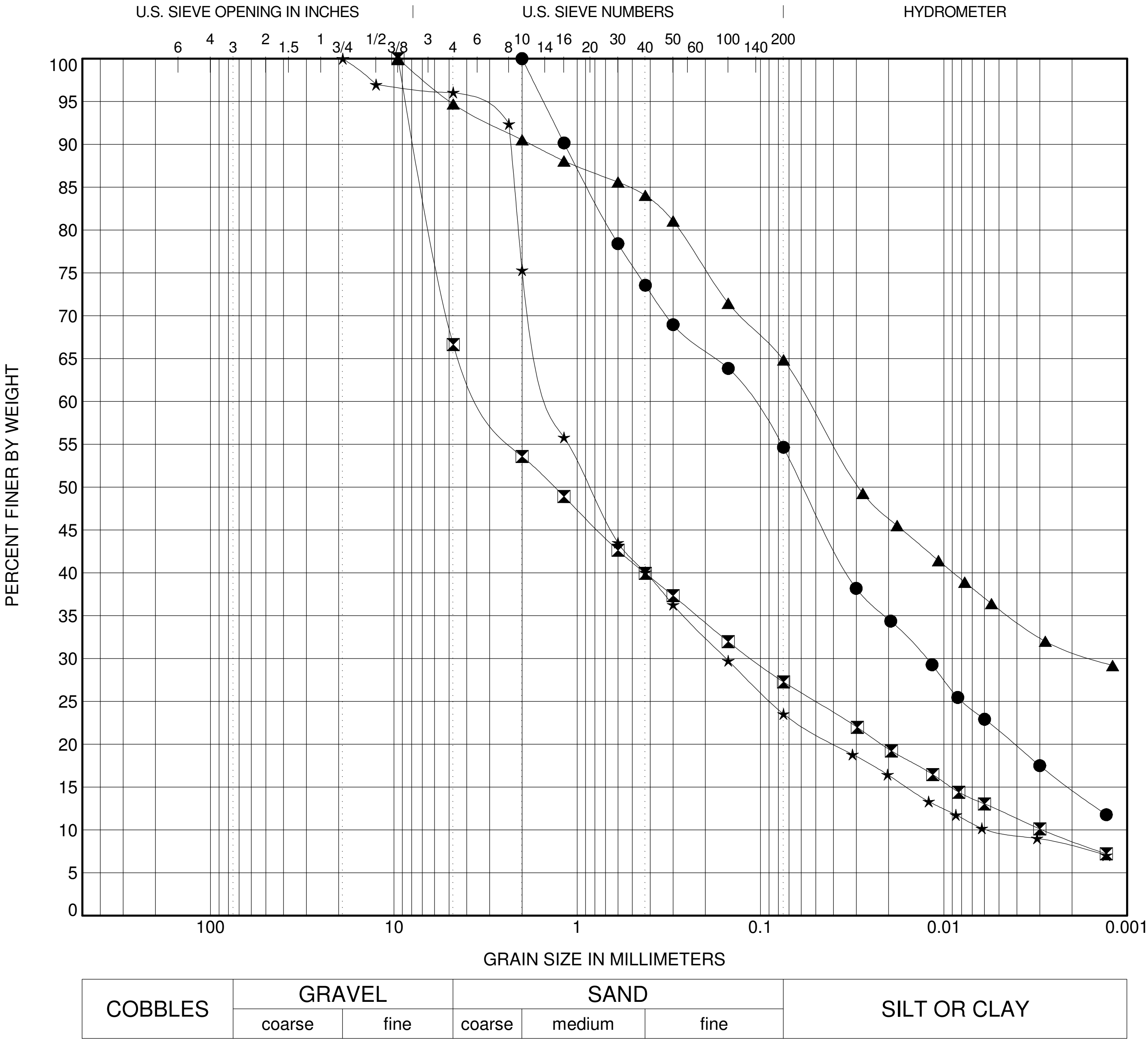
ATTERBERG LIMITS TEST RESULTS
KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE C1



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-4**	**3.5 ft**	**BROWN SANDY SILT (ML)**					
⧗	**B-4**	**10.0 ft**	**BROWN SILTY SAND (SM) with gravel**				**1.42**	**1055.83**
▲	**B-4**	**18.5 ft**	**ORANGE-BROWN SANDY CLAY (CL)**					
★	**B-4**	**25.5 ft**	**BLUE-GRAY SILTY SAND (SM)**				**3.24**	**238.30**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-4**	**3.5 ft**	**2**	**0.112**	**0.012**			**45.4**	**33.2**	**21.5**
⧗	**B-4**	**10.0 ft**	**9.5**	**3.06**	**0.112**	**0.003**	**33.4**	**39.4**	**15.0**	**12.3**
▲	**B-4**	**18.5 ft**	**9.5**	**0.055**	**0.002**		**5.3**	**29.9**	**29.1**	**35.8**
★	**B-4**	**25.5 ft**	**19**	**1.322**	**0.154**	**0.006**	**3.9**	**72.5**	**13.7**	**9.8**

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GRAIN SIZE DISTRIBUTION
KNAPP RESIDENCE
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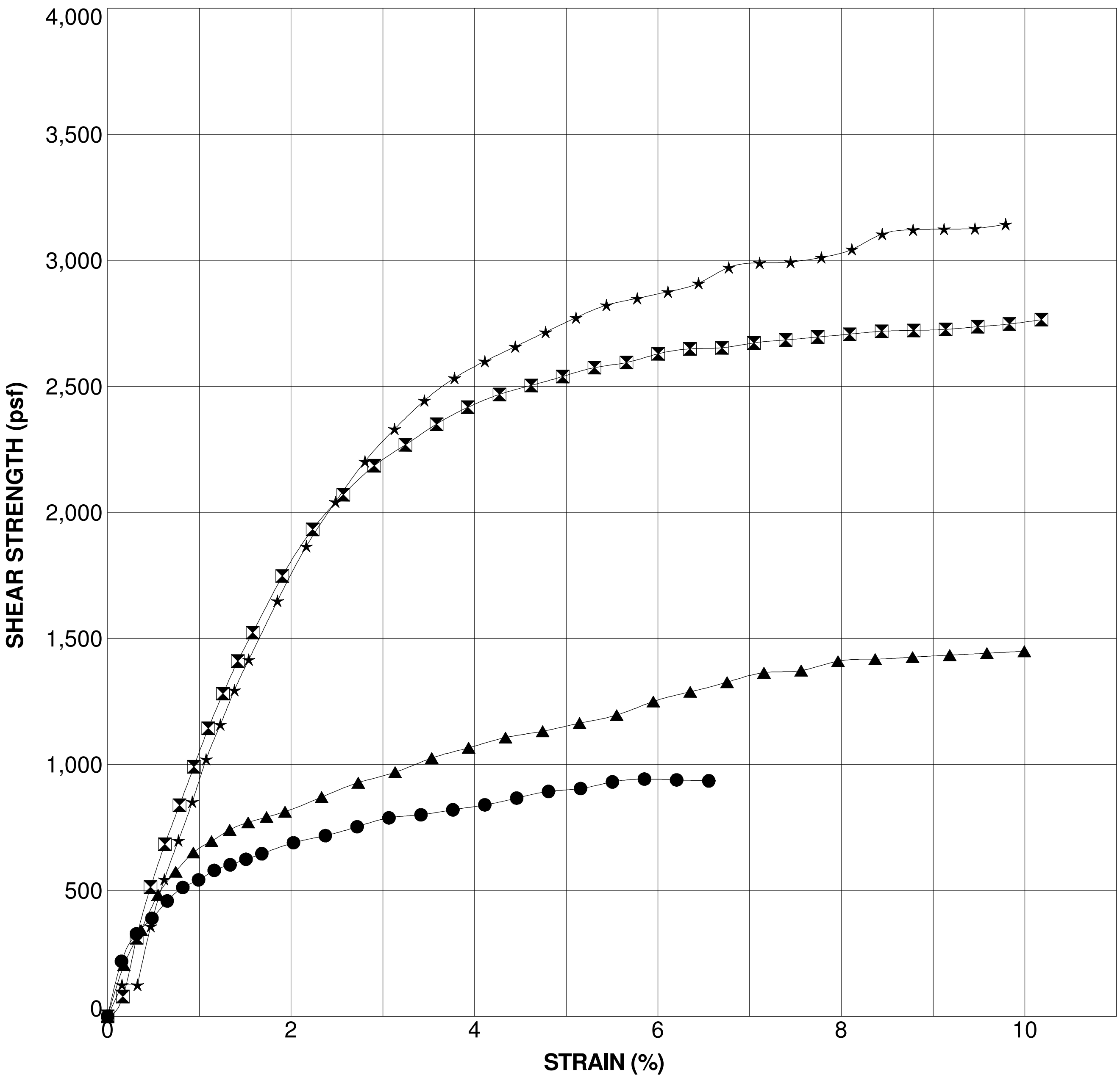
PLATE C2



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-1 at 6 ft	BROWN SANDY SILT (ML)	720	941	5.9	102	15.1
⧗ B-1 at 10 ft	DARK BROWN CLAYEY SILT (ML)	1296	2765	10.2	91	25.6
▲ B-2 at 4.5 ft	LIGHT-BROWN SANDY SILT (ML)	576	1448	10.0	111	10.9
★ B-2 at 15 ft	DARK BROWN CLAYEY SILT (ML)	1872	3143	9.8	101	21.0

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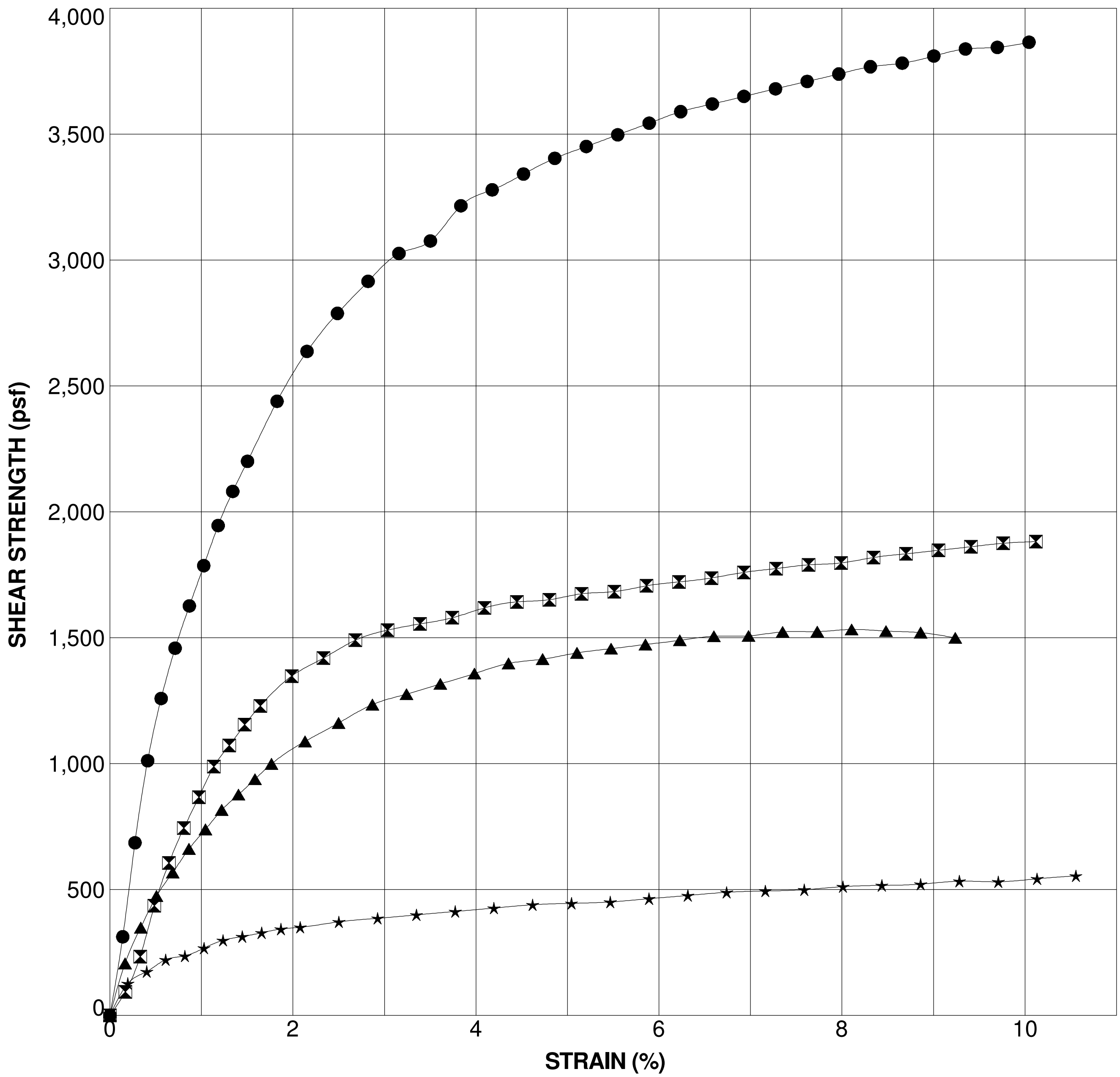
Santa Rosa, California 95403
Tel: (707) 528-6108

Job No.: 10945.05
Appr.: EEO
Date: 02/14/24

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

KNAPP RESIDENCE
43026 North Highway 1
Wesport, California

PLATE C3



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-3 at 14.5 ft	ORANGE TO LIGHT BROWN SANDY SILTY CLAY (CH)	1728	3865	10.0	96	26.0
⧗ B-3 at 20 ft	OLIVE TO LIGHT ORANGE CLAYEY SANDY SILT (ML)	2592	1882	10.1	95	23.9
▲ B-4 at 3.5 ft	BROWN SANDY SILT (ML)	432	1533	8.1	108	14.9
★ B-4 at 10 ft	BROWN SILTY SAND (SM) with gravel	1152	554	10.6	106	18.8

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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

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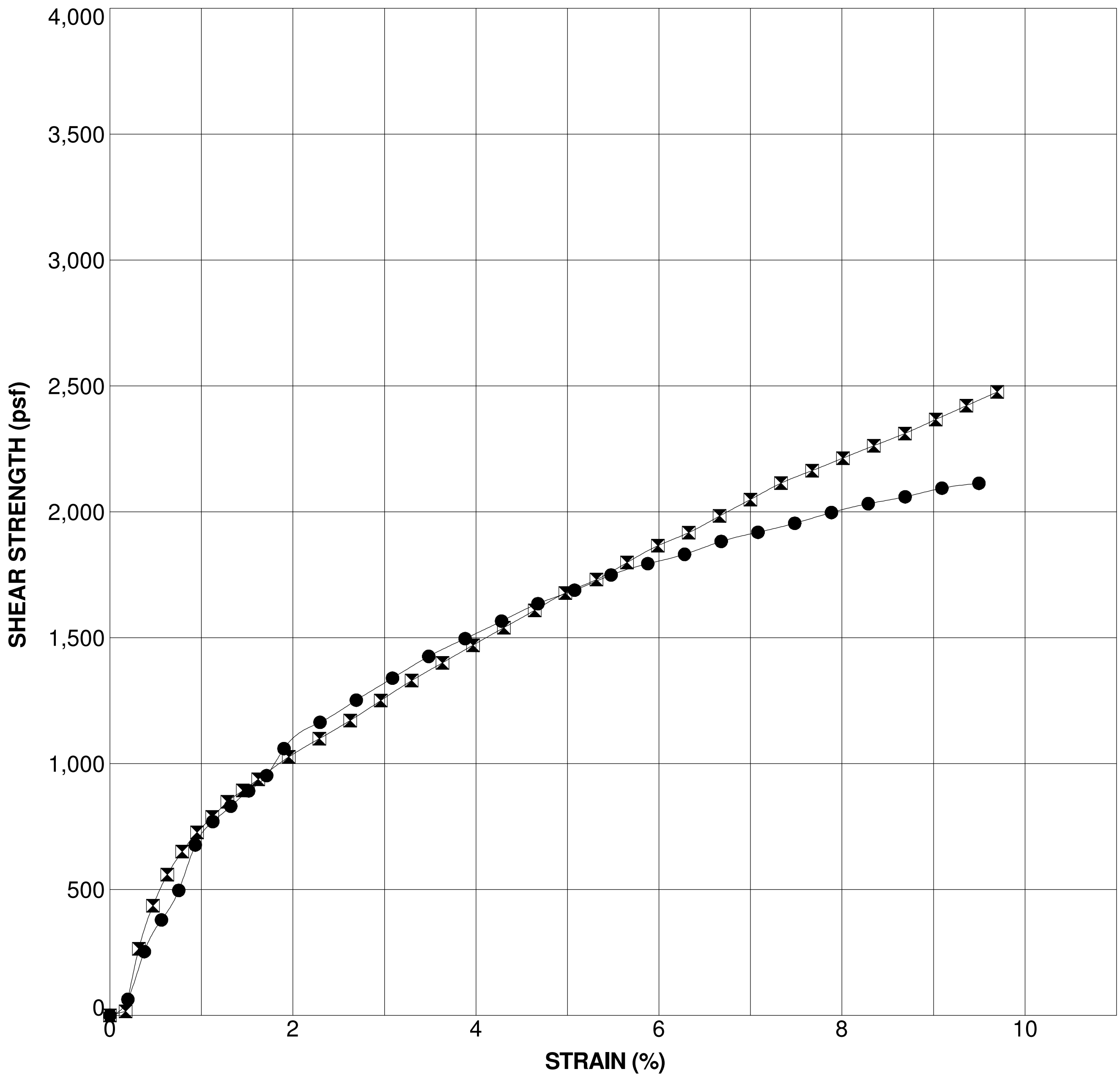
PLATE C4



Sample Source	Classification	Confining Pressure (psf)	Ultimate Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-4 at 18.5 ft	ORANGE-BROWN SANDY CLAY (CL)	2160	2113	9.5	94	28.2
⧗ B-4 at 25.5 ft	BLUE-GRAY SILTY SAND (SM)	3024	2476	9.7	118	14.1

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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

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PLATE C5

APPENDIX D

Liquefaction Analysis

Project:	Knapp
Project #:	10945.05
Date:	2/14/2024
Boring:	B-4

Input Parameters:

Peak Ground Accel (g) =		0.515	
Earthquake Magnitude, M =		7.9	
Water Table Depth (m) =	3.0	10.00	(ft)
Average γ Above Water Table (kN/m^3) =	19.6	125.0	(lb/ft^3)
Average γ Below Water Table (kN/m^3) =	19.6	125.0	(lb/ft^3)
Borehole Diameter (mm) =	101.60	4	(in)
Requires Correction for Sample Liners (YES/NO):		no	
Rod Lengths Assumed Equal to the Depth Plus	1.5	m (for the above ground extension)	
Gravilty Acceleration (m/sec^2)	9.81		
Height of Exposed Face (m)	9	28	(ft)
Boring Distance from Exposed Face (m)	6	20	(ft)

Ko = 0.5

Nc = 19.2

Liquefaction Potential

SPT Sample Number	Depth (m)	Depth (ft)	Layer Thickness (m)	Midpoint of Layer (m)	Measured N	Soil Type (USCS)	Flag "nlp"	Sat/Unsat	Fines Content (%)	Energy Ratio, ER (%)	C_E	C_B	C_R	C_S	N_{60}	σ_{ve} (kPa)	σ_{ve}' (kPa)	C_N	$(N_1)_{60}$	ΔN for Fines Content	$(N_1)_{60\text{-}cs}$	Stress Reduct. Coeff. r_d	CSR	MSF_{max}	MSF for Sand	K_σ for Sand	CRR for M=7.5 & σ_{ve}'=1atm	CRR	Factor of Safety
1	1.37	4.50	1.37	0.69	7	ML		0	55	90	1.50	1	0.75	1.00	7.9	27	27	1.70	13.39	5.6	19.00	1.00	0.334	1.5	0.94	1.10	0.194	N.A.	N.A.
2	2.44	8.00	1.07	1.91	2	ML		0	55	90	1.50	1	0.8	1.00	2.4	48	48	1.51	3.62	5.6	9.23	0.99	0.332	1.2	0.98	1.07	0.113	N.A.	N.A.
3	3.66	12.00	1.22	3.05	2	SM		1	27	90	1.50	1	0.85	1.00	2.6	70	64	1.29	3.28	5.2	8.50	0.98	0.360	1.2	0.98	1.04	0.108	0.11	0.31
4	4.27	14.00	0.61	3.96	3	SC		1	25	90	1.50	1	0.85	1.00	3.8	88	76	1.17	4.46	5.1	9.53	0.98	0.379	1.2	0.98	1.03	0.115	0.12	0.30
5	5.03	16.50	0.76	4.65	8	CL	nlp	1	50	90	1.50	1	0.95	1.00	11.4	102	82	1.06	N.A.	N.A.	N.A.	0.97	0.402	--	--	1.06	N.A.	N.A.	N.A.
6	5.49	18.00	0.46	5.26	8	CL	nlp	1	60	90	1.50	1	0.95	1.00	11.4	114	90	1.03	N.A.	N.A.	N.A.	0.97	0.411	--	--	1.03	N.A.	N.A.	N.A.
7	5.94	19.50	0.46	5.72	12	CL	nlp	1	65	90	1.50	1	0.95	1.00	17.1	123	94	1.02	N.A.	N.A.	N.A.	0.96	0.420	--	--	1.02	N.A.	N.A.	N.A.
8	6.25	20.50	0.30	6.10	10	SM		1	30	90	1.50	1	0.95	1.00	14.3	130	99	1.01	14.39	5.4	19.75	0.96	0.424	1.5	0.94	1.00	0.203	0.19	0.45
9	6.71	22.00	0.46	6.48	8	SC		1	30	90	1.50	1	0.95	1.00	11.4	138	102	1.00	11.36	5.4	16.72	0.96	0.433	1.4	0.95	1.00	0.171	0.16	0.38
10	8.08	26.50	1.37	7.39	12	SM		1	24	90	1.50	1	0.95	1.00	17.1	156	106	0.98	16.73	5.0	21.72	0.94	0.463	1.6	0.93	0.99	0.229	0.21	0.46
11	8.53	28.00	0.46	8.31	21	SM		1	24	90	1.50	1	1	1.00	31.5	174	120	0.95	29.77	5.0	34.76	0.94	0.456	2.2	0.85	0.96	1.054	0.86	1.88
12	10.06	33.00	1.52	9.30	100	sandstone		1	30	90	1.50	1	1	1.00	150.0	193	124	0.95	142.04	5.4	147.40	0.92	0.480	2.2	0.85	0.94	2.000	1.59	2.00
13	11.58	38.00	1.52	10.82	100	sandstone		1	30	90	1.50	1	1	1.00	150.0	223	139	0.92	137.85	5.4	143.21	0.91	0.486	2.2	0.85	0.91	2.000	1.54	2.00

Liquefaction Induced Settlement and Lateral Spreading

Depth (m)	Depth (ft)	Limiting Shear Strain γ_{lim}	Parameter F_α	Maximum Shear Strain γ_{max}	ΔH_i (m)	ΔLD_i (m)	ΔLD_i (in)	Vertical Reconsol. Strain ε_v	ΔS_i (m)	ΔS_i (in)
1.37	4.50	0.178	0.570	0.000	1.37	0.000	0.0	0.000	0.000	0.00
2.44	8.00	0.500	0.928	0.000	1.07	0.000	0.0	0.000	0.000	0.00
3.66	12.00	0.500	0.939	0.500	1.22	0.610	24.0	0.041	0.050	1.96
4.27	14.00	0.498	0.923	0.498	0.61	0.304	12.0	0.038	0.023	0.92
5.03	16.50	0.000	0.000	0.000	0.76	0.000	0.0	0.000	0.000	0.00
5.49	18.00	0.000	0.000	0.000	0.46	0.000	0.0	0.000	0.000	0.00
5.94	19.50	0.000	0.000	0.000	0.46	0.000	0.0	0.000	0.000	0.00
6.25	20.50	0.163	0.531	0.163	0.30	0.050	2.0	0.023	0.007	0.28
6.71	22.00	0.228	0.680	0.228	0.46	0.104	4.1	0.027	0.012	0.48
8.08	26.50	0.131	0.424	0.131	1.37	0.179	7.1	0.021	0.029	1.16
8.53	28.00	0.023	-0.418	0.000	0.46	0.000	0.0	0.000	0.000	0.00
10.06	33.00	0.000	-10.753	0.000	1.52	0.000	0.0	0.000	0.000	0.00
11.58	38.00	0.000	-10.328	0.000	1.52	0.000	0.0	0.000	0.000	0.00
					LD =	1.25 (m)	49.1 (in)	S=	0.073 (m)	4.80 (in)

Dry Sand Settlement

τ_{avg} (tsf)	Average Stress (p) (tsf)	Max Shear Modulus (Gmax) (tsf)	a	b	γ (%)	ε_{15} (%)	ε_{Nc} (%)	Dry Sand Settlement (in)
0.094	0.19	516.5	0.131	17473	0.07	0.073	0.082	0.1
0.166	0.33	541.4	0.137	12372	0.19	0.493	0.550	0.5
0.242	0.50	645.0	0.143	9700.6	0.00	0.000	0.000	0.0
0.302	0.58	723.8	0.147	8843.6	0.00	0.000	0.000	0.0
0.346	0.69	0.0	0.151	8013.4	0.00	0.000	0.000	0.0
0.385	0.75	0.0	0.153	7605.8	0.00	0.000	0.000	0.0
0.414	0.81	0.0	0.156	7249.1	0.00	0.000	0.000	0.0
0.438	0.85	1116.8	0.157	7034.8	0.00	0.000	0.000	0.0
0.461	0.92	1094.4	0.160	6743	0.00	0.000	0.000	0.0
0.514	1.10	1310.5	0.167	6030.6	0.00	0.000	0.000	0.0
0.570	1.17	1575.7	0.169	5834.6	0.00	0.000	0.000	0.0
0.623	1.38	2768.8	0.177	5286.9	0.00	0.000	0.000	0.0
0.706	1.58	2942.8	0.186	4857.8	0.00	0.000	0.000	0.0
							S=	0.55 (in)

Liquefaction Potential

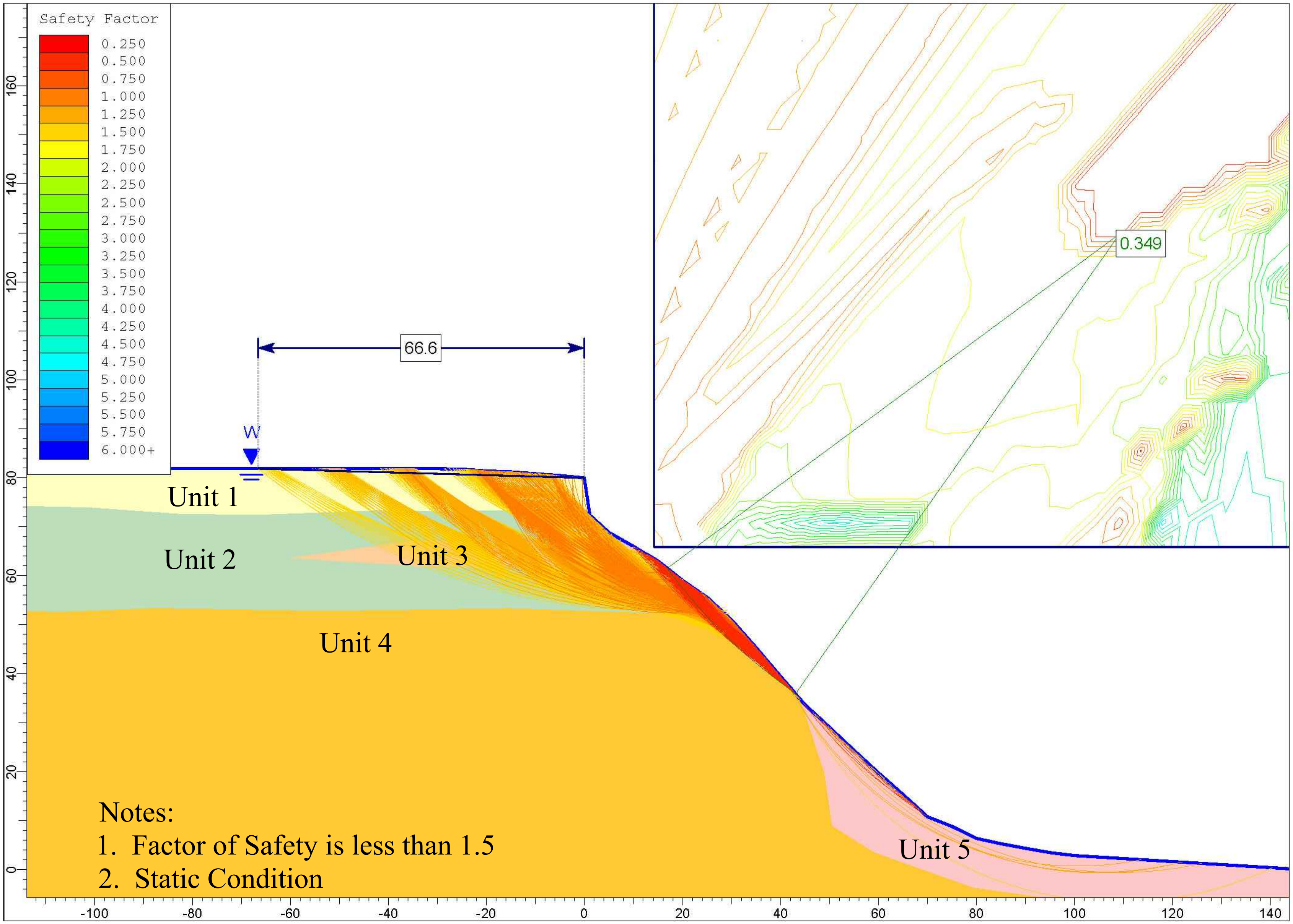
Dry Settlement

(1) Flag "nlp" – based on laboratory testing of fine content, plasticity index, liquid limits and potential intact moisture content.

"nlp" - no liquefacton potential

APPENDIX E

Slope Stability Analysis



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2/14/2024 12:13:41 PM save date
2/14/2024 4:51:52 PM plot date

APPROXIMATE SCALE (FEET)

0 15 30 60

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STATIC SLOPE STABILITY CROSS SECTION A-A'

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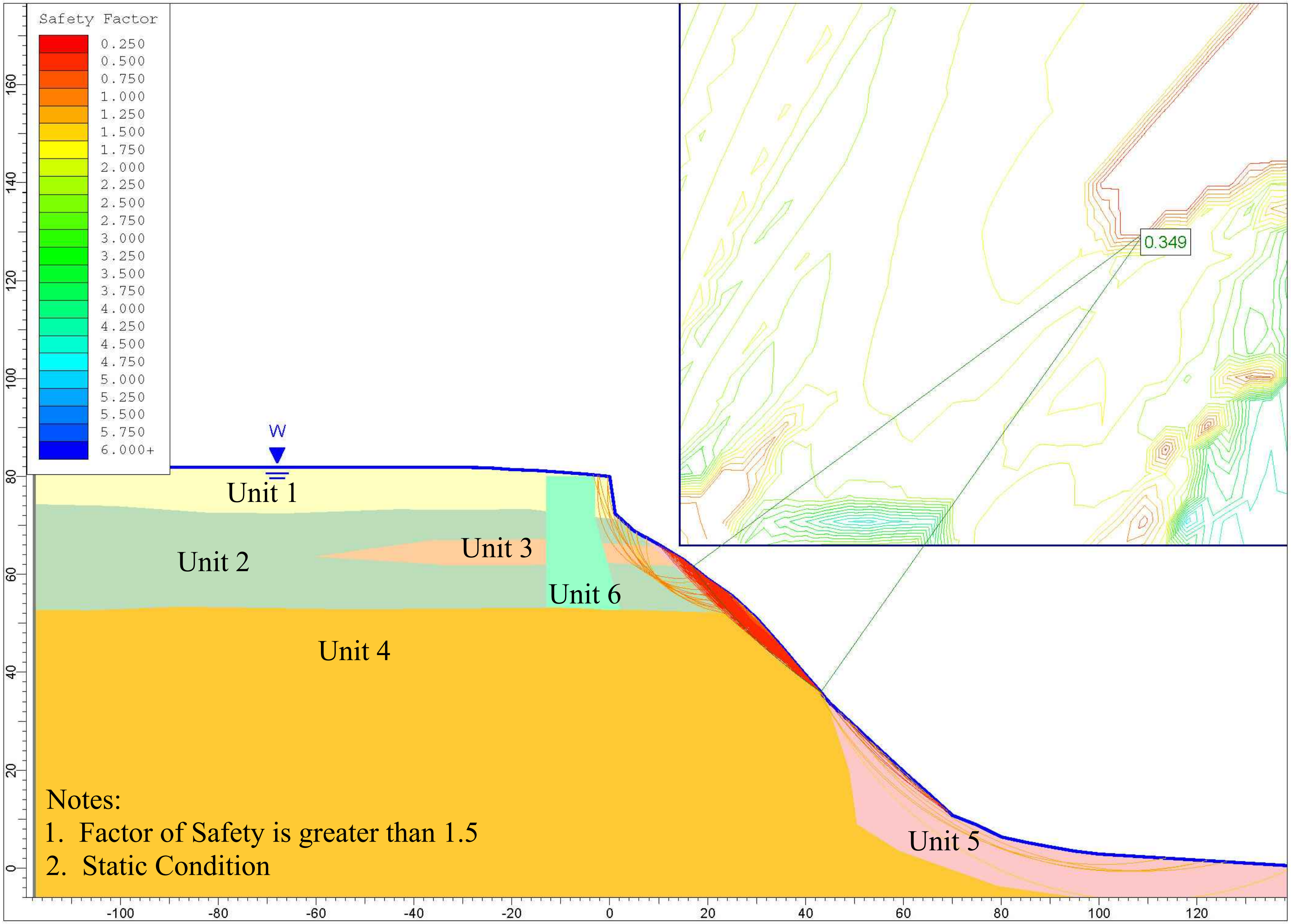
Westport, California

PLATE
E1



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2/14/2024 12:13:41 PM save date
2/14/2024 4:51:41 PM plot date

APPROXIMATE SCALE (FEET)

0 15 30 60

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Job No.: 10945.05

Appr.: KKC

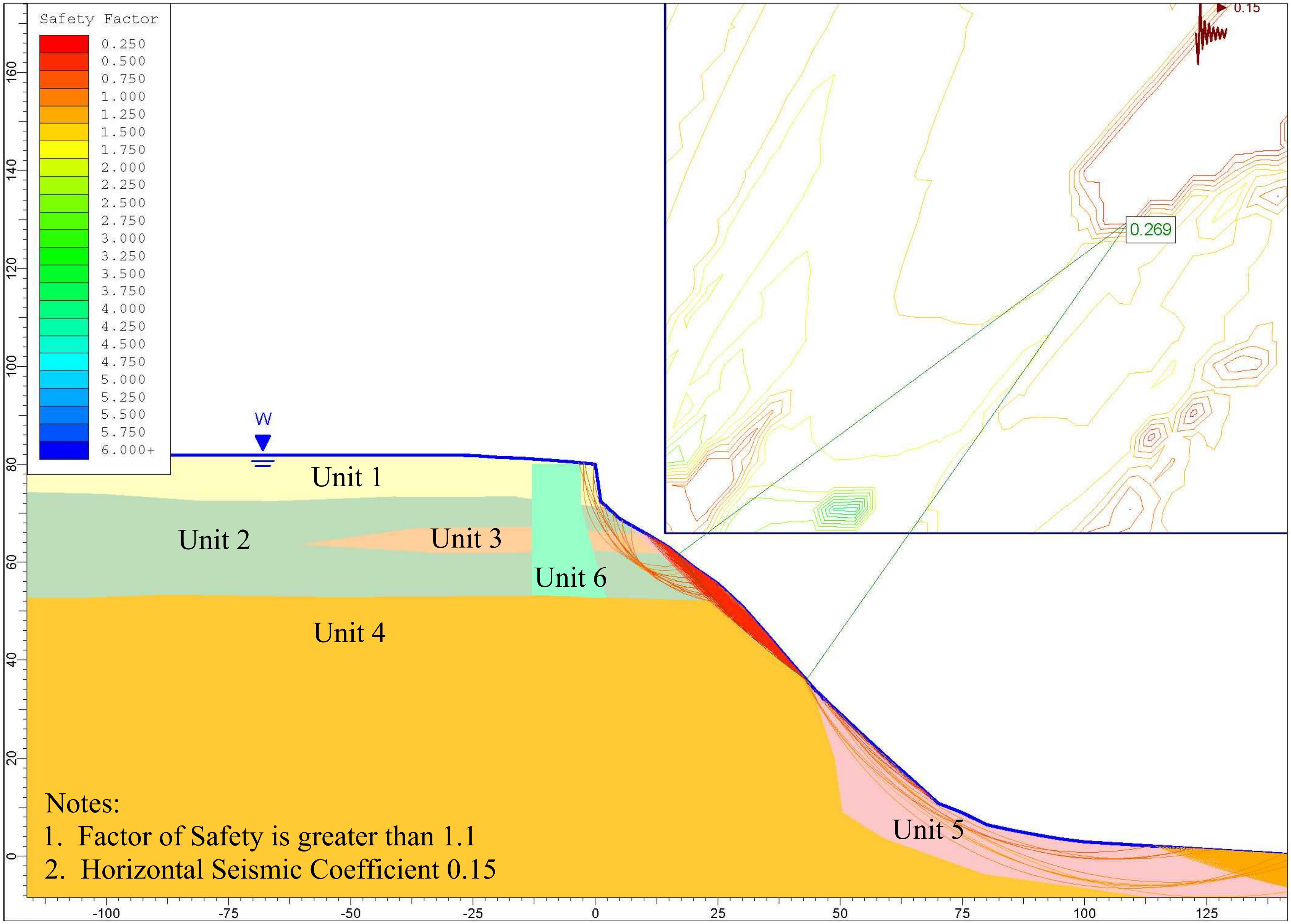
Date: 02/14/24

STATIC SLOPE STABILITY CROSS SECTION A-A'

KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE

E2



APPROXIMATE SCALE (FEET)

0 15 30 60

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Job No.: 10945.05

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Date: 02/14/24

SEISMIC SLOPE STABILITY CROSS SECTION A-A'

KNAPP RESIDENCE
43026 Highway 1
Westport, California

PLATE

E3

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One Electronic Copy

Bill Knapp
bill@netwidget.com

From:	Kraemer, Melissa@Coastal
To:	Mark Cliser
Cc:	Gedik, Tamara@Coastal; tatiana.garcia
Subject:	RE: California Coastal Record Project
Date:	Tuesday, February 20, 2024 10:50:32 AM

Hi Mark

Our geologist and engineer took and look and offered some comments. They agree there appears to be an imminent threat that the landslide continues to fail, but there doesn't seem to be enough evidence showing this threatens the primary structure. That said, they believe the drainage measures (options 2 and 3 in the Brunsing options) seem reasonable as an emergency measure in comparison to the threat to the primary structure (which in their opinion seems low in the immediate short term and wouldn't be considered "armoring."). They were suggesting the County request the applicant to provide clarification on (1) where failure surfaces less than or near 1 are located on the existing conditions slope stability analysis plate, and (2) on the distance from the residence to the landside scarp, and (3) how the landslide has progressed, including whether there were specific recent events that may have led to this application for an emergency permit. Another concern expressed that could clarification is with the grouting - though it seems like it might help with immediate stability concerns, they believe it would result in would the alteration of a natural landform at the point when it becomes exposed in the future, and it's unclear from the information provided how well or long it would perform. It also would be helpful to understand whether the proposed grouting has already been completed (the area at the head of the landslide appears disturbed in the photos). Our enforcement staff noted that they received a call a few weeks back stating that some form of grouting work was in progress without a CDP. There were allegations that the grout was making its way to the beach below. Our understanding is CDFW and the County were notified and were able to visit the site. Are you aware of this (not sure who from the County was involved)? Our enforcement staff also documented a potential an unpermitted gate and fencing that goes up to, and possibly over, the bluff edge, though that may not be related to the current development. Is that something that you're aware of as well?

Another important point that needs clarifying - was there was a major slope failure event this year that led to an emergency permit application or did the event happen last year? If this happened last year, perhaps this isn't an emergency?

Finally, it was noted that there appears to be a lot of landscaping allowed in the geologic setback area. Do you know if that landscaping was permitted to be located in that area? Wondering if excessive irrigation had any impact on slope stability issues.

Thanks Mark, and please let us know if you have questions or want to discuss, and please pass on answers to any of the clarifying questions mentioned above.

Melissa

From: Kraemer, Melissa@Coastal
Sent: Tuesday, February 20, 2024 7:43 AM
To: Mark Cliser <cliserm@mendocinocounty.gov>
Cc: Gedik, Tamara@Coastal <Tamara.Gedik@coastal.ca.gov>; Garcia, Tatiana@Coastal <Tatiana.Garcia@coastal.ca.gov>
Subject: RE: California Coastal Record Project

Thank you Mark. Our geologist is looking at the report and we hope to have comments to you soon. It does look bad. Given the no future shoreline armoring condition, we are asking our geologist to review the geo report and advise on which steps makes the most sense to temporarily stabilize things while figuring out next steps for the longer-term solution. We'll get back to you soon. By the way, please keep Tatiana not Bente in the loop on this since this part of the County is the area that she normally covers (Bente typically handles projects Navarro and south).

From: Mark Cliser <cliserm@mendocinocounty.gov>
Sent: Tuesday, February 20, 2024 7:00 AM
To: Jansen, Bente@Coastal <bente.jansen@coastal.ca.gov>; Kraemer, Melissa@Coastal <Melissa.Kraemer@coastal.ca.gov>
Cc: Leavitt, Amber@Coastal <amber.leavitt@coastal.ca.gov>
Subject: FW: California Coastal Record Project

Hi,

Here are some add'l photos the property owner provided. These were taken in March 2023 when the retreat began.

Mark

March 18, 2023 looking South

March 18, 2023 looking NW same area


March 30, 2023 Drone photo from West showing where water seeps exited on the face