# COUNTY OF MENDOCINO
# DEPARTMENT OF PLANNING AND BUILDING SERVICES
860 NORTH BUSH STREET · UKIAH · CALIFORNIA · 95482
120 WEST FIR STREET · FT. BRAGG · CALIFORNIA · 95437

IGNACIO GONZALEZ, INTERIM DIRECTOR
JULIA KROG, ASSISTANT DIRECTOR
TELEPHONE: 707-234-6650
FAX: 707-463-5709
FB PHONE: 707-964-5379
FB FAX: 707-961-2427
pbs@mendocinocounty.org
www.mendocinocounty.org/pbs


February 4, 2022

Planning – FB
Department of Transportation
Environmental Health - Fort Bragg
Building Inspection - Fort Bragg
Forestry Advisor

Air Quality Management
Department of Forestry/ CalFire
-Land Use
-Resource Management
Department of Fish and Wildlife
Coastal Commission

Cloverdale Rancheria
Redwood Valley Rancheria
Sherwood Valley Band of Pomo Indians
South Coast Fire Protection District
Gualala MAC

**CASE#:** CDP_2021-0006
**DATE FILED:** 1/22/2021
**OWNER/APPLICANT:** MENDOCINO COUNTY DEPARTMENT OF TRANSPORTATION
**REQUEST:** Standard Coastal Development Permit to excavate weak slide material, trench on the upslope side of the road to intercept ground water, and install under drain and backfill the trench with drain rock. Additionally, construct a soldier pile wall with timber lagging and tie backs, place under drain immediately behind wall, install a metal beam guardrail on top of the wall, and surface the road with aggregate base.
**LOCATION:** In the Coastal Zone, 0.7± mile east of Gualala center, along Gualala Road (CR), 0.3± mile from its intersection with Old Stage Road (CR); located in a County right-of-way, at MP 0.33.
**SUPERVISORIAL DISTRICT:** 5 (Williams)
**STAFF PLANNER:** SAM VANDEWATER
**RESPONSE DUE DATE:** February 18, 2022

**PROJECT INFORMATION CAN BE FOUND AT:**
www.mendocinocounty.org
Select "Government" from the drop-down; then locate Planning and Building Services/Public Agency Referrals.

Mendocino County Planning & Building Services is soliciting your input, which will be used in staff analysis and forwarded to the appropriate public hearing. You are invited to comment on any aspect of the proposed project(s). Please convey any requirements or conditions your agency requires for project compliance to the project coordinator at the above address, or submit your comments by email to pbs@mendocinocounty.org. Please note the case number and name of the project coordinator with all correspondence to this department.

---

We have reviewed the above application and recommend the following (please check one):

☐ No comment at this time.

☐ Recommend conditional approval (attached).

☐ Applicant to submit additional information (attach items needed, or contact the applicant directly, copying Planning and Building Services in any correspondence you may have with the applicant)

☐ Recommend denial (Attach reasons for recommending denial).

☐ Recommend preparation of an Environmental Impact Report (attach reasons why an EIR should be required).

☐ Other comments (attach as necessary).

**REVIEWED BY:**

Signature _____ Department _____ Date _____

**CASE:** CDP_2021-0006

**OWNER/APPL:** Mendocino County Department of Transportation

**REQUEST:** Standard Coastal Development Permit to excavate weak slide material, trench on the upslope side of the road to intercept ground water, and install under drain and backfill the trench with drain rock. Additionally, construct a soldier pile wall with timber lagging and tie backs, place under drain immediately behind wall, install a metal beam guardrail on top of the wall, and surface the road with aggregate base.

**LOCATION:** In the Coastal Zone, 0.7± mile east of Gualala center, along Gualala Road (CR), 0.3± mile from its intersection with Old Stage Road (CR); located in a County right-of-way, at MP 0.33.

**GENERAL PLAN:** County right-of-way

**ZONING:** County right-of-way

**EXISTING USES:** County road

**DISTRICT:** 5 (Williams)

**CEQA:** Categorically Exempt; Class 2, Section 15302

**RELATED CASES:** N/A

| | ADJACENT GENERAL PLAN | ADJACENT ZONING | ADJACENT LOT SIZES | ADJACENT USES |
|---|---|---|---|---|
| **NORTH:** | Remote Residential (RMR:40) | Remote Residential (RMR:40) | 15.5± Acres | Vacant |
| **EAST:** | Remote Residential (RMR:40) | Remote Residential (RMR:40) | 10± Acres | Vacant |
| **SOUTH:** | Remote Residential (RMR:40) | Remote Residential (RMR:40) | 10± Acres | Vacant |
| **WEST:** | Remote Residential (RMR:40) | Remote Residential (RMR:40) | 15.5± Acres | Vacant |

**REFERRAL AGENCIES**

**LOCAL**
☒ Air Quality Management District
☒ Building Division (Fort Bragg)
☒ Department of Transportation (DOT)
☒ Environmental Health (EH)
☒ Forestry Advisor
☒ South Coast Fire Protection District
☒ Gualala MAC
☒ Planning Division (Fort Bragg)

**STATE**
☒ CALFIRE (Land Use)
☒ CALFIRE (Resource Management)
☒ California Coastal Commission
☒ California Dept. of Fish & Wildlife

**TRIBAL**
☒ Cloverdale Rancheria
☒ Redwood Valley Rancheria
☒ Sherwood Valley Band of Pomo Indians

**ADDITIONAL INFORMATION:**

**STAFF PLANNER:** SAM VANDY VANDEWATER **DATE:** 2/3/2022

# ENVIRONMENTAL DATA

**1. MAC**:
GIS
*Gualala MAC*

**2. FIRE HAZARD SEVERITY ZONE:**
CALFIRE FRAP maps/GIS
*High Fire Hazard Zone*

**3. FIRE RESPONSIBILITY AREA:**
CALFIRE FRAP maps/GIS
*California Department of Forestry & Fire Prevention*
*South Coast Fire Protection District*

**4. FARMLAND CLASSIFICATION:**
GIS
*Grazing Lands*

**5. FLOOD ZONE CLASSIFICATION:**
FEMA Flood Insurance Rate Maps (FIRM)
*N/A*

**6. COASTAL GROUNDWATER RESOURCE AREA:**
Coastal Groundwater Study/GIS
*Critical Ground Water Bedrock*

**7. SOIL CLASSIFICATION:**
Mendocino County Soils Study Eastern/Western Part
*Western Soil Survey (196)*

**8. PYGMY VEGETATION OR PYGMY CAPABLE SOIL:**
LCP maps, Pygmy Soils Maps; GIS
*NO*

**9. WILLIAMSON ACT CONTRACT:**
GIS/Mendocino County Assessor's Office
*NO*

**10. TIMBER PRODUCTION ZONE:**
GIS
*NO*

**11. WETLANDS CLASSIFICATION:**
GIS
*N/A*

**12. EARTHQUAKE FAULT ZONE:**
Earthquake Fault Zone Maps; GIS
*NO*

**13. AIRPORT LAND USE PLANNING AREA:**
Airport Land Use Plan; GIS
*NO*

**14. SUPERFUND/BROWNFIELD/HAZMAT SITE:**
GIS; General Plan 3-11
*NO*

**15. NATURAL DIVERSITY DATABASE:**
CA Dept. of Fish & Wildlife Rarefind Database/GIS
*YES*

**16. STATE FOREST/PARK/RECREATION AREA ADJACENT:**
GIS; General Plan 3-10
*NO*

**17. LANDSLIDE HAZARD:**
Hazards and Landslides Map; GIS; Policy RM-61; General Plan 4-44
*NO*

**18. WATER EFFICIENT LANDSCAPE REQUIRED:**
Policy RM-7; General Plan 4-34
*NO*

**19. WILD AND SCENIC RIVER:**
www.rivers.gov (Eel Only); GIS
*NO*

**20. SPECIFIC PLAN/SPECIAL PLAN AREA:**
Various Adopted Specific Plan Areas; GIS
*Gualala Town Plan*

**21. STATE CLEARINGHOUSE REQUIRED:**
Policy
*NO*

**22. OAK WOODLAND AREA:**
USDA
*NO*

**23. HARBOR DISTRICT:**
Sec. 20.512
*NO*

## FOR PROJECTS WITHIN THE COASTAL ZONE ONLY

**24. LCP LAND USE CLASSIFICATION:**
LCP Land Use maps/GIS
*Flooding*

**25. LCP LAND CAPABILITIES & NATURAL HAZARDS:**
LCP Land Capabilities maps/GIS; 20.500
*High Productivity Timerland*

**26. LCP HABITATS & RESOURCES:**
LCP Habitat maps/GIS; 20.496
*N/A*

**27. COASTAL COMMISSION APPEALABLE AREA:**
Post LCP Certification Permit and Appeal Jurisdiction maps/GIS; 20.544
*NO*

**28. CDP EXCLUSION ZONE:**
CDP Exclusion Zone maps/GIS
*NO*

**29. HIGHLY SCENIC AREA:**
Highly Scenic & Tree Removal Area Maps/GIS; Secs. 20.504.015, 20.504.020
*NO*

**30. BIOLOGICAL RESOURCES & NATURAL AREAS:**
Biological Resources & Natural Area Map; GIS; General Plan 4-9
*NO*

**31. BLUFFTOP GEOLOGY:**
GIS; 20.500.020
*NO*

**COUNTY OF MENDOCINO**
**DEPT OF PLANNING AND BUILDING SERVICES**
120 WEST FIR STREET
FORT BRAGG, CA 95437
Telephone: 707-964-5379
FAX: 707-961-2427
pbs@co.mendocino.ca.us
www.co.mendocino.ca.us/planning

| | |
|---|---|
| Case No(s) | |
| CDF No(s) | |
| Date Filed | |
| Fee | |
| Receipt No. | |
| Received by | |

Office Use Only

# COASTAL ZONE APPLICATION FORM

## APPLICANT

Name: Howard Dashiell
Mailing Address: 340 Lake Mendocino Drive
City: Ukiah State: CA Zip Code: 95482 Phone: 707-463-4366

## PROPERTY OWNER

Name: Mendocino County Department of Transportation
Mailing Address: 340 Lake Mendocino Drive
City: Ukiah State: CA Zip Code: 95482 Phone: 707-463-4366

## AGENT

Name: Chris Collins
Mailing Address: 340 Lake Mendocino Drive
City: Ukiah State: CA Zip Code: 95482 Phone: 707-234-2818

## PARCEL SIZE

☐ Square feet
☐ Acres

## STREET ADDRESS OF PROJECT

Gualala Road MP 0.33

## ASSESSOR'S PARCEL NUMBER(S)

County of Mendocino Right of Way

I certify that the information submitted with this application is true and accurate.

Chris Collins — Signature of Applicant/Agent — 9/17/21 — Date

Signature of Owner — 9/17/21 — Date

# COASTAL ZONE - SITE AND PROJECT DESCRIPTION QUESTIONNAIRE

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

## THE PROJECT

1. Describe your project and include secondary improvements such as wells, septic systems, grading, vegetation removal, roads, etc.

Excavate weak slide material, trench on the upslope side of the road to intercept ground water, install under drain and backfill the trench with drain rock. Daylight underdrain at low end. Construct a soldier pile wall with timber lagging and tie backs. Place under drain immediately behind wall. Install a metal beam guardrail on top of the wall. Surface the road with aggregate base.

2. If the project is residential, please complete the following:

| TYPE OF UNIT | NUMBER OF STRUCTURES | SQUARE FEET PER DWELLING UNIT |
|---|---|---|
| ☐ Single Family | _____ | _____ |
| ☐ Mobile Home | _____ | _____ |
| ☐ Duplex | _____ | _____ |
| ☐ Multifamily | _____ | _____ |

If Multifamily, number of dwelling units per building:_____

3. If the project is commercial, industrial, or institutional, complete the following:

Total square footage of structures: _____
Estimated employees per shift: _____
Estimated shifts per day: _____
Type of loading facilities proposed: _____

4. Will the proposed project be phased? ☐ Yes ■ No
If Yes, explain your plans for phasing.

5. Are there existing structures on the property? ☐ Yes ■ No
If yes, describe below and identify the use of each structure on the plot plan.

6. Will any existing structures be demolished? ☐ Yes ■ No
Will any existing structures be removed? ☐ Yes ■ No

If yes to either question, describe the type of development to be demolished or removed, including the relocation site, if applicable.

7. Project Height. Maximum height of structure _____ feet.

8. Lot area (within property lines): _____ ☐ square feet ☐ acres

9. Lot Coverage:

| | EXISTING | NEW PROPOSED | TOTAL |
|---|---|---|---|
| Building coverage | _____ square feet | _____ square feet | _____ square feet |
| Paved area | _____ square feet | _____ square feet | _____ square feet |
| Landscaped area | _____ square feet | _____ square feet | _____ square feet |
| Unimproved area | _____ square feet | _____ square feet | _____ square feet |

GRAND TOTAL: _____ square feet
(Should equal gross area of parcel)

10. Gross floor area: _____ square feet (including covered parking and accessory buildings).

11. Parking will be provided as follows:

Number of Spaces Existing_____ Proposed_____ Total_____

| | | |
|---|---|---|
| Number of covered spaces | _____ | Size_____ |
| Number of uncovered spaces | _____ | Size_____ |
| Number of standard spaces | _____ | Size_____ |
| Number of handicapped spaces | _____ | Size_____ |

12. Utilities will be supplied to the site as follows:

A. Electricity
- ☐ Utility Company (service exists to the parcel).
- ☐ Utility Company (requires extension of services to site: _____ feet _____ miles
- ☐ On Site generation, Specify: _____
- ■ None

B. Gas
- ☐ Utility Company/Tank
- ☐ On Site generation, Specify: _____
- ■ None

C. Telephone: ☐ Yes ■ No

13. Will there by any exterior lighting? ☐ Yes ■ No
If yes, describe below and identify the location of all exterior lighting on the plot plan and building plans.

14. What will be the method of sewage disposal?

- ☐ Community sewage system, specify supplier _____
- ☐ Septic Tank
- ■ Other, specify N/A

15. What will be the domestic water source?

- ☐ Community water system, specify supplier _____
- ☐ Well
- ☐ Spring
- ■ Other, specify N/A

16. Is any grading or road construction planned? ■ Yes ☐ No
If yes, grading and drainage plans may be required. Also, describe the terrain to be traversed (e.g., steep, moderate slope, flat, etc.).

For grading and road construction, complete the following:

A. Amount of cut: _____ cubic yards
B. Amount of fill: _____ cubic yards
C. Maximum height of fill slope: _____ feet
D. Maximum height of cut slope: _____ feet
E. Amount of import or export: _____ cubic yards
F. Location of borrow or disposal site: _____
_____

17. Will vegetation be removed on areas other than the building sites and roads? ☐ Yes ■ No
If yes, explain:

18. Does the project involve sand removal, mining or gravel extraction? ☐ Yes ■ No
If yes, detailed extraction, reclamation and monitoring may be required.

19. Will the proposed development convert land currently or previously used for agriculture to another use? ☐ Yes ■ No
If yes, how many acres will be converted? _____ acres (An agricultural economic feasibility study may be required.)

20. Will the development provide public or private recreational opportunities? ☐ Yes ■ No
If yes, explain:

21. Is the proposed development visible from:

A. State Highway 1 or other scenic route? ☐ Yes ■ No
B. Park, beach or recreation area? ☐ Yes ☐ No

22. Will the project involve the use or disposal of potentially hazardous materials such as toxic substances, flammables, or explosives? ☐ Yes ■ No
If yes, explain:

23. Does the development involve diking, filling, dredging or placing structures in open coastal waters, wetlands, estuaries or lakes?

A. Diking ☐ Yes ■ No
B. Filling ☐ Yes ☐ No
C. Dredging ☐ Yes ☐ No
D. Placement of structures in open coastal waters, wetlands, estuaries or lakes ☐ Yes ■ No

Amount of material to be dredged or filled? N/A cubic yards.

Location of dredged material disposal site: N/A

Has a U.S. Army Corps of Engineers permit been applied for? ☐ Yes ■ No

If you need additional room to answer any question, attach additional sheets.


CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Major Towns & Places
California Counties
Coastal Zone Boundary
Highways
Major Roads

0 2,550 5,100 Feet
0 0.5 1 Miles
1:63,360

LOCATION MAP


CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Public Roads

Private Roads

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

AERIAL IMAGERY

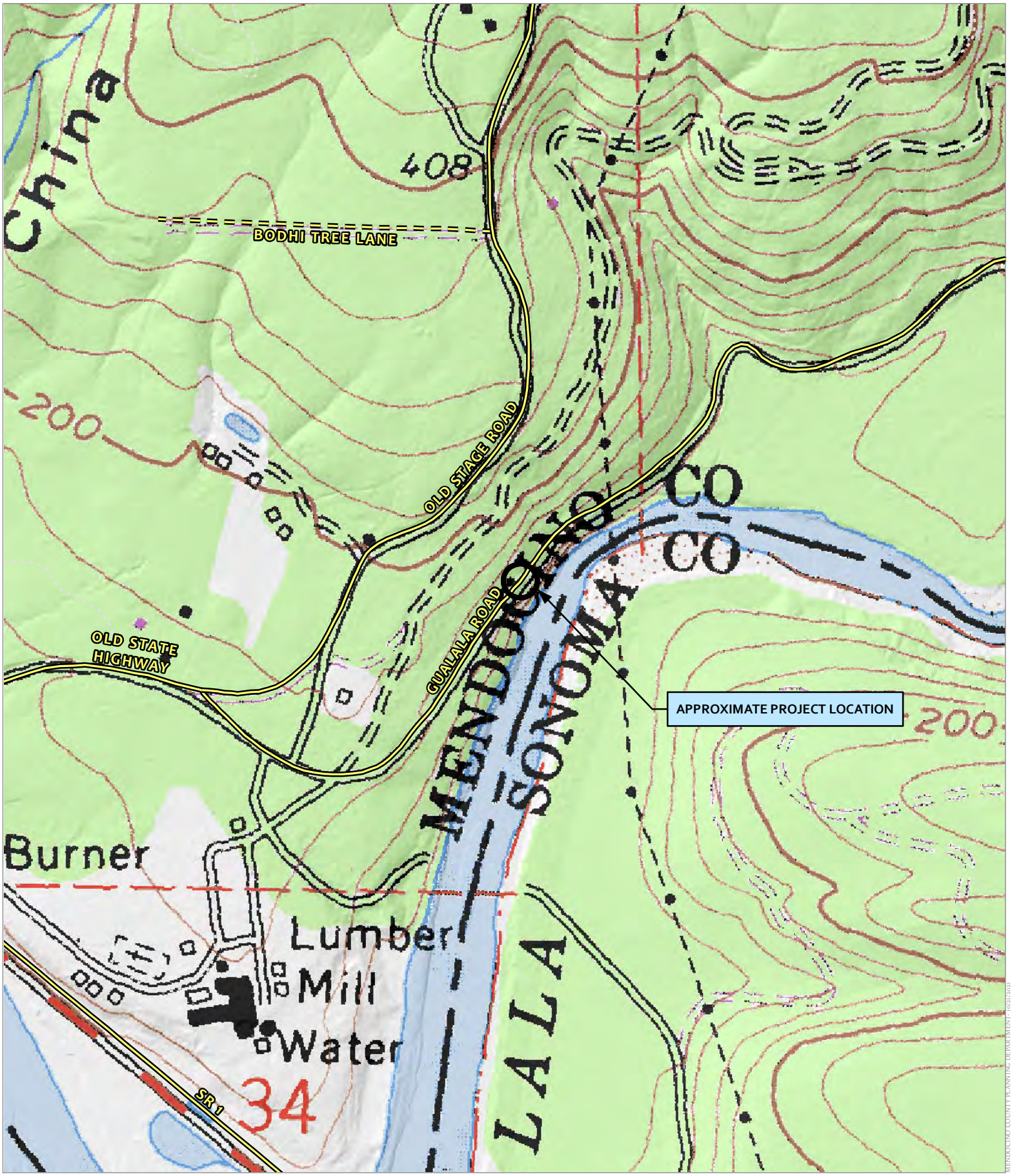
MENDOCINO COUNTY PLANNING DEPARTMENT - 10/27/2023


CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Public Roads

0 75 150 Feet
0 0.0125 0.025 Miles
1:1,800

AERIAL IMAGERY




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Public Roads

Private Roads

0 250 500 Feet

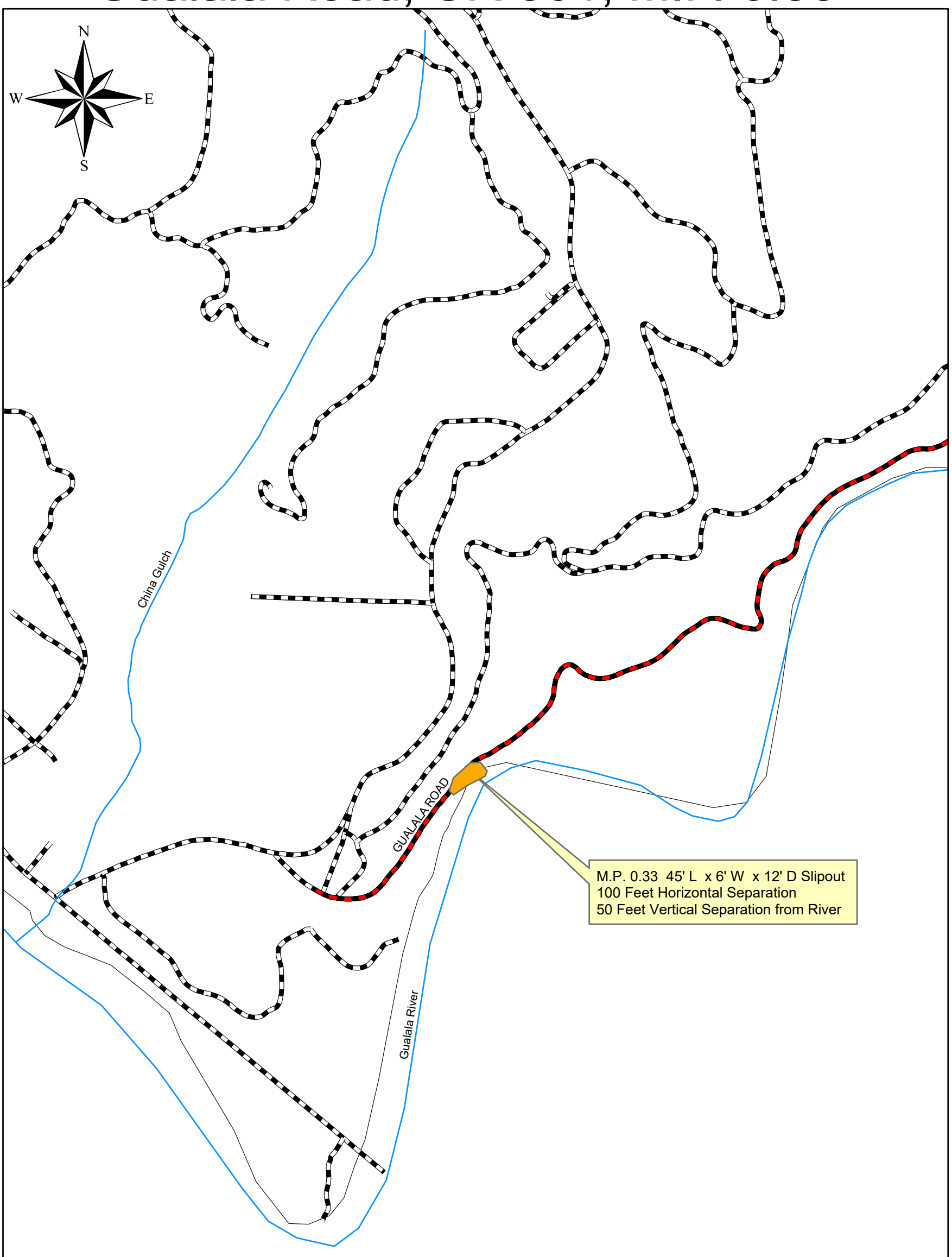
0 0.0425 0.085 Miles

1:6,000

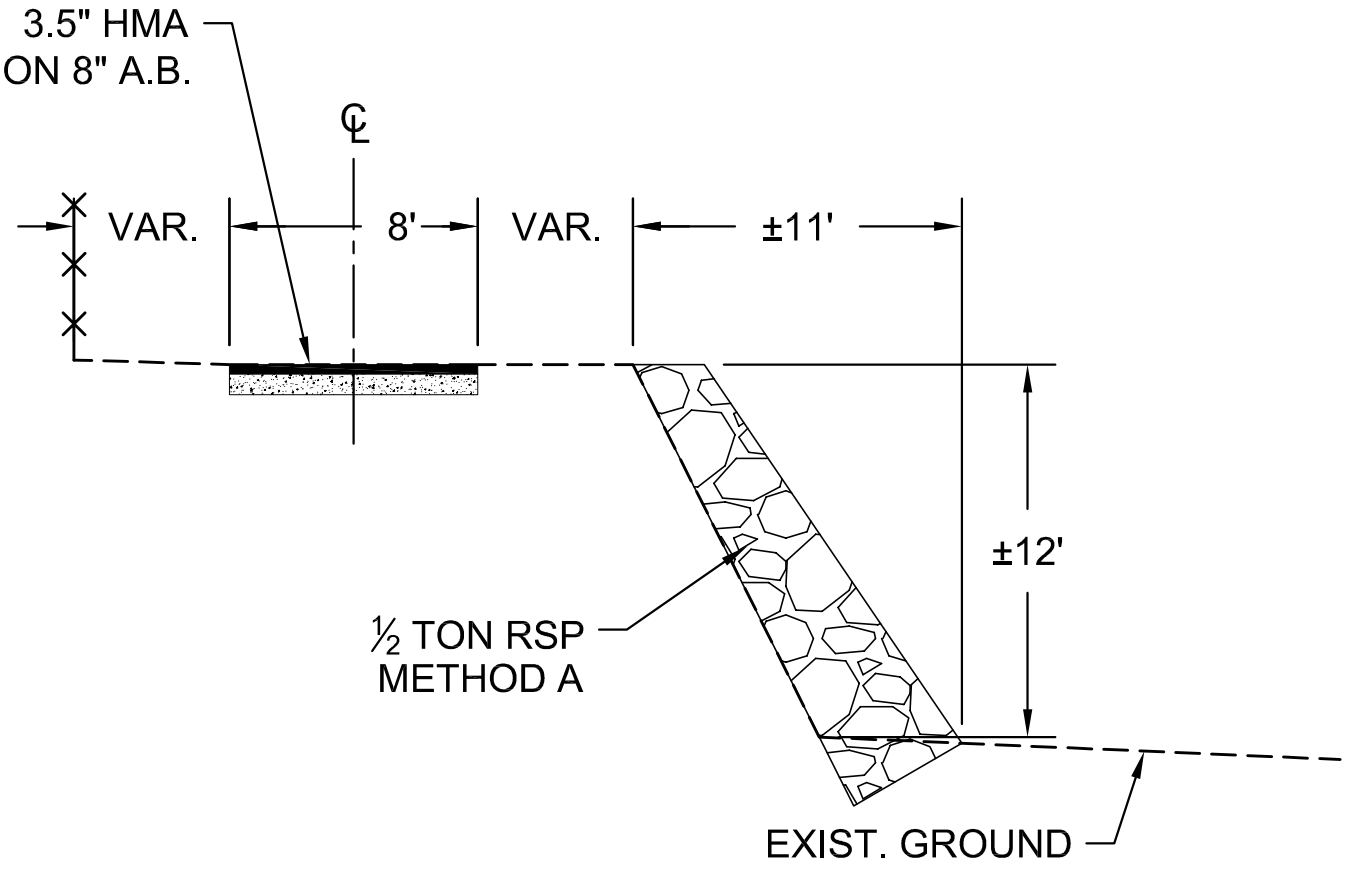
# TOPOGRAPHIC MAP

CONTOUR INTERVAL IS 40 FEET

# Damage Description and Dimensions
# FEMA DR4434 #286225
# Gualala Road, CR 501, M.P. 0.33



# TYPICAL SECTION




MENDOCINO COUNTY DEPARTMENT
OF TRANSPORTATION

**TYPICAL SECTION**
**2019 STORM DAMAGE REPAIRS ON**
WINDY HOLLOW ROAD, CR 508, M.P. 2.11

| PROJECT NO. | DRAWN BY | CHECKED BY | SCALE |
|---|---|---|---|
| F-1906.507 | CAG | HND | NONE |

# PDA Photo Page(s)

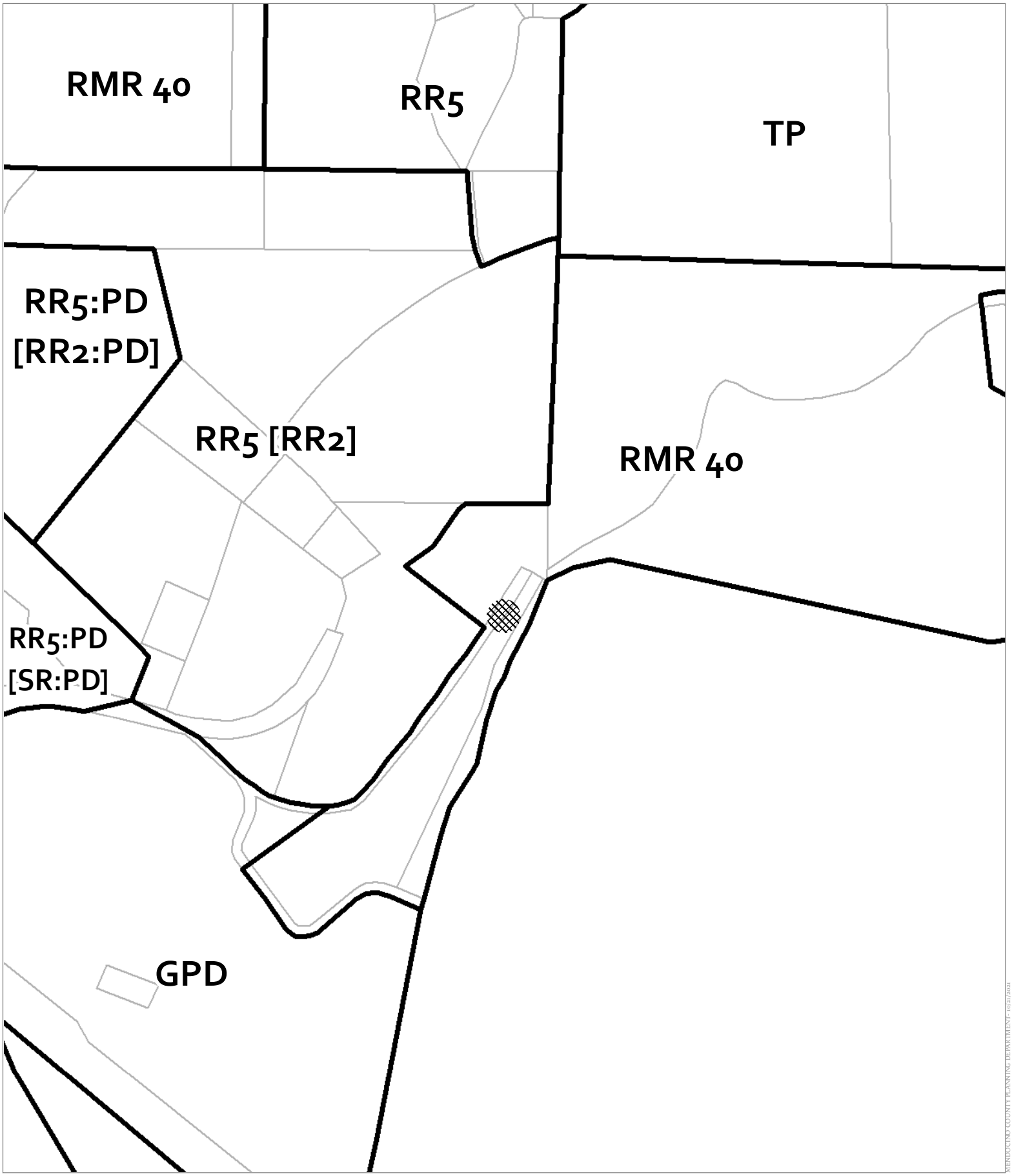
| Disaster #: | | Applicant ID: | Mendocino County Department of Transportation (MCDOT) | Category: | A - G | Date: | 03/05/2019 |
|---|---|---|---|---|---|---|---|
| County: | Mendocino | Address: | | Damage: | FLOOD | Inspector: | |


Photo # 5

Photo # 6

Photo # 7


Photo # 8

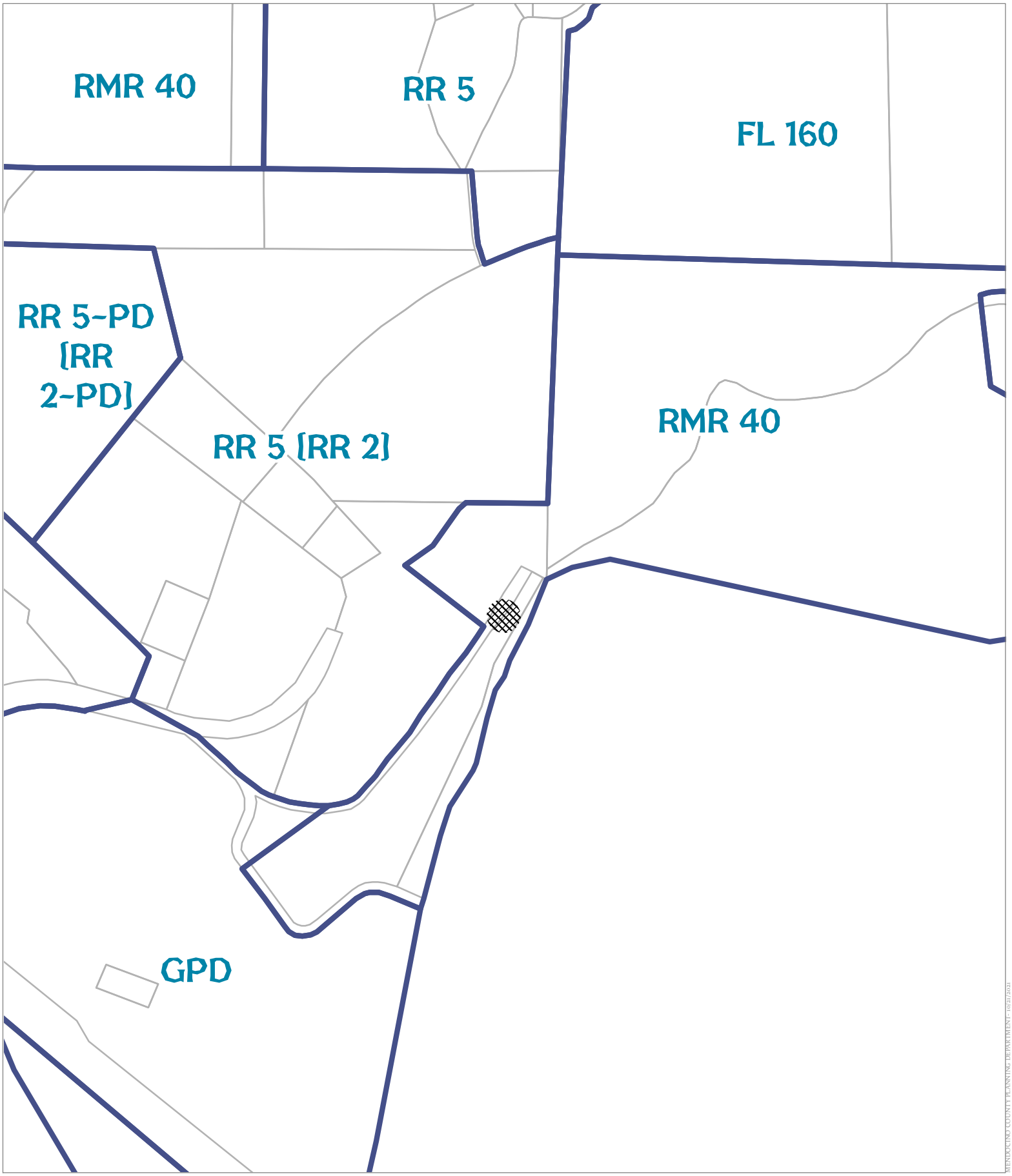



CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Zoning Districts

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

ZONING DISPLAY MAP




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

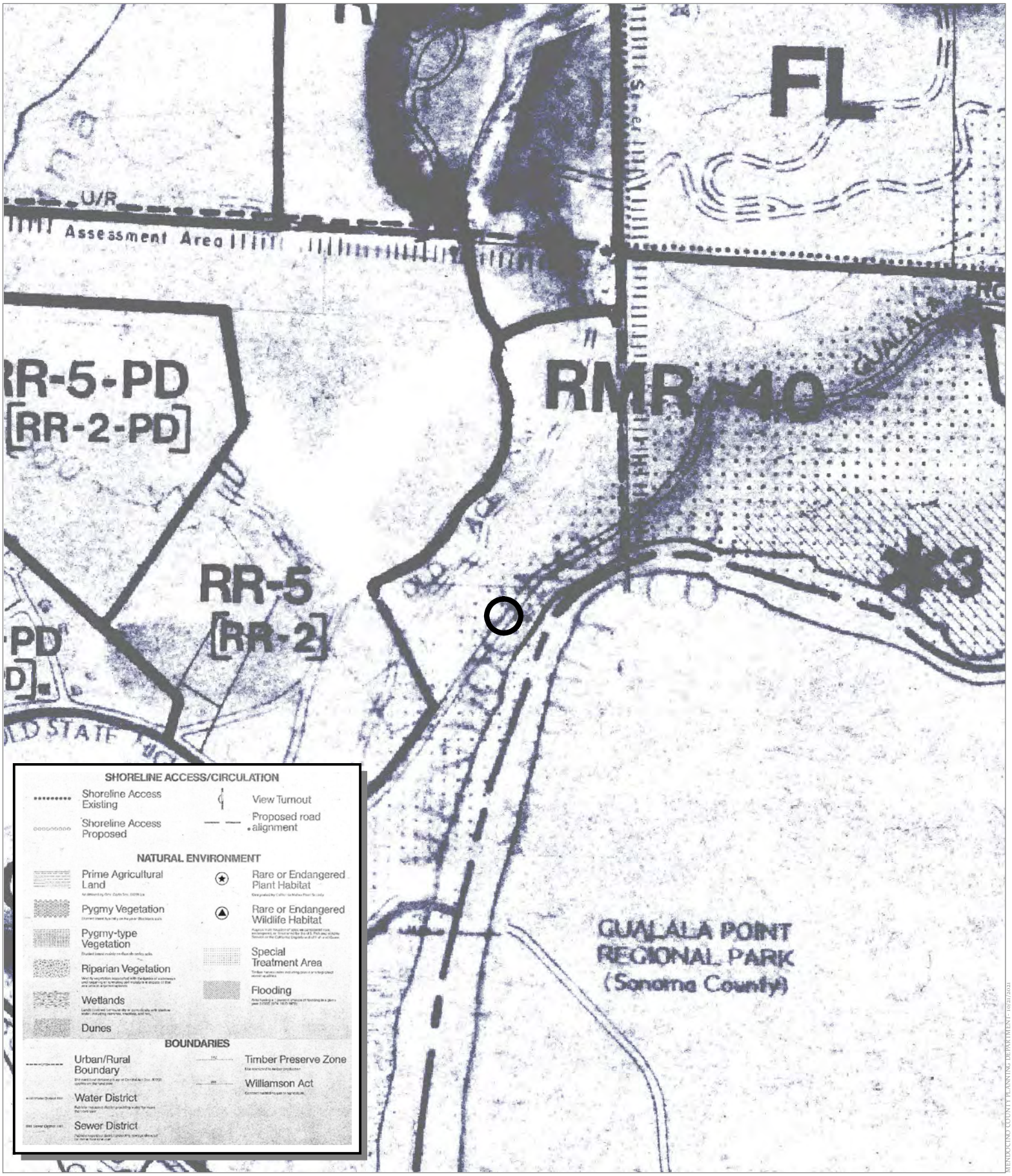
General Plan Classes

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

N W E S

MENDOCINO COUNTY PLANNING DEPARTMENT - 10/21/2021

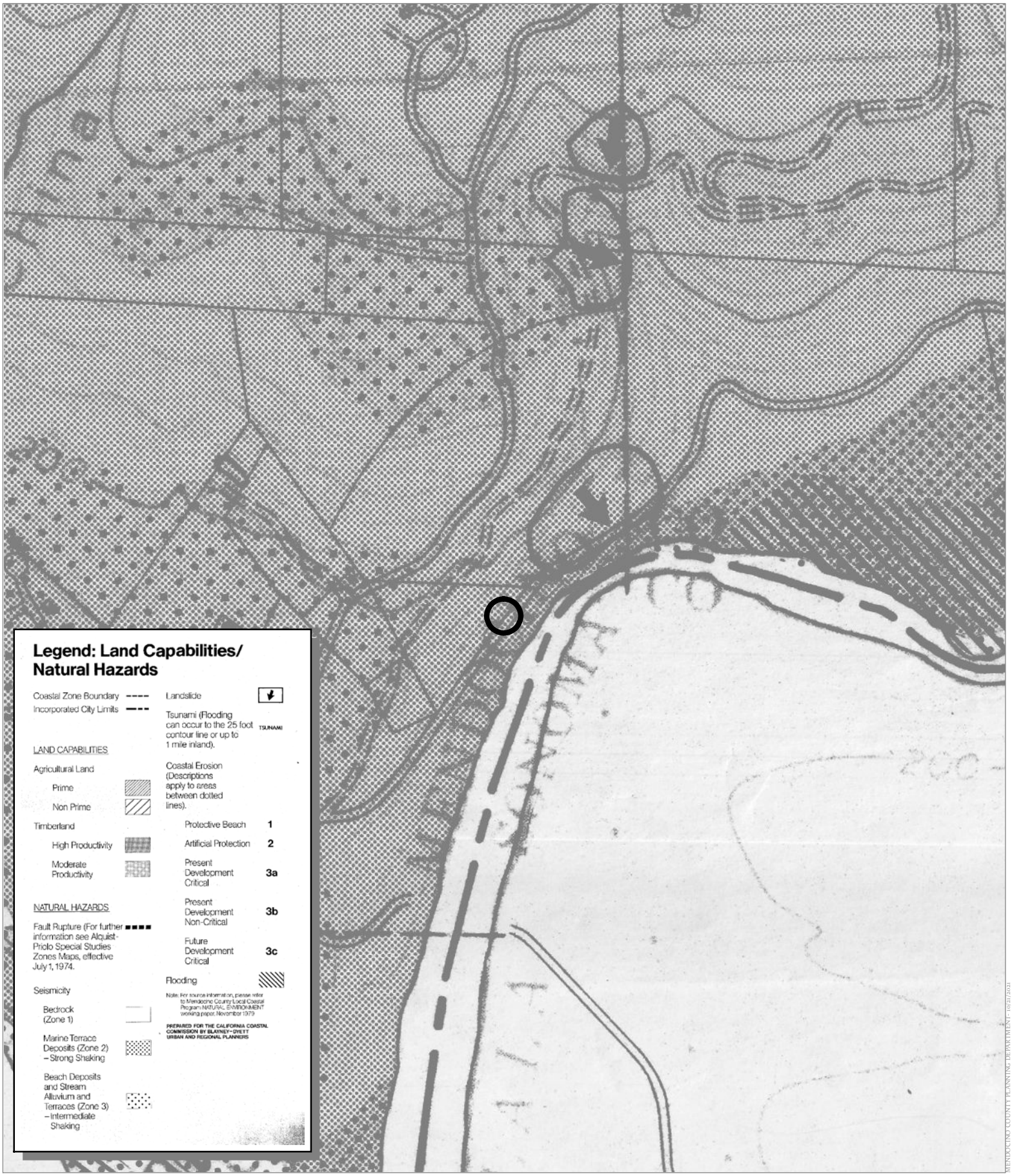
GENERAL PLAN CLASSIFICATIONS




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

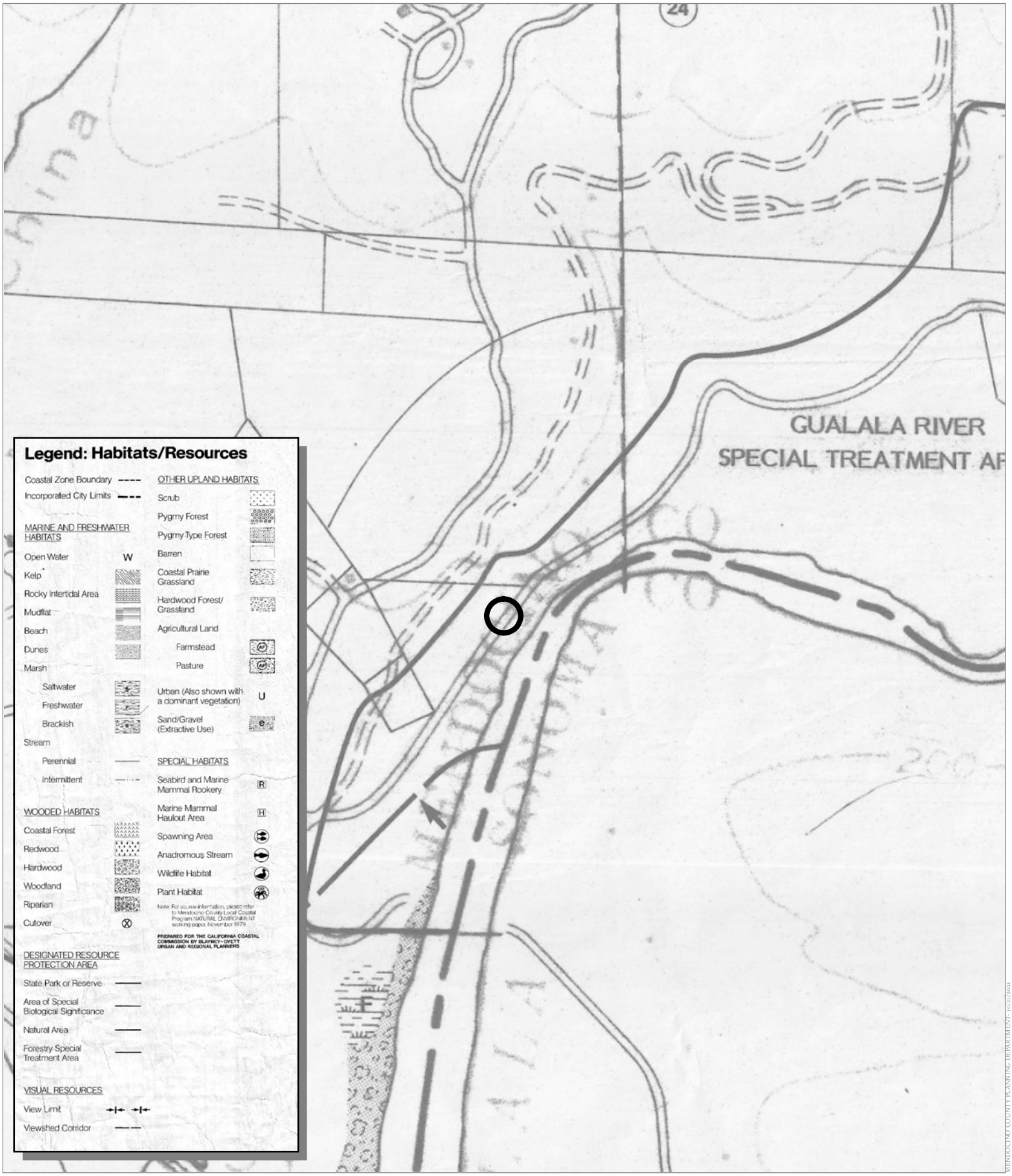
LCP MAP 31: GUALALA




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

LCP LAND CAPABILITIES & NATURAL HAZARDS




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

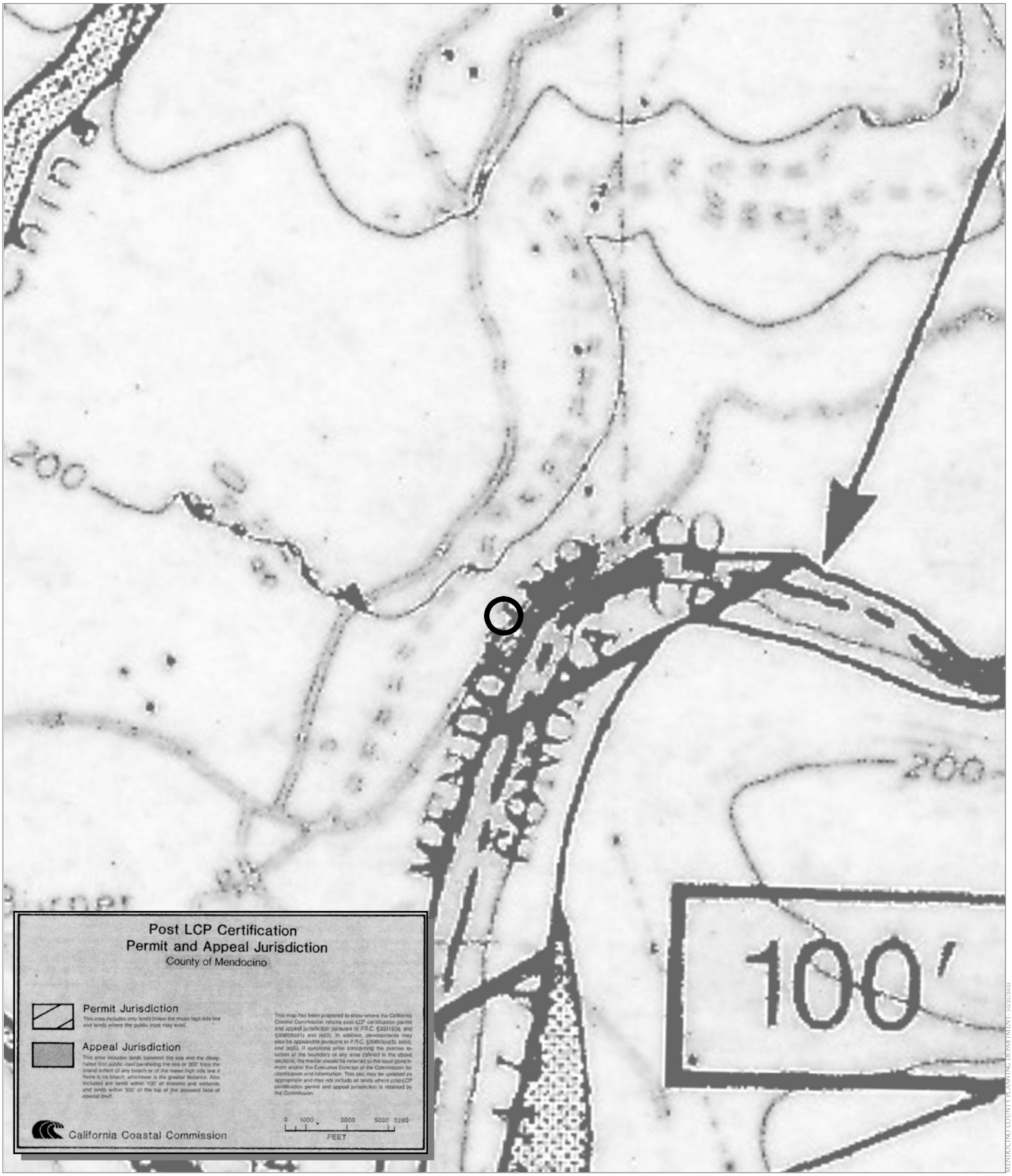
LCP HABITATS & RESOURCES


| LEGEND | |
|---|---|
| SYM. | DESCRIPTION |
| | NATURAL AREAS<br>See Inventory of California Natural Areas Vol. I For More Information |
| ☆ | RARE PLANTS<br>See Inventory of Rare and Endangered Vascular Plants of California For More Information |
| • | STEELHEAD and RAINBOW TROUT① |
| — | SILVER SALMON① |
| - | KING SALMON① |
| | KEY WILDLIFE AREAS①<br>Large Areas |
| | LIMITED HABITAT①<br>Large Areas |
| o | KEY WILDLIFE AREAS①<br>Small Areas or Point Locations |
| □ | LIMITED HABITAT①<br>Small Areas or Point Locations |
| ---- | LINEAR FEATURES① |

CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 550 1,100 Feet
0 0.1 0.2 Miles
1:14,400

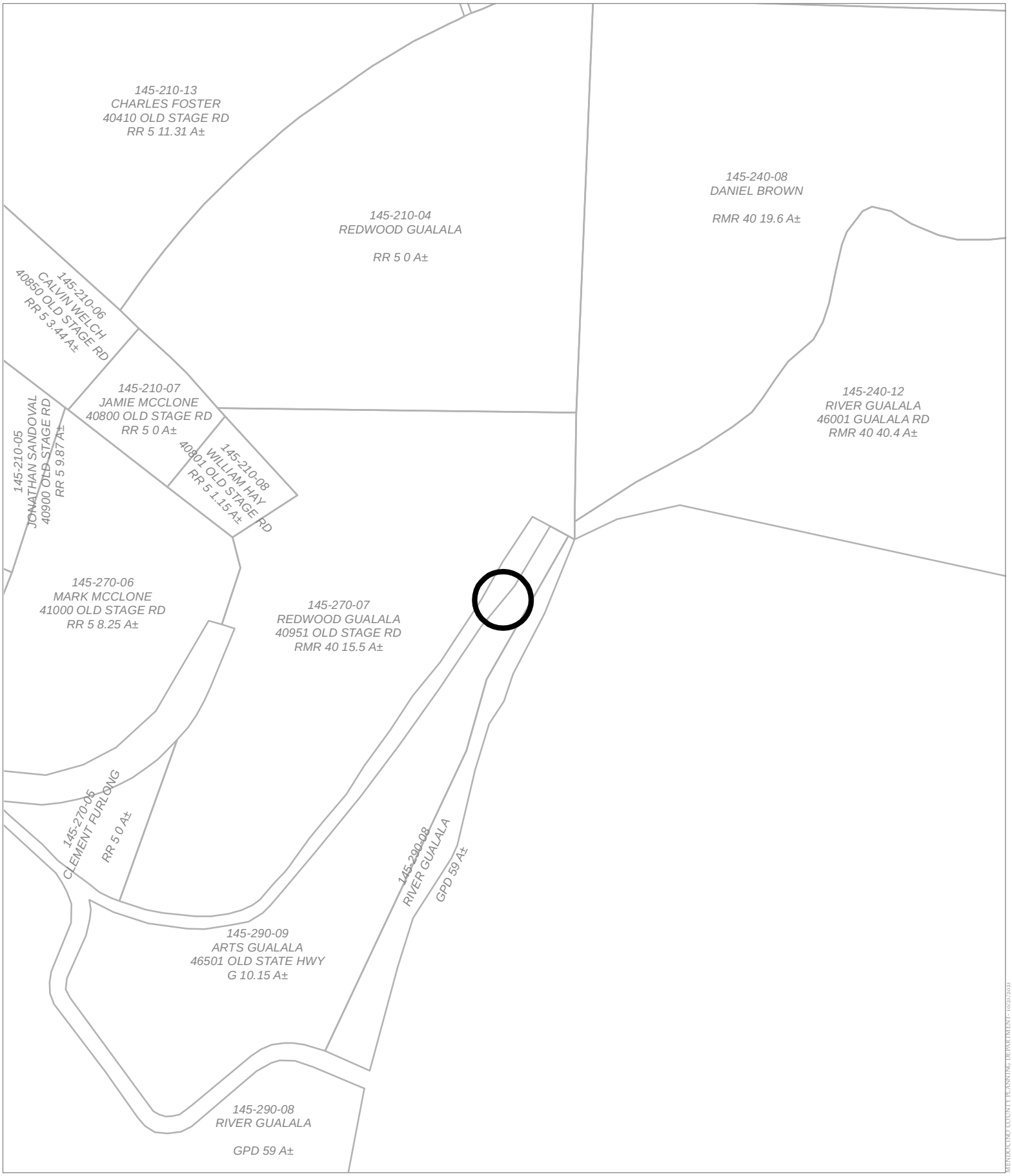
BIOLOGICAL RESOURCES




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

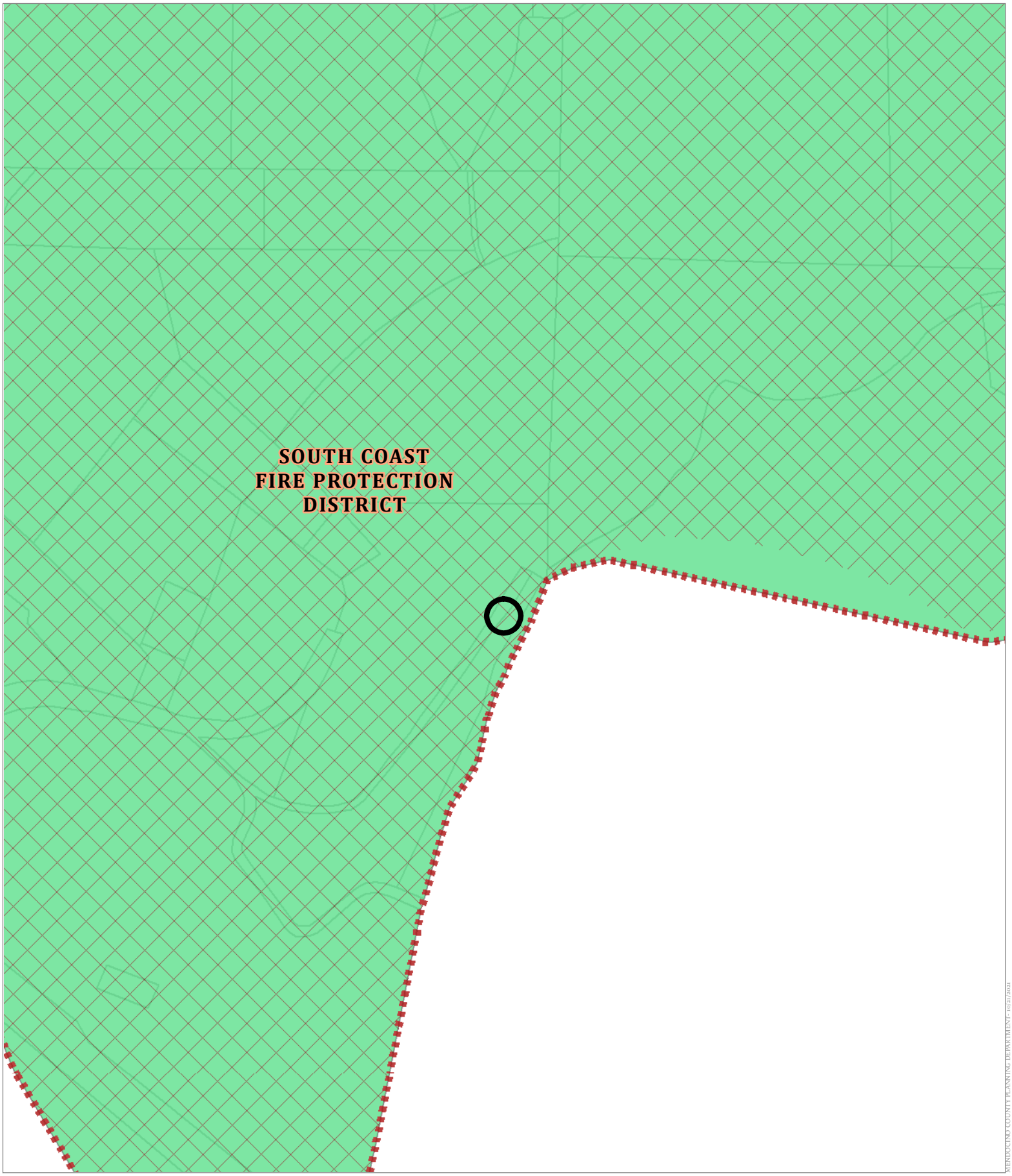
POST LCP CERTIFCATION AND APPEAL JURISDICTION




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 150 300 Feet
0 0.025 0.05 Miles
1:3,600

ADJACENT PARCELS

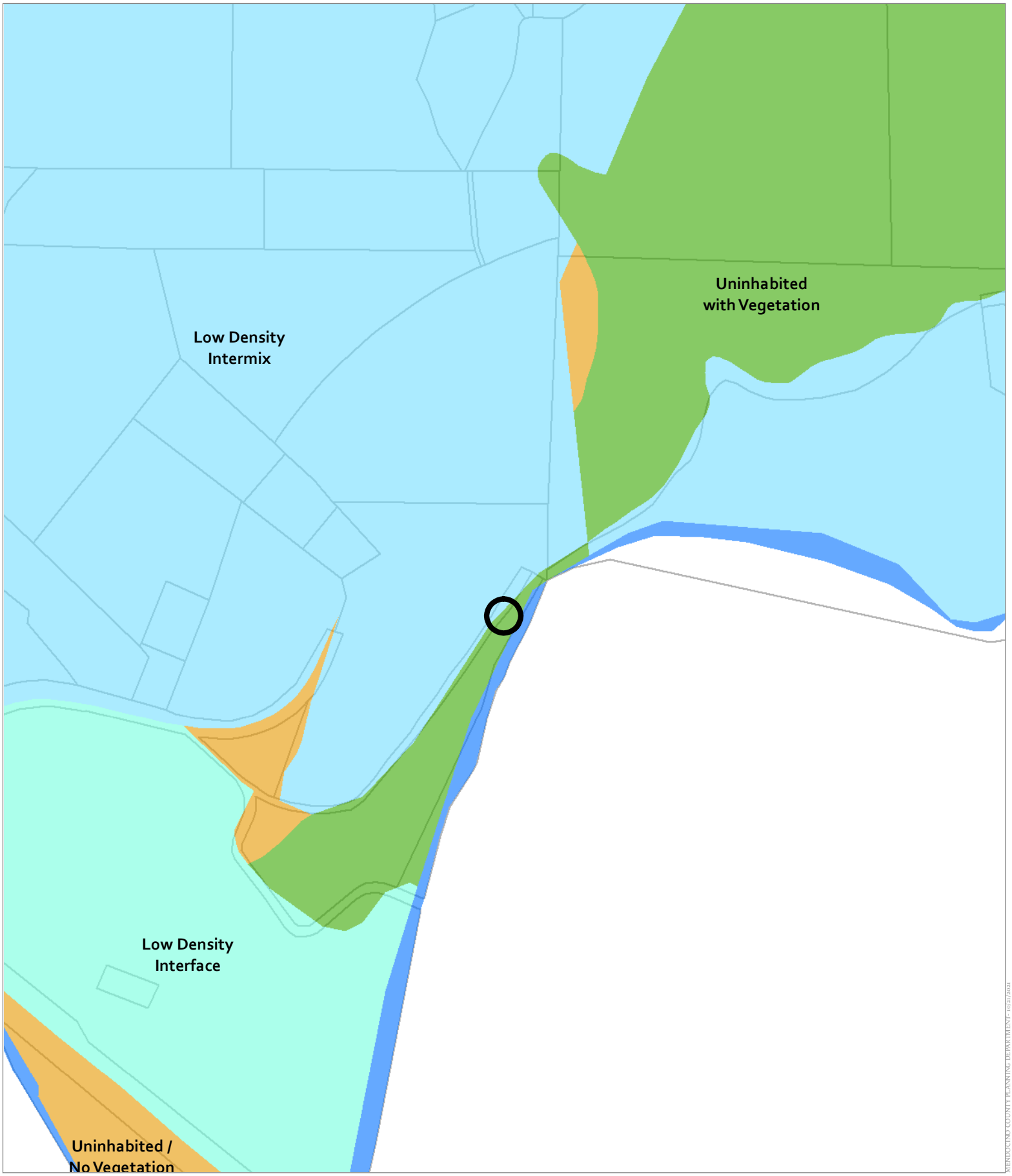



CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

High Fire Hazard
County Fire Districts

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

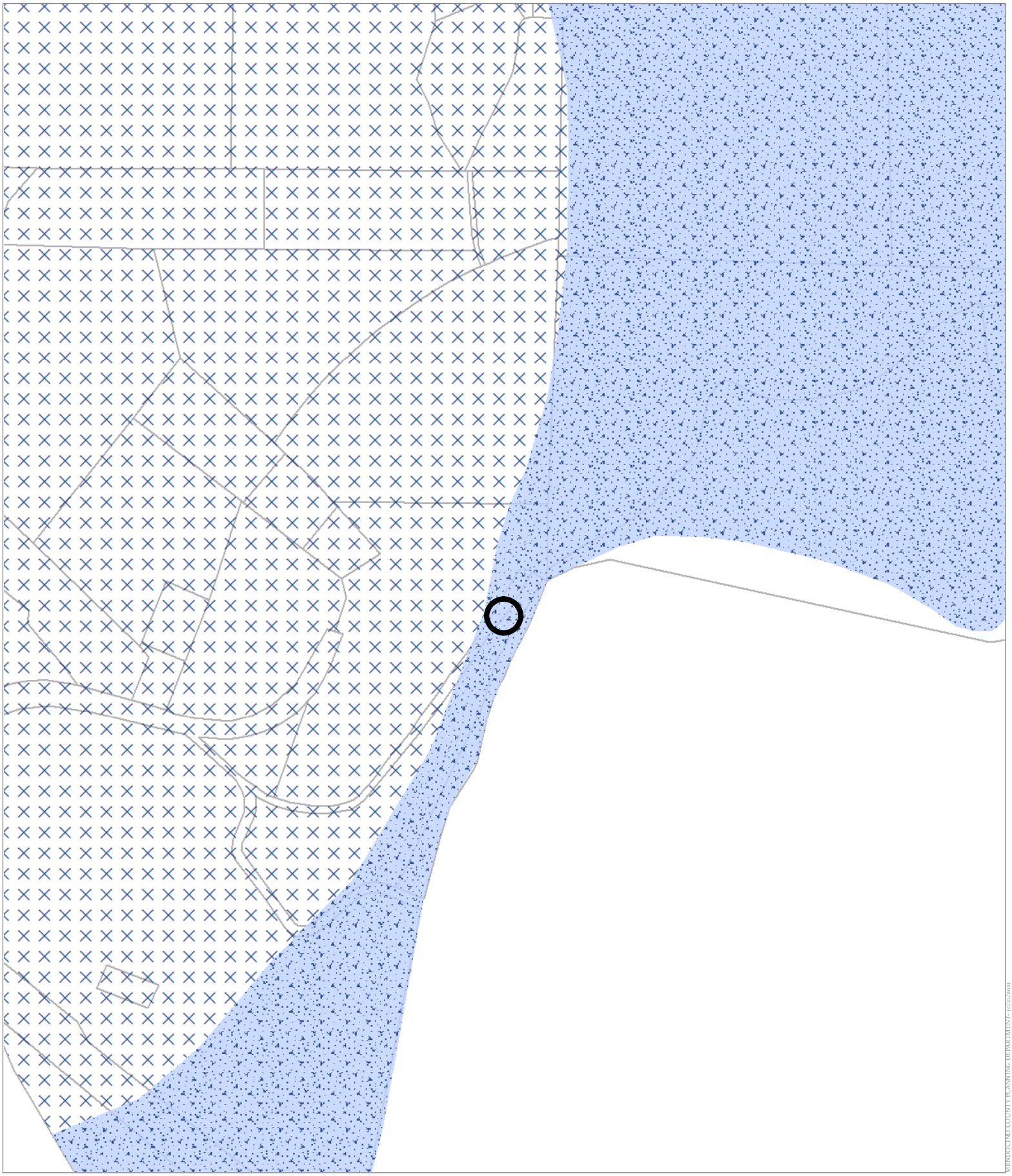
FIRE HAZARD ZONES & RESPONSIBILITY AREAS
STATE RESPONSIBILITY AREA




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

WILDLAND-URBAN INTERFACE ZONES




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Critical Water Areas

Critical Water Resources Bedrock

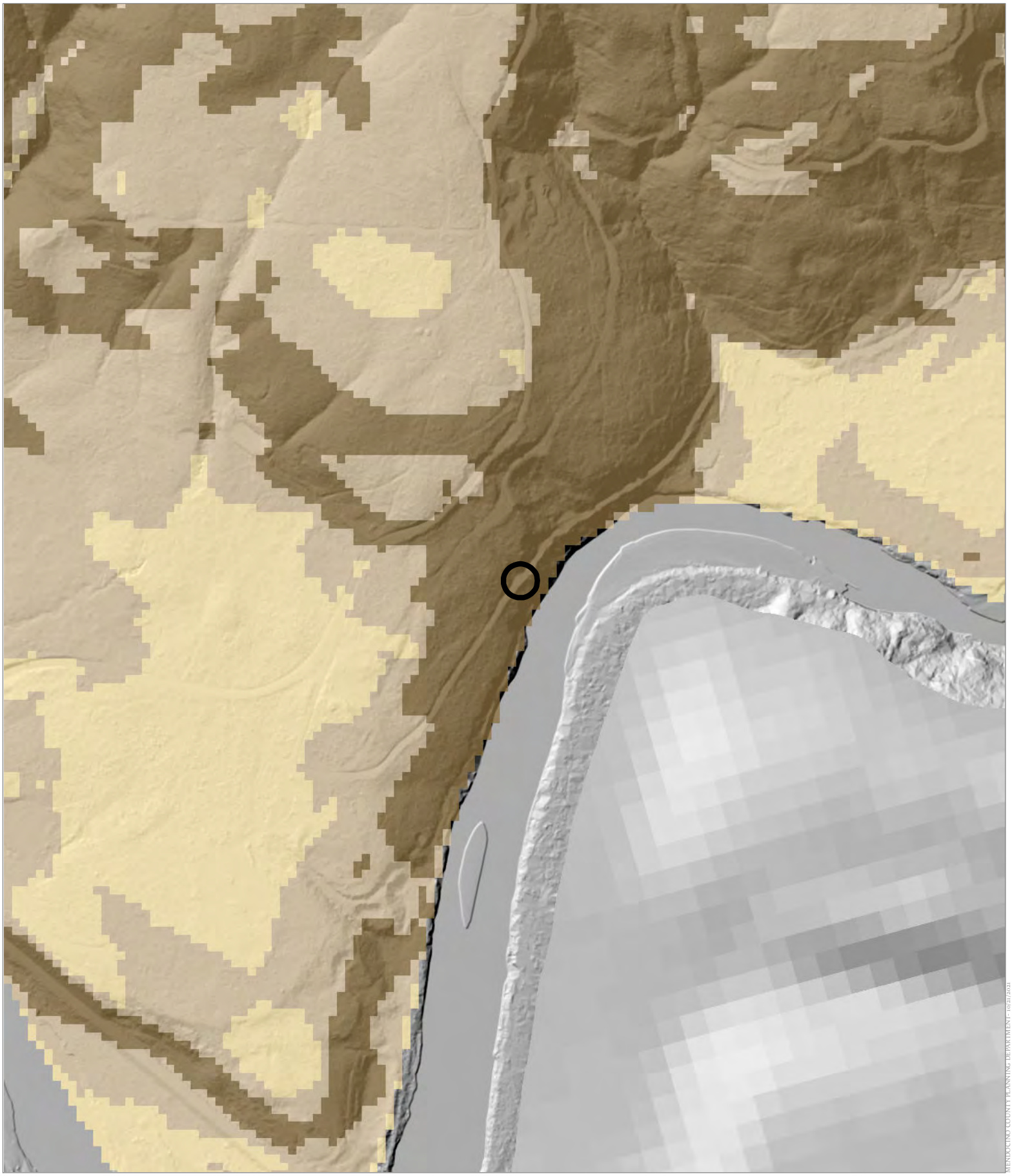
0 250 500 Feet

0 0.0425 0.085 Miles

N W E S

1:6,000

GROUND WATER RESOURCES



CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

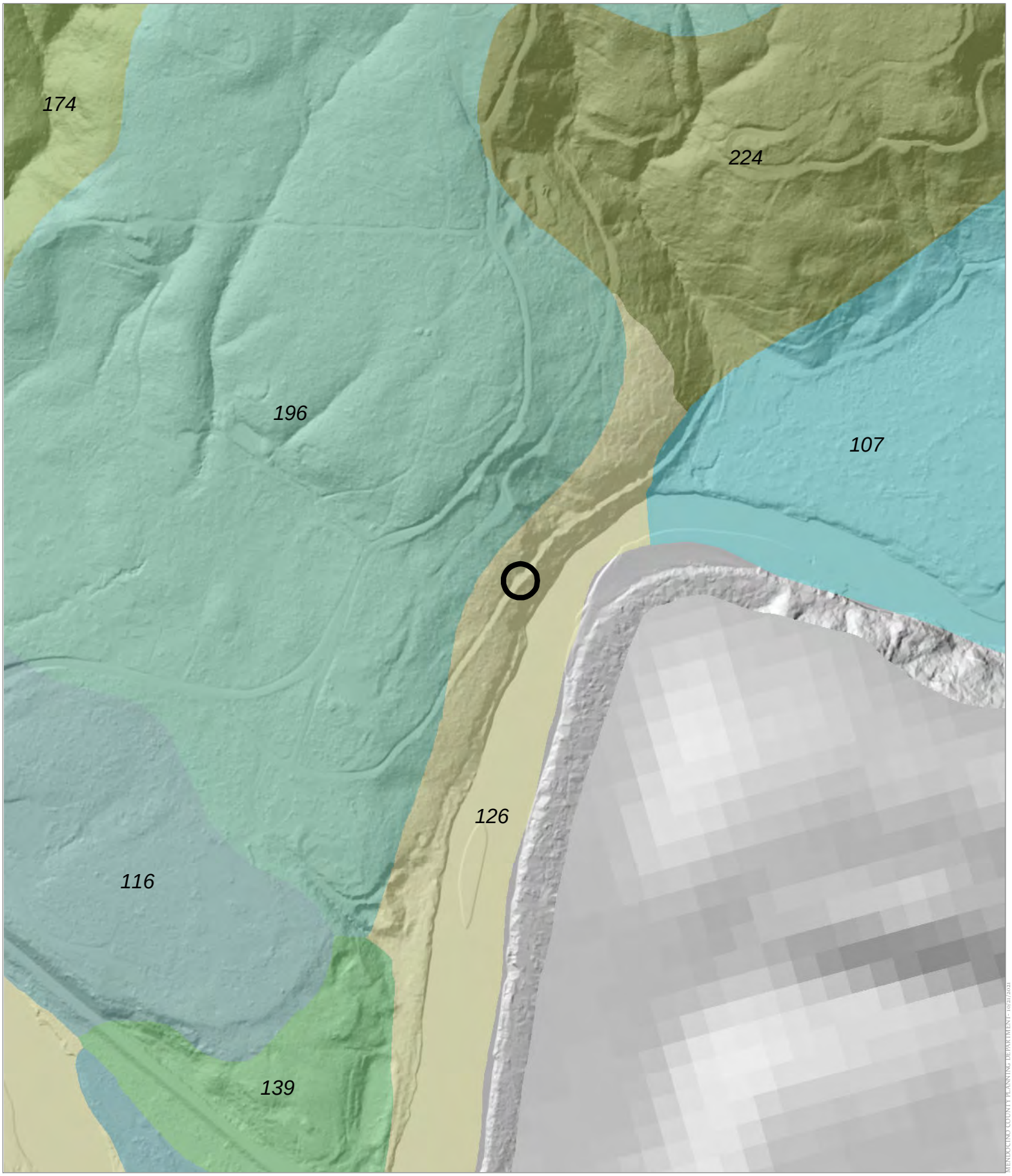
0° - 14°
15° - 32°
33° - 72°

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

N W E S

ESTIMATED SLOPE

MENDOCINO COUNTY PLANNING DEPARTMENT - 10/21/2021

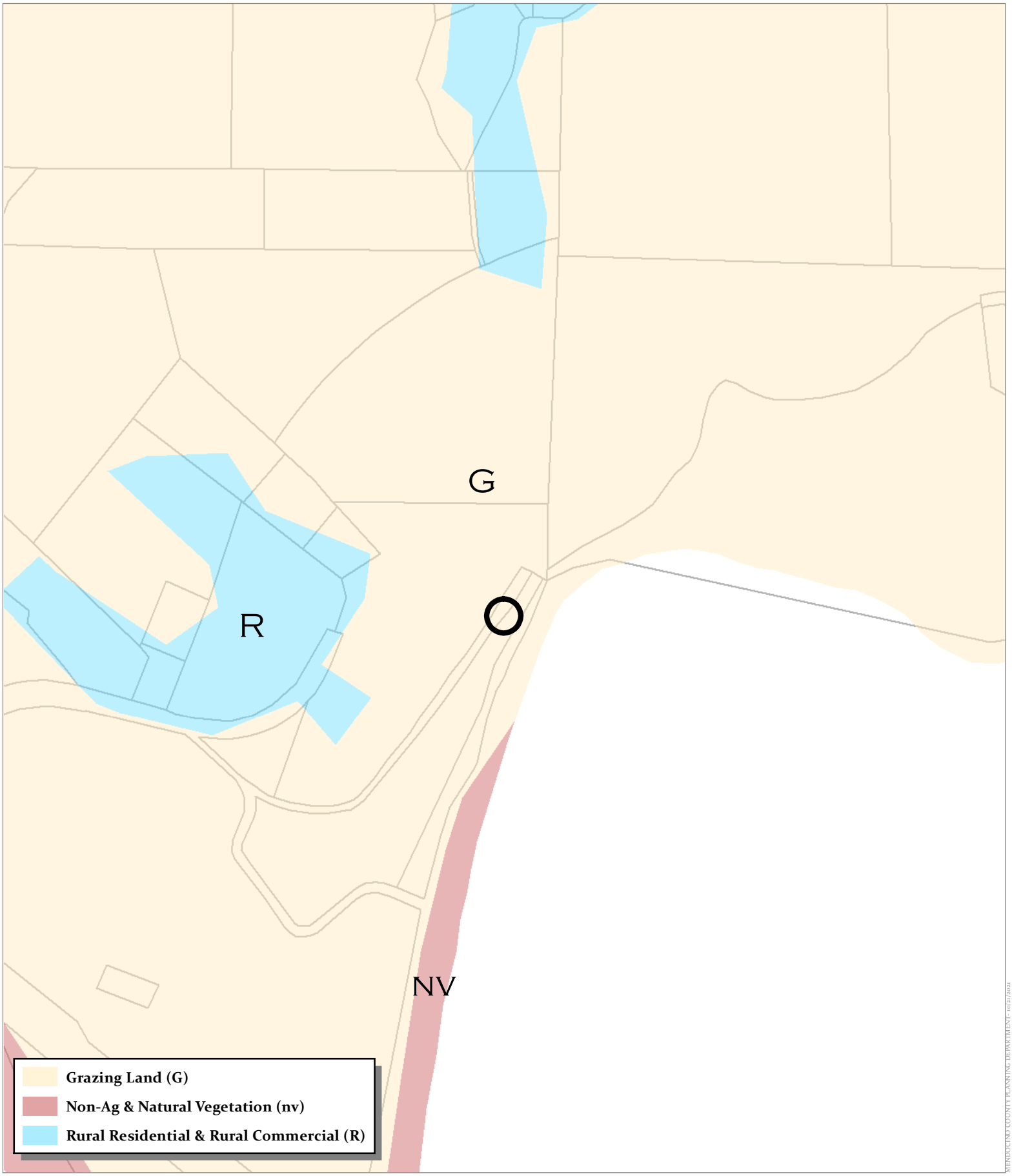



CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

Bishop Pine

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

WESTERN SOIL CLASSIFICATIONS




CASE: CDP 2021-0006
OWNER: County of Mendocino
APN: N/A (Right-of-Way)
APLCT: Howard Dashiell
AGENT: Chris Collins
ADDRESS: Gualala Road, Gualala

0 250 500 Feet
0 0.0425 0.085 Miles
1:6,000

FARMLAND CLASSIFICATIONS

Crawford & Associates, Inc. Geotechnical Engineering, Design and Construction Services
Taber Since 1954
Sacramento | Modesto | Pleasanton | Rocklin | Ukiah

Corporate Office: 1100 Corporate Drive, Suite 230 | Sacramento, CA 95831 | (916) 455-4225
Modesto: 1165 Scenic Drive, Suite B | Modesto, CA 95350 | (209) 312-7668
Pleasanton: 6200 Stoneridge Mall Road, Suite 330 | Pleasanton, CA 94588 | (925) 401-3515
Rocklin: 4220 Rocklin Road, Suite 1 | Rocklin, CA 95677 | (916) 455-4225
Ukiah: 100 North Pine Street | Ukiah, CA 95482 | (707) 240-4400

July 23, 2021
Crawford File No. 19-563.2

To: Alicia Meier, Deputy Director, Engineering
Mendocino County Department of Transportation (MCDOT)

Subject: **DRAFT GEOTECHNICAL MEMORANDUM**
Work Order No. 2 – Gualala Road (CR 501) at MP 0.33
Mendocino County, California

Crawford & Associates, Inc. (Crawford) prepared this **Draft** Geotechnical Memorandum (memo) for the Gualala Road (CR 501) slope failure at Milepost (MP) 0.33. The work was completed in accordance with Project Work Order (WO) No. 2 under the Mendocino County Board of Supervisors (BOS) Agreement No. 20-041 and MCDOT Agreement No. 180074, dated February 23, 2021. This memo summarizes the results of the field investigation, describes the encountered subsurface materials, evaluates potential repair alternatives, and provides geotechnical design recommendations for slope repair with a soldier pile tieback wall.

To prepare this memo, Crawford:

- Discussed the project goals and objectives with representatives of MCDOT;
- Reviewed "*2019 Event Gualala Rd. MP 0.33-DR-4434 286225 Design Basis Advice Letter for Repairs*"[1], dated September 04, 2019;
- Reviewed published topographic, geologic, landslide, and seismic mapping of the site.
- Reviewed the topographic survey[2] completed by MCDOT.
- Performed a surface geologic reconnaissance of the site and immediate vicinity on March 18, 2021.
- Drilled and sampled two road-level borings on May 25, 2021;
- Performed laboratory testing and geotechnical engineering analysis in support of the design recommendations contained herein.

# 1 PROJECT DESCRIPTION

## 1.1 PROJECT DATUM

All elevations in this memo are based on an assumed coordinate system, unless otherwise noted, as provided in the topographic survey completed by MCDOT. The project datum is based on the control point "CP 1", with an assumed elevation of 1,000 feet. However, we estimate that the actual ground surface elevation is between 80 to 120 feet[3].

[1] The letter was provided by MCDOT on 2/08/2021.
[2] The topographic survey was provided by MCDOT on 2/10/2021.
[3] United States Geological Survey (2018), Gualala Quadrangle, 7.5-Minute Series, United States Geological Survey, Scale 1:24,000.

## 1.2 PROJECT LOCATION

The project site is located along Gualala Road at MP 0.33 in Gualala, California, approximately 0.4 miles northeast of its intersection with Old State Highway in southwest Mendocino County. Gualala Road provides public access to the Gualala River Redwood Park. The site is approximately located at latitude 38.7680° and longitude -123.5166° (per Google Earth), with road elevation ranging from about 998 to 1,002 feet. See Figure 1 for Vicinity Map.

## 1.3 SITE DESCRIPTION

Gualala Road at this location traverses a steep, generally southeast-facing slope[4]. The road is a narrow, paved two-lane section (about 16 to 18 feet wide), with a generally straight northeast to southwest alignment with a moderately ascending profile grade (3% to 6%) to the northeast. The road is constructed in a cut-fill section with the inboard cut-slopes up to 20 feet high with inclinations ranging from about 0.8H:1V to 0.9H:1V (horizontal:vertical); above the cut-slopes, native slope inclinations range from about 1.3H:1V to 1.6H:1V. The outboard slopes, where slope failure has occurred, are at about a 0.75H:1V to 1H:1V inclination. The site is located approximately 50 to 70 feet upslope, vertically, and 80 to 100 feet, horizontally, from/near an outside bend of Gualala River (river). The site appears to be located at/near an outside bend in the river and the river appears to be impinging into the slope below this section of roadway. Vegetation in the immediate area consists of relatively dense tree cover, with heavy fern and brush undergrowth along with other plant varieties, that suggest the presence of shallow groundwater.

Three translational debris failures were observed within the immediate site vicinity: (1) an approximately 175-foot long wide failure located along the inboard slope, extending about 70 feet above the roadway (appears recent); (2) an approximately 135-foot wide failure located along the outboard slope (appears older with predominantly immature tree growth); (3) an approximately 40-foot wide failure (recent) located along the outboard slope and within the center of the older failure (2). Based on our conversations with nearby neighbors, the inboard slope has undergone reoccurring failure (1), depositing slide debris on the roadway and/or outboard slope below. Slide debris was observed along the outboard shoulder/slope, presumably deposited from the inboard slope failure(s). The toe of both outboard slope failures (2, 3) extend to the river. The pavement appears to be in relatively poor condition; alligator cracks and slumping was observed at the site. It is our understanding that MCDOT is only seeking recommendations to stabilize the roadway adjacent to the 40-foot wide recently failed outboard slope section (3, see Photo 1).

Prior to the slope failure (1), it appears that surface runoff from the upper slope areas and the inside portion of the road was collected within an inboard ditch and conveyed past the existing failure to the southwest. No culverts were observed within the immediate vicinity of the project site. At the time of Crawford's field investigation (March 2021), the inboard ditch was buried by slide debris along the toe of the failure (1) area.

No evidence of underground or overhead utilities at this site was observed and none were marked by utility members through USA North 811.

[4] All site observations/descriptions provided within this memo are based on site and project conditions observed in the during field reconnaissance (03/18/2021) and/or current topographic data (provided on 2/10/2021). Site conditions are subject to change over time.

**Photo 1. Gualala MP 0.33 Project Site Facing East Looking East**

## 2 FIELD INVESTIGATION

Crawford completed two borings along the roadway on March 25, 2021. Clear Heart Drilling, Inc. drilled the borings under the supervision of a Crawford field engineer. A summary of the explorations is provided below in Table 1. See Figure 4 for exploration locations.

**Table 1: Summary of Exploratory Borings**

| Boring I.D. | Completion Date | Surface Elevation (ft) | Drilled Depth (ft) | Drill Rig | Hammer Type | Hammer Efficiency Ratio | Drilling Equipment |
|---|---|---|---|---|---|---|---|
| A-21-001 | 03/25/21 | 1,002.3 | 30.8 | DR8K (Track) | CME Auto (140 lbs) | 80.4% | 4-inch O.D. solid-stem auger |
| A-21-002 | | 1,000.1 | 35.0 | | | | 4-inch O.D. solid-stem auger |

Clear Heart Drilling utilized a Deeprock DR8K track-mounted drill rig to complete the explorations. A hammer energy calibration test was not performed for this project/site. The DR8K CME auto-hammer is assumed to have an efficiency ratio of 80.4% based on the most recent testing information provided by the driller.

Soil and weathered/fractured rock samples were recovered from the drilled borings by means of a 2.0-inch O.D. "Standard Penetration" split-spoon sampler (ASTM D1586) with 1.4-inch I.D. stainless steel liners and a 3.0-inch O.D. "Modified California" split-spoon sampler (ASTM D3550) with 2.4-inch I.D. stainless steel liners. The samplers were advanced with the standard 350 ft-lb striking force using a 140-lb automatic hammer and a drop height of 30 inches. At each test interval, the sampler was driven 18 inches (or until sampler refusal criterion was met), and the blows required to advance the sampler every 6 inches of penetration were recorded. The sampler refusal criterion is defined as 50 or more blows with less than 6 inches of sampler advancement. The field blow counts (N) were recorded as the number of hammer blows required to drive the sampler the final 12-inches of the 18-inch total sample

interval unless refusal was met. Sampler penetration resistance provides a field measure of relative densities and can be correlated to soil (or weathered/fractured rock) strength and bearing characteristics. The field-recorded (uncorrected) blow counts are shown on the boring logs provided in Appendix A. Energy-corrected ($N_{60}$) blow counts are provided in the summary table within Appendix B.

Crawford logged the borings consistent with the Unified Soil Classification System and the Caltrans 2010 Logging Manual. Selected portions of recovered soil and weathered/fractured rock drive samples were retained in sealed containers for laboratory testing and reference. Groundwater observations were recorded during drilling operations when/if encountered and when the drilling method allowed. At completion, all explorations were backfilled per the requirements of the Mendocino County Division of Environmental Health.

# 3 LABORATORY TESTING

The following laboratory tests were completed on representative soil/rock samples obtained from the drilled borings:

- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D4318)
- Moisture Content and Unit Weight (ASTM D2216 and D7263)
- Material Finer than #200 Sieve (ASTM D1140)
- Particle-Size Sieve Analysis (ASTM D6913)
- pH and Minimum Resistivity (CTM 643)
- Sulfate Content and Chloride Content (CTM 417 and CTM422m)

See Appendix B for a summary of the laboratory test results.

# 4 GEOLOGIC SETTING

## 4.1 REGIONAL GEOLOGY

The project site lies within the Coast Ranges Geomorphic Province, which is characterized by a series of northwest-trending mountain ranges with intermountain valleys and sub-parallel to the active San Andreas Fault. The Coast Ranges is composed of thick Cenozoic sedimentary and volcanic strata overlying Mesozoic metamorphic rock. The northern Coast Ranges are dominated by the irregular, knobby, landslide-topography of the Franciscan Complex.

Published geologic mapping[5] (Figure 2A/2B) shows the site underlain by Anchor Bay Member, Gualala Formation. The unit generally consists of well consolidated, silicified mudstone with interbedded layers of sandstone, consolidated moderately hard coarse-grained sandstone overlain by undifferentiated marine terrace sands, and sheared colluvial deposits (near the San Andreas Fault).

## 4.2 LOCAL GEOLOGY

Crawford conducted a geologic reconnaissance of the site as part of the field investigation (March 2021). Based on this reconnaissance, rock observed/exposed along the inboard slope slip plane (1) is classified as sedimentary siltstone, reddish brown, decomposed, soft, and very intensely fractured. The drilled borings encountered mostly sandstone (with interbedded mudstone) below the fill. Overall, the local geology is generally consistent with the regional geologic mapping of this area.

[5] Davenport, C.W.; Geology and geomorphic features related to landsliding, Gualala 7.5' Quadrangle, Mendocino County, California; Scale: 1:24,000; California; Division of Mines and Geology, 1984.

### 4.3 SITE LANDSLIDING

Published landslide mapping[5] (Figure 2A/B) indicates that the site is situated within an area with active slides and disrupted ground (complex landsliding) that are too small to delineate individually at mapped scale.

Based on the geologic reconnaissance (May 2021), the three slope failures within the immediate site vicinity (as described in Section 1.3) are relatively shallow translational debris slides. The slide debris mostly consists of fine to medium grained soils, fractured rock fragments of various sizes, and downed trees. Area topography is generally hummocky, indicative of widespread shallow slope movement/creep.

### 4.4 FAULTS AND SEISMIC ACTIVITY

Based on the United States Geologic Survey fault data/mapping[6] (Figure 3), the nearest "active" fault (defined as surface displacement within the last 11,000 years) is a trace of the Historic-age San Andreas Fault Zone (North Coast Section), located about 1.3 miles northeast of the site.

The site is located in an area of potential strong seismic ground motions, having a probabilistic seismic hazard peak ground acceleration of approximately 0.84g[7].

## 5 SUBSURFACE CONDITIONS

### 5.1 EARTH MATERIALS

Based on the boring data, subsurface materials are divided into two general material units, as described in Table 2 below. Refer to the exploration logs provided in Appendix A for more specific soil/rock descriptions and boring details.

**Table 2: Subsurface Profile**

| Unit | Location | Bottom Depth (ft) | Material Description |
|---|---|---|---|
| 1 | A-20-001<br>A-20-002 | 6.0<br>3.0 | **Fill Material** – brown; dry to moist; dense Clayey Sand (SC) and hard Sandy lean Clay (CL). Approximately 52 to 57% fines. SPT blow counts ($N_{60}$) range from 17 to +100 bpf (average of 32 bpf). Sample liners too disturbed/loose to pocket pen. Sampled material contained sufficient gravel rendering pocket torvane results invalid. |
| 2 | A-20-001<br>A-20-002 | +30.1<br>+35.0 | **"Intact" Weathered Rock** – brown to reddish brown; soft to moderately soft; decomposed to intensely weathered Sedimentary Rock (Sandstone interbedded with Mudstone). SPT blow counts ($N_{60}$) range from 36 to +100 bpf (i.e. refusal). |

(1) Pocket Penetrometer (PP) is a field measure for estimating the unconfined compressive strength of cohesive soil or cohesive intermediate geomaterial (IGM)/decomposed rock.
(2) SPT Blow Counts ($N_{60}$) is a measure of Standard Penetration Test blows per foot, corrected for hammer energy. If the refusal criterion is met as discussed above (50 blows with less than 6" of sampler advancement), then the result is denoted as blows over the actual interval length sampler driven, neglecting the first 6" of advancement.

[6] U.S. Geological Survey, Quaternary Faults Database, accessed on June 1, 2021, at: *https://www.usgs.gov/natural-hazards/earthquake-hazards/faults*.
[7] https://arsonline.dot.ca.gov, accessed on 07/08/21

## 5.2 GROUNDWATER

Groundwater was not encountered within any of the completed explorations for this investigation (March 2021). Groundwater levels in general will fluctuate due to changes in precipitation, seasonal fluctuations, surface/subsurface drainage characteristics, and other site-specific factors.

## 5.3 CORROSION EVALUATION

Table 3 summarizes the results of the chemical analysis testing completed on select samples obtained from the borings to evaluate the corrosion potential of the site earth materials.

**Table 3: Corrosion Test Summary**

| Boring I.D./ Sample No. | Depth (ft) | pH | Minimum Resistivity (ohm-cm) | Chloride Content (ppm) | Sulfate Content (ppm) |
|---|---|---|---|---|---|
| A-21-001-2B | 5.5 | 4.92 | 4,820 | 15.5 | 1.5 |
| A-21-002-4A | 16 | 6.00 | 2,950 | 3.3 | 2.1 |

According to Caltrans Corrosion Guidelines (Version 3.0, 2018)[8], a site is considered to be potentially corrosive to structural foundation elements (concrete/steel) if one or more of the following conditions exist:

- pH is 5.5 or less
- Chloride concentration is 500 parts per million (ppm) or greater
- Sulfate concentration is 1,500 ppm or greater

Per Caltrans guidelines, with the exception of MSE wall design, minimum resistivity is not included as a parameter to define a corrosive environment for structures. Resistivity can serve as an indicator parameter of the possible presence of soluble salts (chlorides and sulfates), with a minimum resistivity value of 1,100 ohm-cm or less indicating the potential presence of high quantities of soluble salts (higher propensity for corrosion), and thus requiring additional testing.

Based on the test results summarized above and current Caltrans guidelines, site earth materials (Unit 1 and 2) are considered potentially **"corrosive"** to structural concrete/steel foundation elements. The tests are only an indicator of soil corrosion potential; the Design Engineer should consult with a corrosion engineer (or specific product manufacturer) if these values are considered significant. Section 12 of the Caltrans Corrosion Guidelines provides information regarding corrosion mitigation measures for structural elements if deemed appropriate by the Design Engineer.

# 6 CONCLUSIONS

Based on the boring data and site observations, the slope failure (3) occurred predominantly within the Unit 1 fill material. The primary causes of failure are likely to be the inherent weakness of the Unit 1 material on an over-steepened slope and high seasonal storm water infiltration in combination with a build-up of seepage pressures within/along the soil-rock interface. Saturation and undercutting at the toe of the slope by the river and erosion and surcharge loading from debris deposited by the inboard slope failure (1) could also be considered contributory causes of the failure.

[8] California Department of Transportation, Division of Engineering Services, Materials Engineering and Testing Services, Corrosion Branch, Corrosion Guidelines, Version 3.0, March 2018.

It is our understanding that MCDOT is only seeking recommendations to stabilize the roadway adjacent to the 40-foot wide recently failed outboard slope section (3). As described in Section 1.3, an older, wider failure (2) was observed at the site and extends approximately 55 and 40 feet to the north and south, respectively, of the recently failed outboard slope section (3); evaluation of this older failure area (2) is not included within this memo. Adjacent to the proposed repair alternative (discussed below), this larger slide area may continue to experience future movement, possibly impacting the road, if this section of roadway is not stabilized.

MCDOT has proposed stabilizing the road with a soldier pile tieback wall (see Figure 4 for proposed wall layout, provided by MCDOT). In addition to a soldier pile tieback wall, two other alternatives were evaluated for road repair – a Mechanically Stabilized Earth (MSE) wall and a Rock Slope Protection (RSP) embankment. The following summarizes the recommended key elements of each option:

1. **Soldier Pile Tieback Wall:**
   - Vertical soldier piles and anchor piles embedded into the Unit 2 “intact” rock;
   - Tiebacks from the soldier piles to the inboard anchor piles for control of lateral stresses;
   - Lagging or facing elements to support backfill;
   - Excavation and removal of disturbed materials in front of the wall;
   - Sub-drainage behind the wall for control of hydrostatic forces;
   - A trenched underdrain along the inboard edge of the road to intercept shallow subsurface water seepage;
   - An inboard-sloping road surface or outboard berm, or other method(s) to control surface runoff/direct water away from the repaired area;
   - Erosion control in front of the wall; and
   - Reconstructed paved road section per MCDOT typical standards.

2. **MSE Wall:**
   - Excavation and removal of disturbed materials;
   - Establishing the base of the wall into the Unit 2 “intact” rock;
   - Constructing the wall per the manufacturer’s specifications;
   - Sub-drainage behind the wall, with gravity relief;
   - A trenched underdrain along inboard edge of the road to intercept shallow subsurface water seepage;
   - An inboard-sloping road surface or outboard berm, or other method(s) to control surface runoff/direct water away from the repaired area; and
   - Reconstructed paved road section per MCDOT typical standards.

3. **RSP Embankment:**
   - Excavation and removal of disturbed materials;
   - Keying the buttress into suitable bearing strata;
   - Continuous subdrainage along the heel of the excavation, with gravity relief;
   - 1- to 2-ton RSP along the key and temporary construction backslope, transitioning to smaller rock between the rock buttress and road structural section;
   - Constructing finished grade slopes at no steeper than 1H:1V and trim surrounding ground surface to drain;

- An inboard-sloping road surface or outboard berm, or other method(s) to control surface runoff/direct water away from the repaired area; and
- Reconstructed paved road section per MCDOT typical standards.

The MSE wall and RSP embankment alternatives do not appear practical/feasible at this site. The base of an MSE wall should be located at least 15 feet below the road grade, which may require a complete excavation/closure of the road and temporary (or permanent) shoring measures, such as soil nails, to install. The long-term performance of the MSE wall is dependent on stable toe support; significant erosion at the base of the slope from the river could compromise the long-term stability of this alternative. The RSP embankment toe would likely "catch" the slope near/or below the river bottom and involve construction within the river. A temporary stockpile area (for the MSE wall) or permanent disposal area (for the RSP embankment) would need to be identified in order to store/dispose of the excavated materials. Overall, both of these options would result in a significant disturbance area and a larger environmental impact compared to the soldier pile tieback wall alternative.

Other options are considered less appropriate/practical for this site. The existing slopes are too steep to "catch" either a typical 2H:1V reconstructed embankment section or a steepened 1.5H:1V reinforced embankment. Rigid wall systems, such as a reinforced concrete cantilever wall, are not recommended due to limited tolerance for movement. Significant road realignment and/or significant grade changes do not appear viable due to the existing high, steep cuts present at the site.

# 7 RECOMMENDATIONS

Based on the field exploration and analysis, a soldier pile tieback wall is considered appropriate for this site. This repair option can be accomplished with a minimum 11-foot high wall across the alignment. It would have the advantages of achieving a relatively high level of security through use of deep foundation elements with anchored tiebacks, provide a measure of internal structural flexibility with relative independence from subsequent downslope or adjacent movement and require limited slope excavation requirements with little site/traffic disturbance during construction.

## 7.1 GEOTECHNICAL ENGINEERING PARAMETERS

A generalized soil profile (see Section 5.1, Table 2) was developed for this site based on our exploratory boring data. Based on that soil profile, geotechnical engineering design parameters were determined from the following data and assumptions:

- Unit weight based on laboratory test results;
- Average cohesion based on laboratory testing, pocket penetrometer and/or torvane data, and published blow count correlations;
- Friction angles based on published blow count correlations;
- Average $N_{60}$ values recorded on the soil boring logs and corrected for hammer efficiency and overburden pressure (as applicable);
- Engineering experience and judgment based on past projects with a similar soils environment/profile.

The geotechnical engineering design parameters used for our analysis are shown below in Table 4.

**Table 4: Geotechnical Engineering Design Parameters**

| Unit | Material | Unit Weight (pcf) | Friction Angle (deg) | Cohesion (psf) |
|---|---|---|---|---|
| - (Retained Section) | Structure Backfill | 120 | 34 | 0 |
| 2 (Embedded Section) | Sedimentary Rock | 125 | 38 | 0 |

The earth pressure distributions for permanent nongravity cantilevered wall as shown in Figure 3.11.5.6-1 (AASHTO LRFD Bridge Design Specifications (BDS), 8th Edition[9]) and Figure 5.8.6.2-2 (Caltrans BDS, Article 5.8.6.2[10]) is considered appropriately conservative for use in design.

## 7.2 SOLDIER PILE WALL

The soldier pile wall will be approximately 50-foot-long (proposed wall length and layout line provided by MCDOT) and positioned about 12 feet (and varies) from the existing roadway centerline with layout line as shown on Figure 4. A minimum wall height on order of 11 feet is anticipated within the failure area.

We consider cast-in-drilled-hole (CIDH) piles with a minimum diameter of 24 inches appropriate for this project. An H-pile "core" should be used to provide additional lateral capacity within the pile excavations. Concrete should be placed in clean, dry excavations, as soon as possible after completion of drilling. We expect that groundwater seepage into the pile excavations can be controllable by pumping, as necessary, for dry-season construction (e.g., late summer to early fall).

The backfill between the soldier piles should be retained with timber lagging or concrete facing placed between the pile flanges. Wall drainage should consist of either (1) a permeable material section (Class 1 or 3 Permeable Material, Caltrans 2018 Standard Specification 68[11]) wrapped in filter fabric, (2) Class 2 Permeable Material without filter fabric, (3) permeable backfill (e.g., clean drain rock) with a filter fabric backing, or (4) prefabricated drainage panel (e.g. geocomposite wall drain, Caltrans 2018 Standard Specification 96) attached behind the wall. A perforated pipe should be placed along the bottom of the wall and gravity flow to a solid drainpipe outlet. The outlet should be discharged downslope of the wall onto an appropriately-sized RSP energy dissipater. A "cleanout" riser can be added at the beginning of the solid drainpipe for long-term drain maintenance.

Soldier piles are recommended to achieve a minimum 10 feet of embedment into Unit 2 material[12]. The wall is recommended to extend a minimum of 5 feet beyond the ends of the slide limits along the outboard edge of the road; however, we understand that the County may not be able to extend the wall the full 5 feet to the north due to existing redwood trees located immediately adjacent (less than 5 feet) from the failure area. CIDH excavation should be observed by a Crawford representative to confirm rock elevation/depth.

[9] AASHTO LRFD Bridge Design Specifications, 8th Edition, November 2017 with May 2018 Errata.
[10] California Department of Transportation, Bridge Design Specifications (BDS), 2003.
[11] State of California Department of Transportation, Standard Specifications, 2018.
[12] The final pile tip elevations will be determined by the structural engineer.

A trenched underdrain (per Caltrans 2018 Standard Plan D102) should be constructed along the inboard road area to intercept shallow subsurface water seepage. Trench the underdrain to a recommended minimum depth of 5 feet below finished road grade and backfill with (1) permeable material (e.g., Class 1 or 3 Permeable Material, Caltrans 2018 Standard Specification 68) wrapped in filter fabric or (2) Class 2 Permeable Material without filter fabric. Low permeability material (e.g., compacted native soil) should be placed within the uppermost 12 inches to prevent surface water from entering the underdrain. A "cleanout" riser can be added at the beginning of the underdrain for long-term drain maintenance.

See attached Figure 5 for a typical section of the proposed soldier pile tieback wall.

## 7.3 EARTH PRESSURES – SOLDIER PILES

Table 5 summarizes our recommended nominal active and seismic earth pressures and allowable passive earth pressures[13] for design of the soldier pile wall. Note that the variable "H" in the table below is the design height of the wall, as determined by the Design Engineer. See attached Figure 6 for the Earth Pressures Diagram.

**Table 5: Recommended Nominal Earth Pressures**

| Element | Material | Earth Pressures (psf) | | Pressure Distribution |
|---|---|---|---|---|
| Retaining Wall | Structural Backfill | Active (Static) | 34*H | Triangular (tieback to anchor piles) (see AASHTO BDS – Fig. 3.11.5.6-1; Caltrans BDS – Fig. 5.8.6.2-2) |
| | | Active (Traffic) | See Note 1 | Uniform, see figure 6 |
| | | Active (Seismic) | 24*H | Triangular, see figure 6 |
| Soldier Piles | Unit 2 Material | Passive | 350*$Z_1$ | Triangular, see figure 6 (see AASHTO BDS – Fig. 3.11.5.6.1) |

**(1)** For traffic live load surcharge, a uniform lateral load applied to wall that is the greater of 0.28*(design surcharge pressure) or 0.28*(minimum traffic surcharge pressure of 240 psf).

**(2)** $Z_1$ = depth measured from bottom of wall to the pile tip.

The static active earth pressure applied to the retaining wall is based on the equations and pressure diagrams presented in AASHTO BDS Section 3.11.5.6 and Caltrans BDS Article 5.8.6.2 and assuming one level of tiebacks connected to anchor piles (refer specifically to diagram in Figure 3.11.5.6-1 and Figure 5.8.6.2-2, respectively). For seismic design, add the incremental lateral seismic active soil pressure specified above to the static active earth pressure.

The earth pressures applied to the embedded soldier piles are based on Figure 3.11.5.6-1 in AASHTO BDS, but modified by modeling the weathered "intact" rock material as "soil like" using soil strength design parameters (friction angle and/or cohesion). The passive earth pressure is determined based on equations and design charts provided in Section 3.11.5.4 of AASHTO BDS, with a maximum nominal passive pressure of 7 ksf. We recommend neglecting passive resistance in the upper 5 feet of Unit 2. Active pressure against the back of the soldier piles is neglected since the piles are embedded into "intact" rock-like material. The passive resistance can be applied to an effective pile width of 2x the pile diameter (2b), provided that the pile spacing is greater than the effective pile width.

[13] A factor of safety of 1.5 has been applied to the passive earth pressures in Table 5.

### 7.4 EARTH PRESSURES - ANCHOR PILES (IF NEEDED)

If required, lateral wall forces can be resisted with horizontal tieback rods connected to CIDH anchor piles. We recommend constructing the CIDH anchor piles outside of the vehicle wheel well path (i.e. either along the center of the inboard side of the road or along the inboard shoulder (preferred)) to mitigate against differential settlement. In addition, the anchor piles should be placed far enough away from the soldier pile wall in order to fully develop the passive pressure distribution. Embed the anchor piles a minimum of 5 feet into Unit 2 material[14].

Apply the same triangular passive resistance to the anchor piles as specified for the embedded soldier piles in Table 5 above. The passive resistance on the anchor piles can be applied to an effective pile width of 2x the pile diameter (2b), provided that the pile spacing is greater than the effective pile width. See Figure 6 for the Earth Pressure Diagram.

## 8 RISK MANAGEMENT

Our experience and that of our profession indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the Geotechnical Engineer of Record to provide additional services during design and construction.

For this project, Crawford should be retained as the Geotechnical Engineer of Record to:

- Review and provide comments on the final plans and specifications, insofar as they rely upon this report, prior to construction bidding to verify consistency with the recommendations contained herein.
- Monitor construction to check and document our report assumptions. At a minimum, Crawford should monitor initial pile excavations.
- Update this report if design changes occur, two years or more lapse between this report and construction, or site conditions have changed.

Should there be any change in the project or should subsurface conditions differ from those described in this report be encountered during construction, this office should be contacted/notified for evaluation and supplemental recommendations, as needed.

Crawford is not responsible for any other parties' interpretation of our report and recommendations contained herein, as well as subsequent addendums, letters, and discussions. If others perform the construction observation, they should review this report and either accept the conclusions and recommendations herein as their own or provide alternative recommendations.

## 9 RISK MANAGEMENT

Our experience and that of our profession indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the Geotechnical Engineer of Record to provide additional services during design and construction.

For this project, Crawford should be retained as the Geotechnical Engineer of Record to:

[14] The final pile tip elevations will be determined by the structural engineer.

- Review and provide comments on the final plans and specifications, insofar as they rely upon this report, prior to construction bidding to verify consistency with the recommendations contained herein.
- Monitor construction to check and document our report assumptions. At a minimum, Crawford should monitor initial pile excavations.
- Update this report if design changes occur, two years or more lapse between this report and construction, or site conditions have changed.

Should there be any change in the project or should subsurface conditions differ from those described in this report be encountered during construction, this office should be contacted/notified for evaluation and supplemental recommendations, as needed.

Crawford is not responsible for any other parties' interpretation of our report and recommendations contained herein, as well as subsequent addendums, letters, and discussions. If others perform the construction observation, they should review this report and either accept the conclusions and recommendations herein as their own or provide alternative recommendations.

## 10 LIMITATIONS

Crawford performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Where referenced, ASTM or Caltrans standards are used as a general (not strict) guideline only. We do not warranty our services.

This report is based on the current site and project conditions and should only be used for the evaluation and design of repair alternatives for the Gualala Road MP 0.33 slope failure project. It is assumed the soil/rock and groundwater conditions interpreted/encountered in the explorations (see logs provided in Appendix A) are representative of the subsurface conditions at the site. Actual conditions between explorations will vary along the project alignment. The interface shown between soil/rock materials on the exploration logs is approximate; the transition between material types may be abrupt or gradual. The recommendations are based on the final exploration logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions.

Modern design and construction are complex, with many regulatory sources/restrictions, involved parties, and construction alternatives. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on project complexities and cost estimates to cover changes and delays.

## CLOSING

Thank you for the opportunity to provide geotechnical services and design input for this project. Please contact us if you have any questions regarding the above recommendations or require additional information.

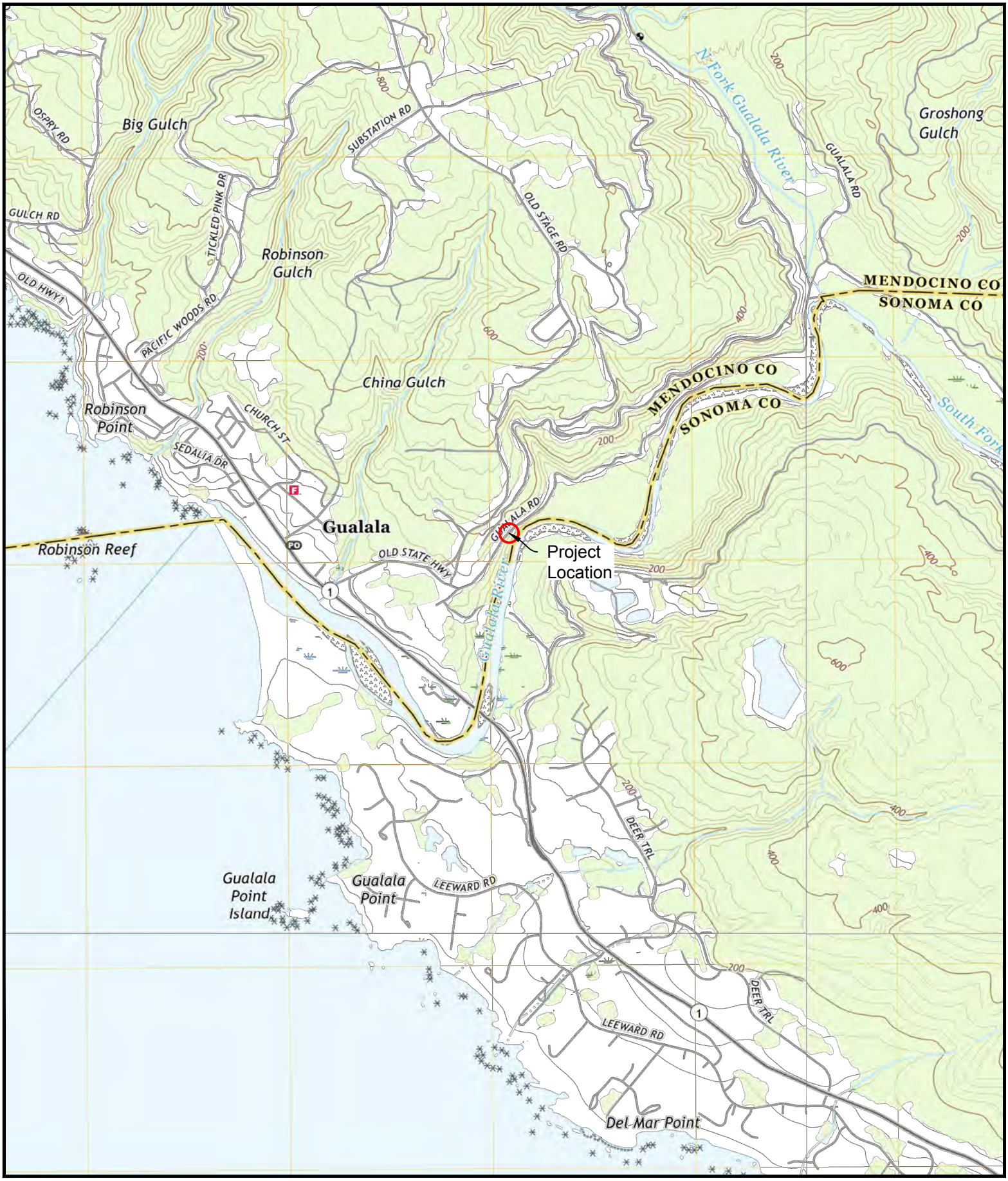
Sincerely,

**Crawford & Associates, Inc.**

Reynicole Gilbert, MS, EIT
*Project Engineer*

Chris Trumbull, PE, GE, D. GE
*Senior Project Manager*

## FIGURES




North

Source:
USGS 7.5' Topographic Maps, Gualala, Mendocino County, California, 2018, Scale: 1:24,000.

USGS 7.5' Topographic Maps, McGuire Ridge, Mendocino County, California, 2018, Scale: 1:24,000.

USGS 7.5' Topographic Maps, Stewarts Point, Sonoma County, California, 2018, Scale: 1:24,000.

USGS 7.5' Topographic Maps, Stewarts Point OE W, Sonoma County, California, 2018, Scale: 1:24,000.

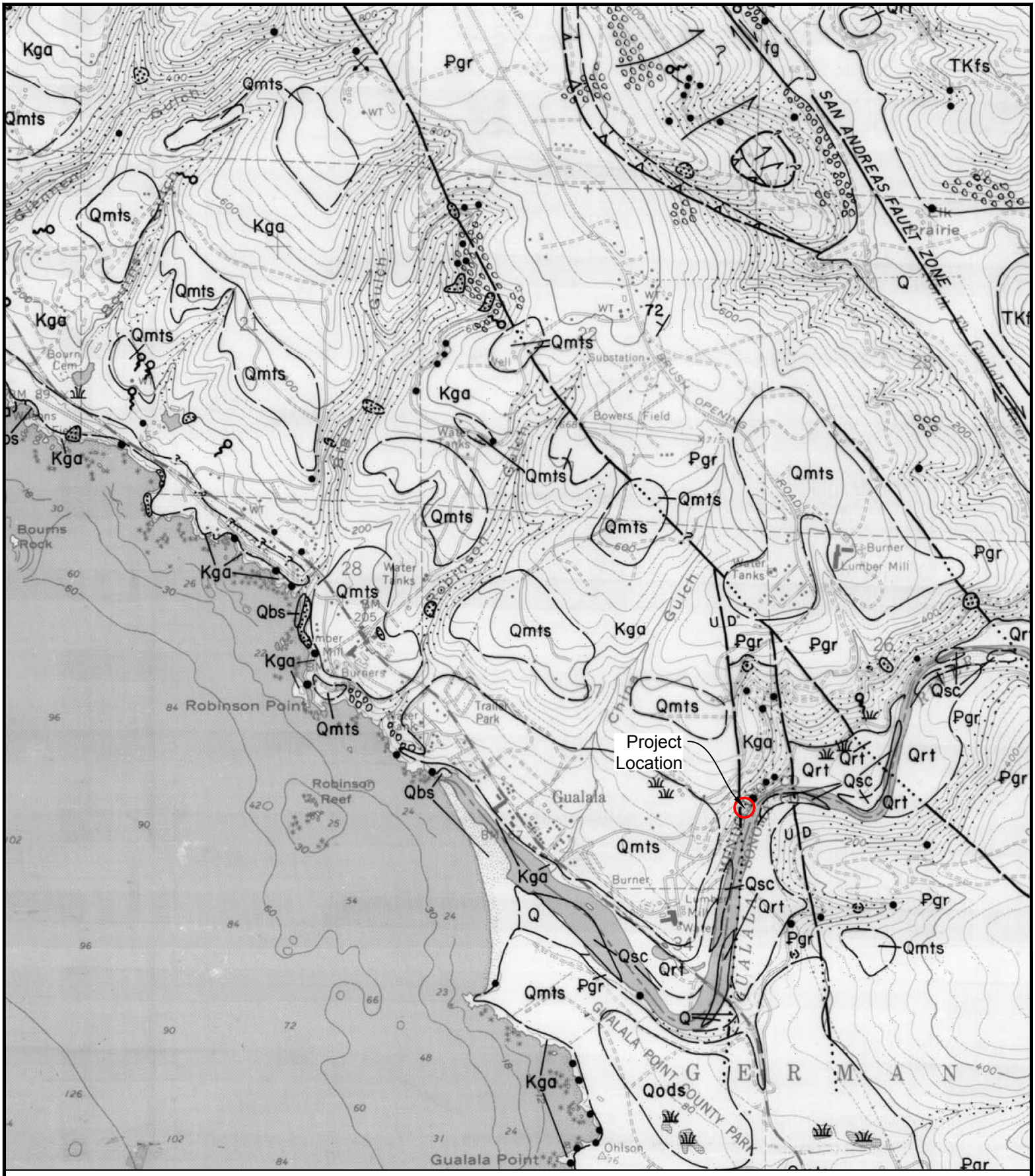
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

# GUALALA ROAD (CR 501) MP 0.33

MENDOCINO COUNTY, CA

Figure 1
Vicinity Map

| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | 1" = 2,000' |
| Date: | 05/13/21 |




SEE FIGURE 2B FOR LEGND

North

Source: Davenport, C.W.; *Geology and geomorphic features related to landsliding, Gualala 7.5' Quadrangle, Mendocino County, California*; Scale: 1:24,000; California; Division of Mines and Geology, 1984.

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

GUALALA ROAD (CR 501)
MP 0.33

MENDOCINO COUNTY, CA

Figure 2A
Geologic and Landslide Map

| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | 1" = 2,000' |
| Date: | 05/13/21 |

# EXPLANATION

TRANSLATIONAL/ROTATIONAL SLIDE: relatively cohesive slide mass with a failure plane that is deep-seated in comparison to that of a debris slide of similar areal extent; sense of motion along slide plane is linear in a translational slide and arcuate or "rotational" in a rotational slide; complex versions with rotational heads and translational movement or earthflows downslope are common; translational movement along a planar joint or bedding discontinuity may be referred to as a block glide; ↖ indicates scarp, ⟸ indicates direction of movement; solid where active, dashed where dormant, queried where uncertain.

EARTHFLOW: mass movement resulting from slow to rapid flowage of saturated soil and debris in a semiviscous, highly plastic state; after initial failure, the flow may move, or creep, seasonally in response to destabilizing forces; ↖ indicates scarp, ⟵ indicates direction of movement; dashed where dormant, queried where uncertain.

DEBRIS SLIDE: unconsolidated rock, colluvium, and soil that has moved slowly to rapidly downslope along a relatively steep (generally greater than 65 percent), shallow translational failure plane; forms steep, unvegetated scars in the head region and irregular hummocky deposits (when present) in the toe region; scars likely to ravel and remain unvegetated for many years; revegetated scars recognized by steep, even-faceted slope and light-bulb shape; includes scarp and slide deposits; solid where active, dashed where dormant.

DEBRIS FLOW/TORRENT TRACK: long stretches of bare, generally unstable stream channel banks scoured and eroded by the extremely rapid movement of water-laden debris; commonly triggered by debris sliding in the upper part of the drainage during high intensity storms; scoured debris may be deposited downslope as a tangled mass of organic material in a matrix of rock and soil; debris may be reactivated or washed away during subsequent events; solid where active, dashed where dormant, queried where uncertain.

DEBRIS SLIDE SLOPE: geomorphic feature characterized by steep (generally greater than 65 percent), usually well vegetated slopes that have been sculpted by numerous debris slide events; vegetated soils and colluvium above shallow soil/bedrock interface may be disrupted by active debris slides or bedrock exposed by former debris sliding; slopes near angle of repose may be relatively stable except where weak bedding planes and extensive bedrock joints and fractures parallel slope.

• ACTIVE SLIDE: too small to delineate at this scale.

DISRUPTED GROUND: irregular ground surface caused by complex landsliding processes resulting in features that are indistinguishable or too small to delineate individually at this scale; also may include areas affected by downslope creep, expansive soils, and/or gully erosion; boundaries usually are indistinct.

Qsc STREAM/RIVER CHANNEL DEPOSITS (Holocene): silt, sand, and gravel within active stream channel; characteristically unvegetated.

Q ALLUVIUM (Holocene): unconsolidated silt, sand, and gravel deposited by streams above active channel; characteristically vegetated; locally includes Qsc.

Qbs BEACH DEPOSITS (Holocene): primarily unconsolidated sands and gravels.

Qods OLDER DUNE SANDS (Quaternary): unconsolidated deposits of silts and fine sands; characteristically vegetated.

Qrt ALLUVIAL TERRACE DEPOSITS (Quaternary): poorly consolidated flat-lying deposits of silt, sand, and gravel elevated above present streams and rivers; includes anomolous gravel flat located between Little North Fork Gualala and South Fork Garcia Rivers.

Qmts MARINE TERRACE DEPOSITS (Quaternary): poorly to moderately consolidated deposits of marine silts, sands, and quartz-rich pea gravels forming extensive flat benches paralleling the coastline; probably much more extensive than mapped; overlain in many places by unconsolidated alluvial fan/colluvial deposits.

fg SAN ANDREAS FAULT GOUGE (Quarternary): highly sheared, chaotic, and unconsolidated mixture of various pre-Quaternary rock types bounded by active or inactive strands of the San Andreas fault system; may be more extensive than mapped; outcrops resemble colluvium.

Pgr GERMAN RANCHO FORMATION (Paleocene-Eocene): consolidated, moderately hard, coarse-grained sandstone interbedded with minor mudstone and less common conglomerate; overlain in many places by undifferentiated marine terrace sands; highly sheared and colluvial in appearance near the San Andreas fault system.

Kga ANCHOR BAY MEMBER, GUALALA FORMATION (Cretaceous): well consolidated, silicified mudstone interbedded with smaller amounts of sandstone near the coast; inland exposures consist of consolidated, moderately hard, coarse-grained micaceous sandstone; overlain in many places by undifferentiated marine terrace sands; highly sheared and colluvial in appearance near the San Andreas fault system.

TKfs COASTAL BELT FRANCISCAN (Tertiary-Cretaceous): well consolidated sandstone interbedded with smaller amounts of siltstone, mudstone, and minor conglomerate; pervasively sheared; commonly highly weathered, and tends to easily disaggregate, resulting in numerous debris slides along creeks and roads within debris slide amphitheaters/slopes.

RATES OF LANDSLIDE MOVEMENT*

| | |
|---|---|
| 10 ft/sec or more | = extremely rapid |
| 1 ft/min-10 ft/sec | = very rapid |
| 5 ft/day-1 ft/min | = rapid |
| 5 ft/mo-5 ft/day | = moderate |
| 5 ft/yr-5 ft/mo | = slow |
| 1 ft/5yr-5 ft/yr | = very slow |
| 1 ft/5yr or less | = extremely slow |

*Modified from: Varnes, D.J., 1978, Slope movement types and processes. *in* Landslides: Analysis and Control, Transportation Research Board, National Academy of Sciences, Washington, D.C., Special Report 176, Figure 2.1.

LITHOLOGIC CONTACT: dashed where approximately located, queried where uncertain.

FAULT: dashed where approximately located, dotted where concealed or inferred, queried where uncertain; U on upthrown side, D on downthrown side.

RIGHT LATERAL STRIKE-SLIP FAULT

50 STRIKE AND DIP OF BEDDING

LINEAMENT: linear feature of unknown origin observed on aerial photographs.

SPRINGS OR SEEPS

MARSH, SAG POND, OR OTHER SMALL POND

BORROW AREA

## REFERENCES


California Department of Forestry, 1981, Cal Aero Photos: Photos CDF-ALL-SR; Flight 6/16/81; Frames 4-1 to 4-5, 5-1 to 5-7, and 6-1 to 6-8; black and white, nominal scale 1:24,000.

California Division of Mines and Geology, 1976-1984, Geologic review of Timber Harvesting Plans: Unpublished field studies conducted for the California Department of Forestry.

California Division of Mines and Geology, 1974, Official map of the Special Studies Zones, Gualala 7.5-minute quadrangle: Scale 1:24,000.

Hamilton, D.H., and Jahns, R.H., 1974, Supplemental geologic investigation for the proposed Mendocino Power Plant site: Unpublished geologic report for the Pacific Gas and Electric Company, scale 1:24,000.

Wagner, D.L., and Bortugno, E.J., 1982, Geologic map of the Santa Rosa quadrangle: California Division of Mines and Geology, Regional Geologic Map Series No. 2A, scale 1:250,000.

Wentworth, C.M., Jr., 1966, The Upper Cretaceous and Lower Tertiary rocks of the Gualala area, northern Coast Ranges, California: Stanford University, unpublished Ph.D. thesis, 197 p., scale reduced from 1:24,000.

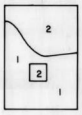
Williams, J.W., and Bedrossian, T.L., 1976, Geologic factors in Coastal Zone planning, Schooner Gulch to Gualala River, Mendocino County, California: California Division of Mines and Geology, Open File Report 76-3 SF, 36 p., 2 plates, scale 1:24,000.


## SOURCES OF GEOLOGIC DATA

Geologic data were derived from aerial photo interpretation, limited field reconnaissance, and the modification of published and unpublished geologic maps in the references listed above. The location of active strands of the right lateral San Andreas fault system are from the Special Studies Zones map (CDMG, 1974). Locations of other faults, most strikes and dips, contacts between the German Rancho and Gualala Formations, and delineated marine terraces are from Wentworth (1966). Compilation methods are after Wagner and Bortugno (1982). The author was assisted in the office by Janet Hollibaugh, Lydia Lofgren, and Charles Smith.

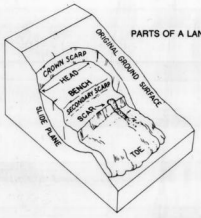
Access

1. Data compiled from aerial photo interpretation, previously existing geologic data, and reconnaissance level field work.
2. Data compiled from aerial photo interpretation and previously existing geologic data; field access not available.




Source Data

3. Geologic data compiled from Wentworth (1966).
4. Geologic data compiled from Hamilton and Jahns (1974).
5. Geologic data compiled from Wagner and Bortugno (1982).


ACTIVITY OF LANDSLIDES

Active or probably active - presently moving or recently moved. Distinct topographic slide features present, i.e., sharp barren scarps, cracks, jackstrawed trees. Major revegetation has not occurred.

Dormant - little evidence of recent movement. Slide features modified by weathering and erosion. Vegetation generally well established. Some mass movements may have developed under climatic conditions different from today. Causes of failure may remain and movement could be renewed.

SEE FIGURE 2A FOR MAP

Source: Davenport, C.W.; *Geology and geomorphic features related to landsliding, Gualala 7.5' Quadrangle, Mendocino County, California*; Scale: 1:24,000; California; Division of Mines and Geology, 1984.

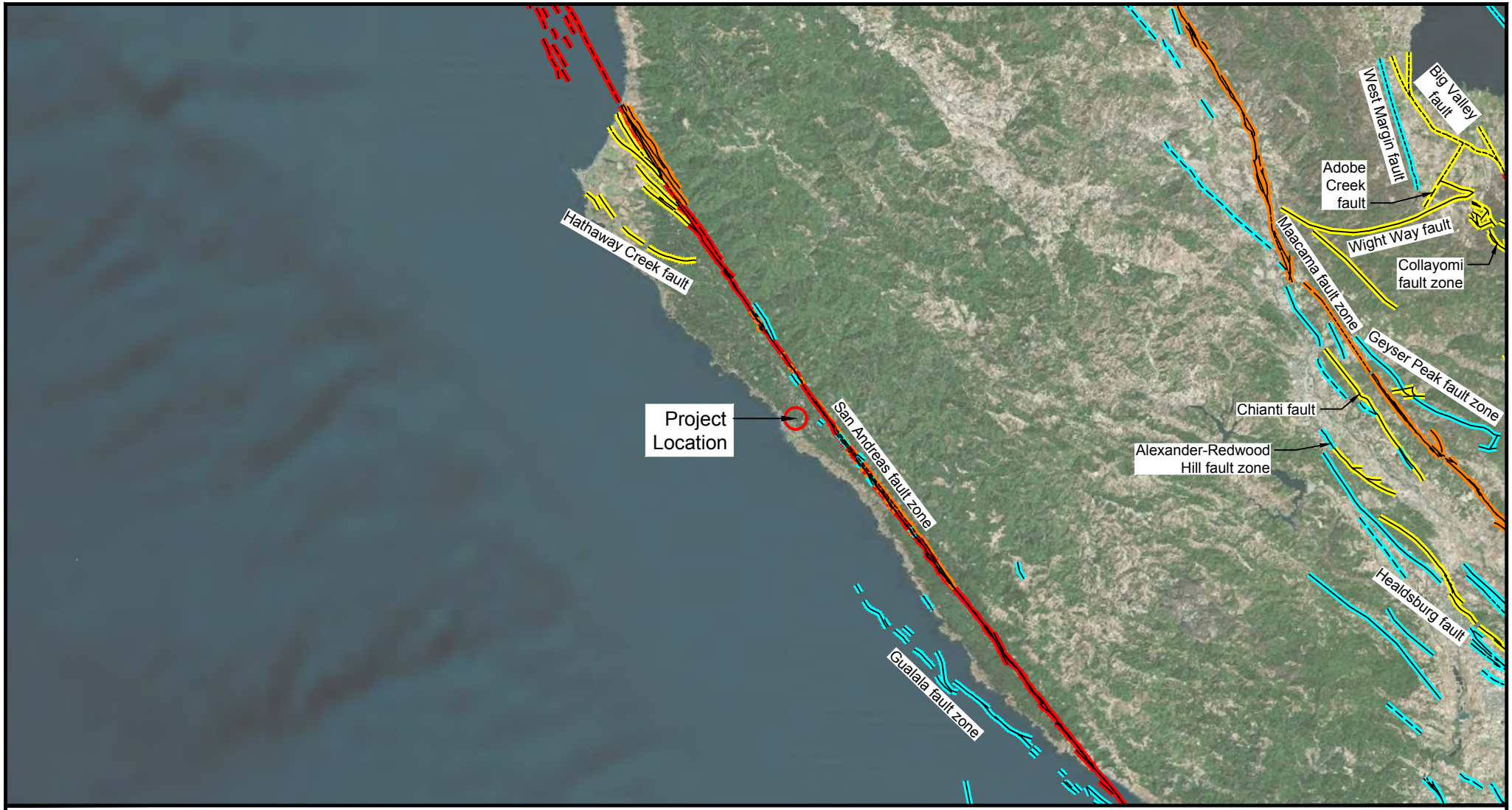

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225


GUALALA ROAD (CR 501)
MP 0.33

MENDOCINO COUNTY, CA

Figure 2B
Geologic and Landslide Map Legend

| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | N/A |
| Date: | 05/13/21 |




# LEGEND

| Quaternary Fault (Age) | Quaternary Fault (Age) | Location |
|---|---|---|
| <150 years | <750,000 years | Well Constrained |
| <15,000 years | <1.6 million years | Moderately Constrained |
| <130,000 years | | Inferred |

North

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

Fault Data: USGS GIS Data

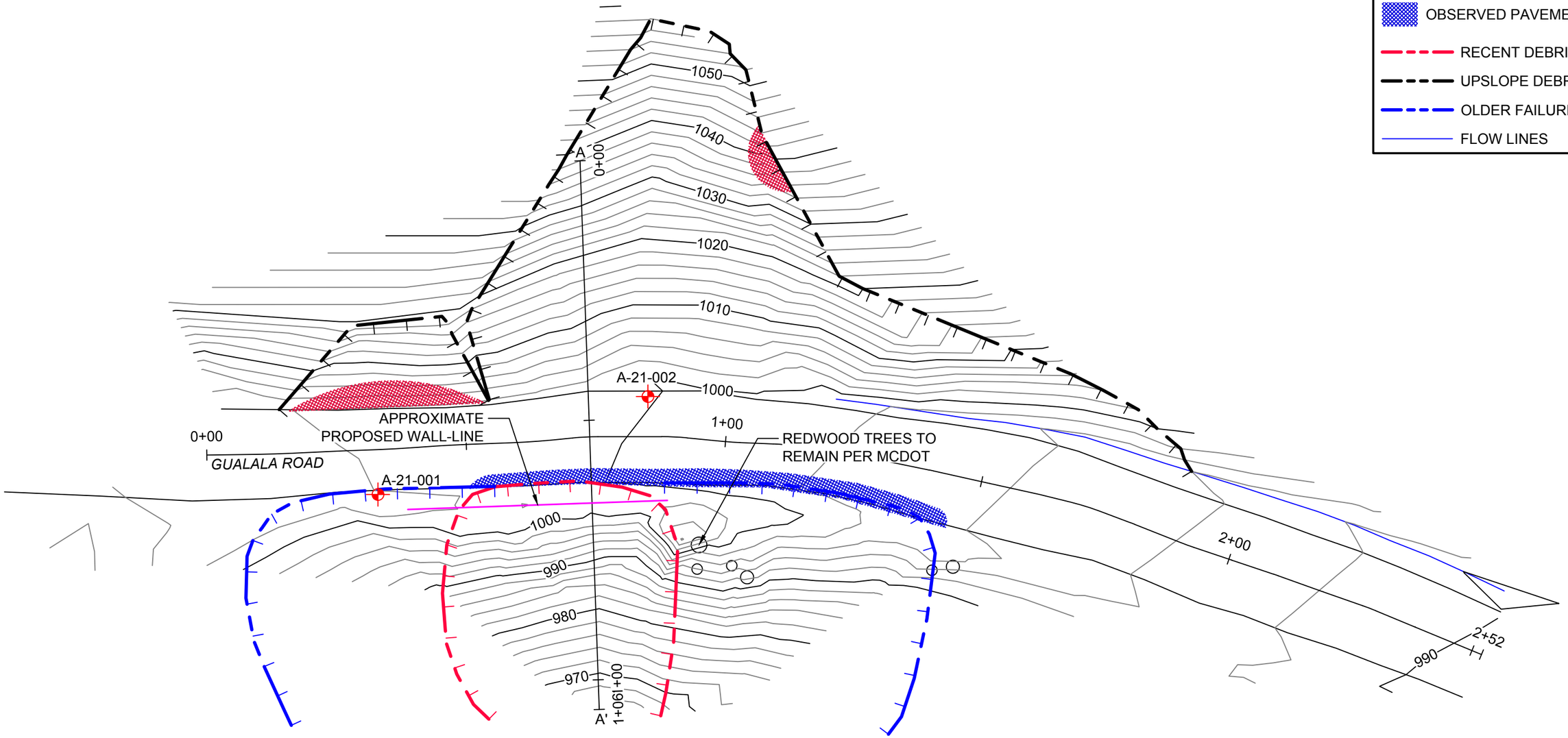
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

GUALALA ROAD (CR 501) MP 0.33

MENDOCINO COUNTY, CA

Figure 3
Fault Map

Proj. No: 19-563.2
Scale: 1" = 40,000'
Date: 05/13/21




Source:
Topographic Data: Topographic Data provided by MCDOT via electronic transfer on 02/10/21

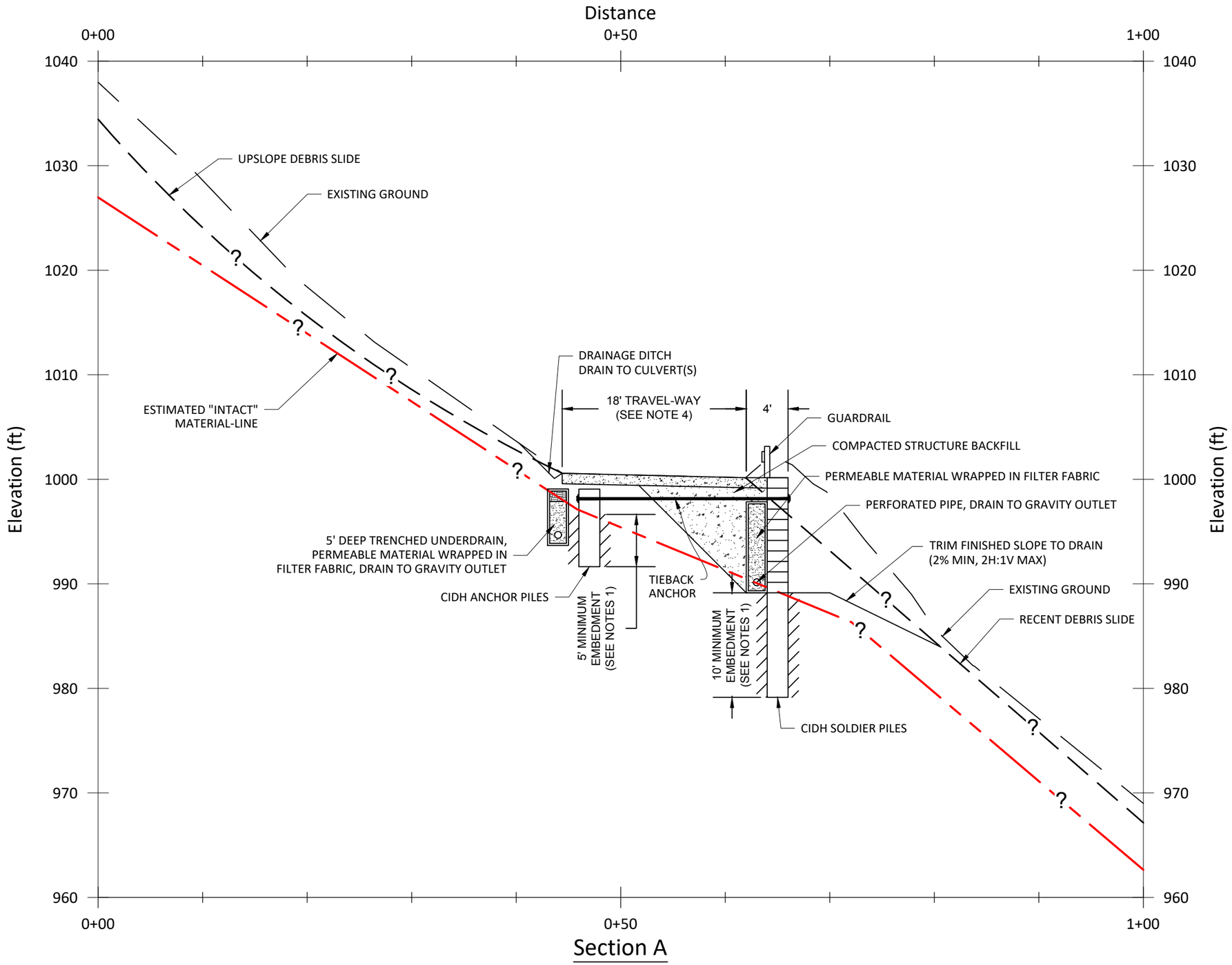
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

GUALALA ROAD (CR 501)
MP 0.33

MENDOCINO COUNTY, CA

Figure 4
Exploration Map

| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | 1" = 20' |
| Date: | 07/23/21 |




Section A

Notes:

1. Soldier/anchor pile tips should meet or exceed the minimum embedment below the "intact" material-line as shown above. The actual pile tip elevations TBD by designer.
2. Direct surface water away from the failure area with either an inboard cross-sloped road or an outboard berm.

Source:
Topographic Data: Topographic Data provided by MCDOT via electronic transfer on 02/10/21.

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

GUALALA ROAD (CR 501)
MP 0.33

MENDOCINO COUNTY, CA

Figure 5
Typical Section
Soldier Pile Wall

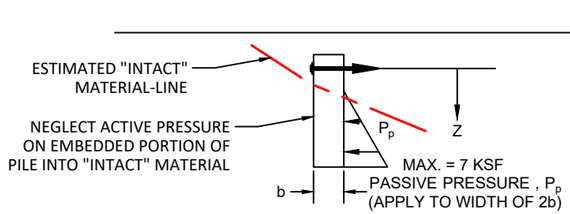
| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | 1" = 10' |
| Date: | 07/23/21 |

# EARTH PRESSURES - SOLDIER PILE WALL WITH ANCHOR PILES

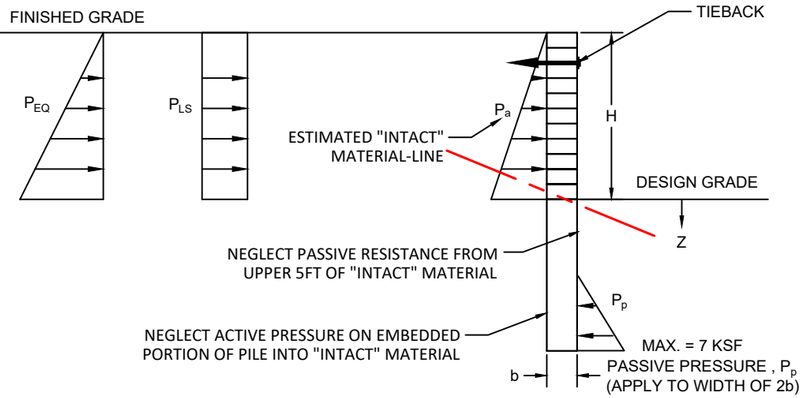
SEISMIC

TRAFFIC
LIVE LOAD
SURCHARGE

STATIC EARTH
PRESSURE




ANCHOR PILE




SOLDIER PILE WALL

EARTH PRESSURE NOTES:

1. $P_a$ = 34*H PSF, TRIANGULAR DISTRIBUTION
2. $P_p$ = 350*Z PSF, TRIANGULAR DISTRIBUTION
3. $P_{LS}$ = 0.28*(240 PSF OR DESIGN SURCHARGE), UNIFORM DISTRIBUTION
4. $P_{EQ}$ = 24*H PSF, TRIANGULAR DISTRIBUTION

Data Source:
-AASHTO LRFD Bridge Design Specification 8th Edition, 2017

- Caltrans Geotechnical Manual, 2021

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services
Taber Since 1954
1100 Corporate Way
Suite 230
Sacramento, CA 95831
(916) 455-4225

GUALALA ROAD (CR 501)
MP 0.33

MENDOCINO COUNTY, CA

Figure 6
Earth Pressures Diagram

| | |
|---|---|
| Proj. No: | 19-563.2 |
| Scale: | N/A |
| Date: | 07/23/21 |

## APPENDIX A

**BORING LOG LEGEND**
**BORING LOGS**

## GROUP SYMBOLS AND NAMES

| Graphic / Symbol | Group Names |
|---|---|
| GW | Well-graded GRAVEL<br>Well-graded GRAVEL with SAND |
| GP | Poorly graded GRAVEL<br>Poorly graded GRAVEL with SAND |
| GW-GM | Well-graded GRAVEL with SILT<br>Well-graded GRAVEL with SILT and SAND |
| GW-GC | Well-graded GRAVEL with CLAY (or SILTY CLAY)<br>Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND) |
| GP-GM | Poorly graded GRAVEL with SILT<br>Poorly graded GRAVEL with SILT and SAND |
| GP-GC | Poorly graded GRAVEL with CLAY (or SILTY CLAY)<br>Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND) |
| GM | SILTY GRAVEL<br>SILTY GRAVEL with SAND |
| GC | CLAYEY GRAVEL<br>CLAYEY GRAVEL with SAND |
| GC-GM | SILTY, CLAYEY GRAVEL<br>SILTY, CLAYEY GRAVEL with SAND |
| SW | Well-graded SAND<br>Well-graded SAND with GRAVEL |
| SP | Poorly graded SAND<br>Poorly graded SAND with GRAVEL |
| SW-SM | Well-graded SAND with SILT<br>Well-graded SAND with SILT and GRAVEL |
| SW-SC | Well-graded SAND with CLAY (or SILTY CLAY)<br>Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) |
| SP-SM | Poorly graded SAND with SILT<br>Poorly graded SAND with SILT and GRAVEL |
| SP-SC | Poorly graded SAND with CLAY (or SILTY CLAY)<br>Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) |
| SM | SILTY SAND<br>SILTY SAND with GRAVEL |
| SC | CLAYEY SAND<br>CLAYEY SAND with GRAVEL |
| SC-SM | SILTY, CLAYEY SAND<br>SILTY, CLAYEY SAND with GRAVEL |
| PT | PEAT |
| | COBBLES<br>COBBLES and BOULDERS<br>BOULDERS |

| Graphic / Symbol | Group Names |
|---|---|
| CL | Lean CLAY<br>Lean CLAY with SAND<br>Lean CLAY with GRAVEL<br>SANDY lean CLAY<br>SANDY lean CLAY with GRAVEL<br>GRAVELLY lean CLAY<br>GRAVELLY lean CLAY with SAND |
| CL-ML | SILTY CLAY<br>SILTY CLAY with SAND<br>SILTY CLAY with GRAVEL<br>SANDY SILTY CLAY<br>SANDY SILTY CLAY with GRAVEL<br>GRAVELLY SILTY CLAY<br>GRAVELLY SILTY CLAY with SAND |
| ML | SILT<br>SILT with SAND<br>SILT with GRAVEL<br>SANDY SILT<br>SANDY SILT with GRAVEL<br>GRAVELLY SILT<br>GRAVELLY SILT with SAND |
| OL | ORGANIC lean CLAY<br>ORGANIC lean CLAY with SAND<br>ORGANIC lean CLAY with GRAVEL<br>SANDY ORGANIC lean CLAY<br>SANDY ORGANIC lean CLAY with GRAVEL<br>GRAVELLY ORGANIC lean CLAY<br>GRAVELLY ORGANIC lean CLAY with SAND |
| OL | ORGANIC SILT<br>ORGANIC SILT with SAND<br>ORGANIC SILT with GRAVEL<br>SANDY ORGANIC SILT<br>SANDY ORGANIC SILT with GRAVEL<br>GRAVELLY ORGANIC SILT<br>GRAVELLY ORGANIC SILT with SAND |
| CH | Fat CLAY<br>Fat CLAY with SAND<br>Fat CLAY with GRAVEL<br>SANDY fat CLAY<br>SANDY fat CLAY with GRAVEL<br>GRAVELLY fat CLAY<br>GRAVELLY fat CLAY with SAND |
| MH | Elastic SILT<br>Elastic SILT with SAND<br>Elastic SILT with GRAVEL<br>SANDY elastic SILT<br>SANDY elastic SILT with GRAVEL<br>GRAVELLY elastic SILT<br>GRAVELLY elastic SILT with SAND |
| OH | ORGANIC fat CLAY<br>ORGANIC fat CLAY with SAND<br>ORGANIC fat CLAY with GRAVEL<br>SANDY ORGANIC fat CLAY<br>SANDY ORGANIC fat CLAY with GRAVEL<br>GRAVELLY ORGANIC fat CLAY<br>GRAVELLY ORGANIC fat CLAY with SAND |
| OH | ORGANIC elastic SILT<br>ORGANIC elastic SILT with SAND<br>ORGANIC elastic SILT with GRAVEL<br>SANDY elastic ELASTIC SILT<br>SANDY ORGANIC elastic SILT with GRAVEL<br>GRAVELLY ORGANIC elastic SILT<br>GRAVELLY ORGANIC elastic SILT with SAND |
| OL/OH | ORGANIC SOIL<br>ORGANIC SOIL with SAND<br>ORGANIC SOIL with GRAVEL<br>SANDY ORGANIC SOIL<br>SANDY ORGANIC SOIL with GRAVEL<br>GRAVELLY ORGANIC SOIL<br>GRAVELLY ORGANIC SOIL with SAND |

## FIELD AND LABORATORY TESTS

| | |
|---|---|
| **C** | Consolidation |
| **CL** | Collapse Potential |
| **CP** | Compaction Curve |
| **CR** | Corrosion, Sulfates, Chlorides |
| **CU** | Consolidated Undrained Triaxial |
| **DR** | Drained Residual Shear Strength |
| **DS** | Direct Shear |
| **EI** | Expansion Index |
| **M** | Moisture Content |
| **OC** | Organic Content |
| **P** | Permeability |
| **PA** | Particle Size Analysis |
| **PI** | Liquid Limit, Plastic Limit, Plasticity Index |
| **PL** | Point Load Index |
| **PM** | Pressure Meter |
| **PP** | Pocket Penetrometer |
| **R** | R-Value |
| **SE** | Sand Equivalent |
| **SG** | Specific Gravity |
| **SW** | Swell Potential |
| **TV** | Pocket Torvane |
| **UC** | Unconfined Compression - Soil<br>Unconfined Compression - Rock |
| **UU** | Unconsolidated Undrained Triaxial |
| **UW** | Unit Weight |

## SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler (ID 2.0 in.)
- Modified California Sampler (ID 2.5 in.)
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

## DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

## WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

**REFERENCE:** Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010) with Errata Sheet (2015).

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

# Boring Record Legend

Soil Legend

| CONSISTENCY OF COHESIVE SOILS | | | | |
|---|---|---|---|---|
| **Descriptor** | **Unconfined Compressive Strength (tsf)** | **Pocket Penetrometer (tsf)** | **Torvane (tsf)** | **Field Approximation** |
| Very Soft | < 0.25 | < 0.25 | < 0.12 | Easily penetrated several inches by fist |
| Soft | 0.25 - 0.50 | 0.25 - 0.50 | 0.12 - 0.25 | Easily penetrated several inches by thumb |
| Medium Stiff | 0.50 - 1.0 | 0.50 - 1.0 | 0.25 - 0.50 | Can be penetrated several inches by thumb with moderate effort |
| Stiff | 1.0 - 2.0 | 1.0 - 2.0 | 0.50 - 1.0 | Readily indented by thumb but penetrated only with great effort |
| Very Stiff | 2.0 - 4.0 | 2.0 - 4.0 | 1.0 - 2.0 | Readily indented by thumbnail |
| Hard | > 4.0 | > 4.0 | > 2.0 | Indented by thumbnail with difficulty |

| APPARENT DENSITY OF COHESIONLESS SOILS | |
|---|---|
| **Descriptor** | **SPT $N_{60}$ (blows / 12 inches)** |
| Very Loose | 0 - 5 |
| Loose | 5 - 10 |
| Medium Dense | 10 - 30 |
| Dense | 30 - 50 |
| Very Dense | > 50 |

| MOISTURE | |
|---|---|
| **Descriptor** | **Criteria** |
| Dry | No discernable moisture |
| Moist | Moisture present, but no free water |
| Wet | Visible free water |

| PERCENT OR PROPORTION OF SOILS | |
|---|---|
| **Descriptor** | **Criteria** |
| Trace | Particles are present but estimated to be less than 5% |
| Few | 5 to 10% |
| Little | 15 to 25% |
| Some | 30 to 45% |
| Mostly | 50 to 100% |

| SOIL PARTICLE SIZE | | |
|---|---|---|
| **Descriptor** | | **Size** |
| Boulder | | > 12 inches |
| Cobble | | 3 to 12 inches |
| Gravel | Coarse | 3/4 inch to 3 inches |
| | Fine | No. 4 Sieve to 3/4 inch |
| Sand | Coarse | No. 10 Sieve to No. 4 Sieve |
| | Medium | No. 40 Sieve to No. 10 Sieve |
| | Fine | No. 200 Sieve to No. 40 Sieve |
| Silt and Clay | | Passing No. 200 Sieve |

| PLASTICITY OF FINE-GRAINED SOILS | |
|---|---|
| **Descriptor** | **Criteria** |
| Nonplastic | A 1/8-inch thread cannot be rolled at any water content. |
| Low | The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit. |
| Medium | The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit. |
| High | It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. |

| CEMENTATION | |
|---|---|
| **Descriptor** | **Criteria** |
| Weak | Crumbles or breaks with handling or little finger pressure. |
| Moderate | Crumbles or breaks with considerable finger pressure. |
| Strong | Will not crumble or break with finger pressure. |

**REFERENCE:** Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

## ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

## BEDDING SPACING

| Descriptor | Thickness or Spacing |
|---|---|
| Massive | > 10 ft |
| Very thickly bedded | 3 ft - 10 ft |
| Thickly bedded | 1 ft - 3 ft |
| Moderately bedded | 4 in - 1 ft |
| Thinly bedded | 1 in - 4 in |
| Very thinly bedded | 1/4 in - 1 in |
| Laminated | < 1/4 in |

## WEATHERING DESCRIPTORS FOR INTACT ROCK

| | Diagnostic Features | | | | | |
|---|---|---|---|---|---|---|
| | Chemical Weathering-Discoloration-Oxidation | | Mechanical Weathering and Grain Boundary Conditions | Texture and Solutioning | | |
| Descriptor | Body of Rock | Fracture Surfaces | | Texture | Solutioning | General Characteristics |
| Fresh | No discoloration, not oxidized | No discoloration or oxidation | No separation, intact (tight) | No change | No solutioning | Hammer rings when crystalline rocks are struck. |
| Slightly Weathered | Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull | Minor to complete discoloration or oxidation of most surfaces | No visible separation, intact (tight) | Preserved | Minor leaching of some soluble minerals may be noted | Hammer rings when crystalline rocks are struck. Body of rock not weakened. |
| Moderately Weathered | Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy" | All fracture surfaces are discolored or oxidized | Partial separation of boundaries visible | Generally preserved | Soluble minerals may be mostly leached | Hammer does not ring when rock is struck. Body of rock is slightly weakened. |
| Intensely Weathered | Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions) | All fracture surfaces are discolored or oxidized; surfaces are friable | Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated | Altered by chemical disintegration such as via hydration or argillation | Leaching of soluble minerals may be complete | Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened. |
| Decomposed | Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay | | Complete separation of grain boundaries (disaggregated) | Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete | | Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes". |

**Note**: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

## PERCENT CORE RECOVERY (REC)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

## ROCK QUALITY DESIGNATION (RQD)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

**Note:** RQD* indicates soundness criteria not met

## ROCK HARDNESS

| Descriptor | Criteria |
|---|---|
| Extremely Hard | Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows |
| Very hard | Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows |
| Hard | Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen |
| Moderately Hard | Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows |
| Moderately Soft | Specimen can be grooved 1/16 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure |
| Soft | Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure |
| Very Soft | Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light manual pressure. |

## FRACTURE DENSITY

| Descriptor | Criteria |
|---|---|
| Unfractured | No fractures |
| Very Slightly Fractured | Core lengths greater than 3 ft. |
| Slightly Fractured | Core lengths mostly from 1 ft. to 3 ft. |
| Moderately Fractured | Core lengths mostly from 4 in. to 1 ft. |
| Intensely Fractured | Core lengths mostly from 1 in. to 4 in. |
| Very Intensely Fractured | Mostly chips and fragments. |

**REFERENCE:** Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

# Boring Record Legend

Rock Legend

# LOG OF BORING A-21-001

PROJECT NO: 19-563.2
PROJECT: Gualala Road (CR 501) at PM 0.33
LOCATION: Gualala, CA
COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: AC
DEPTH OF BORING: 30.1 (ft)

BEGIN DATE: 03/25/2021
COMPLETION DATE: 03/25/2021
SURFACE ELEVATION: 1002.3 (ft)
SURFACE CONDITION: Paved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 80.4 (%)

DRILLING CONTRACTOR: Clear Heart Drilling
DRILLING METHOD: Solid-Stem
DRILL RIG: DR8K (track)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 (in)
BACKFILL METHOD: Neat Cement Grout

| ELEVATION (ft) | DEPTH (ft) | SAMPLE | SAMPLE NO | BLOWS PER 6 IN. | BLOWS PER FOOT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION | RECOVERY(%) | RQD (%) | LABORATORY: PLASTIC LIMIT | LIQUID LIMIT | MOISTURE (%) | D. DENSITY (PCF) | % PASSING 200 SIEVE | DRILL METHOD | CASING DEPTH | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1002 | 0 | | Bulk 1 | | | | | ASPHALT CONCRETE(3") | 100 | | | | | | | | | |
| 1001 | 1 | | | | | | | SANDY lean CLAY (CL); brown; moist; mostly medium plasticity fines; some medium to fine SAND; trace GRAVEL. (Fill) | | | | | | | | | | |
| 1000 | 2 | | | | | | | | | | | | | | 52 | | | |
| 999 | 3 | | 1 | 6<br>8<br>12 | 20 | | | | 89 | | 22 | 44 | 14.9 | 89.1 | | | | Sample loose in MCAL, could not PP or TV. |
| 998 | 4 | | | | | | | | | | | | | | | | | |
| 997 | 5 | | 2 | 18<br>29<br>24 | 53 | | | CLAYEY SAND (SC); dense; tan and brown; dry to moist; some fine SAND; mostly fine SAND; some fines. (Fill) | 83 | | | | 8.8<br>10.8 | 101.6<br>116.9 | 44 | | | CR @ 5.5'<br>Soil pH: 4.92<br>Min. Resistivity: 4,280 ohm-cm<br>Chloride: 15.5 ppm<br>Sulfate: 1.5 ppm |
| 996 | 6 | | | | | | | | | | | | | | | | | |
| 995 | 7 | | | | | | | SEDIMENTARY ROCK (Sandstone interbedded with Claystone); brown; soft to moderately soft; decomposed to intensely weathered; (CLAYEY SAND (SC); very dense; dry to moist; mostly coarse to fine SAND; some fines; few GRAVEL). | | | | | | | | | | |
| 994 | 8 | | 3 | 20<br>33<br>43 | 76 | | | | 67 | | | | | | | | | |
| 993 | 9 | | | | | | | | | | | | | | | | | |
| 992 | 10 | | 4 | 28<br>40<br>50 | 90 | | | | 83 | | | | | | | | | |
| 991 | 11 | | | | | | | | | | | | | | | | | |
| 990 | 12 | | | | | | | | | | | | | | | | | Drill rig shaking. |
| 989 | 13 | | | | | | | | | | | | | | | | | |
| 988 | 14 | | | | | | | | | | | | | | | | | |
| 987 | 15 | | 5 | 11<br>15<br>12 | 27 | | | | 67 | | | | | | | | | |
| 986 | 16 | | | | | | | | | | | | 11.5 | | 33 | | | |
| 985 | 17 | | | | | | | | | | | | | | | | | Soft layer |
| 984 | 18 | | | | | | | | | | | | | | | | | |
| 983 | 19 | | | | | | | | | | | | | | | | | |
| 982 | 20 | | 6 | 6<br>9<br>29 | 38 | | | | 94 | | | | | | | | | |
| 981 | 21 | | | | | | | | | | | | 11.4 | 113.9 | | | | |
| 980 | 22 | | | | | | | | | | | | | | | | | |
| 979 | 23 | | | | | | | | | | | | | | | | | |
| 978 | 24 | | | | | | | | | | | | | | | | | |
| 977 | 25 | | 7 | 50/1 | 50/1 | | | gray | 100 | | | | | | | | | Drill chatter |
| 976 | 26 | | | | | | | | | | | | | | | | | |
| 975 | 27 | | | | | | | | | | | | | | | | | |
| 974 | 28 | | | | | | | | | | | | | | | | | |
| 973 | 29 | | | | | | | | | | | | | | | | | Auger bit scraping loudly. |
| 972 | 30 | | 8 | 50/1 | 50/1 | | | Sample and auger refusal<br>Bottom of borehole at 30.1 ft bgs | 100 | | | | | | | | | |
| 971 | 31 | | | | | | | | | | | | | | | | | |
| 970 | 32 | | | | | | | | | | | | | | | | | |


Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831
(916) 455-4225


PROJECT NO: 19-563.2
PROJECT: Gualala Road (CR 501) at PM 0.33
BORING: A-21-001
ENTRY BY: YYG
CHECKED BY: AC

# LOG OF BORING A-21-002

PROJECT NO: 19-563.2
PROJECT: Gualala Road (CR 501) at PM 0.33
LOCATION: Gualala, CA
COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: AC
DEPTH OF BORING: 35.0 (ft)

BEGIN DATE: 03/25/2021
COMPLETION DATE: 03/25/2021
SURFACE ELEVATION: 1000.1 (ft)
SURFACE CONDITION: Paved
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 80.4 (%)

DRILLING CONTRACTOR: Clear Heart Drilling
DRILLING METHOD: Solid-Stem
DRILL RIG: DR8K (track)
HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
BOREHOLE DIAMETER: 4.5 (in)
BACKFILL METHOD: Neat Cement Grout

| ELEVATION (ft) | DEPTH (ft) | SAMPLE | SAMPLE NO | BLOWS PER 6 IN. | BLOWS PER FOOT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION | RECOVERY(%) | RQD (%) | LABORATORY: PLASTIC LIMIT | LIQUID LIMIT | MOISTURE (%) | D. DENSITY (PCF) | % PASSING 200 SIEVE | DRILL METHOD | CASING DEPTH | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 999 | 1 | | Bulk 1 | | | | | ASPHALT CONCRETE(3") | 100 | | | | | | | | | |
| 998 | 2 | | | | | | | SANDY lean CLAY (CL); brown; dry to moist; mostly medium plasticity fines; some fine SAND; few GRAVEL. (Fill) | | | 20 | 33 | | | 57 | | | |
| 997 | 3 | | 1 | 18<br>50/5 | 50/5 | | | SEDIMENTARY ROCK (Sandstone interbedded with Claystone); reddish brown; soft to moderately soft; decomposed to intensely weathered; (CLAYEY SAND (SC); very dense; dry to moist; mostly coarse to fine SAND; some fines; few GRAVEL). | 100 | | | | 12.6 | 117.0 | 26 | | | Auger scraping |
| 996 | 4 | | | | | | | | | | | | | | | | | |
| 995 | 5 | | 2 | 16<br>31<br>46 | 77 | | | | 67 | | | | | | | | | |
| 994 | 6 | | | | | | | | | | | | | | | | | |
| 993 | 7 | | | | | | | | | | | | | | | | | |
| 992 | 8 | | | | | | | | | | | | | | | | | |
| 991 | 9 | | | | | | | | | | | | | | | | | |
| 990 | 10 | | 3 | 13<br>50/5 | 50/5 | | | | 100 | | | | 14.3 | 104.0 | | | | |
| 989 | 11 | | | | | | | | | | | | | | | | | |
| 988 | 12 | | | | | | | | | | | | | | | | | |
| 987 | 13 | | | | | | | | | | | | | | | | | |
| 986 | 14 | | | | | | | | | | | | | | | | | |
| 985 | 15 | | 4 | 12<br>13<br>30 | 43 | | | | 89 | | | | | | | | | |
| 984 | 16 | | | | | | | | | | | | 11.0 | 107.8 | | | | CR @ 15.5'<br>Soil pH: 6.00<br>Min. Resistvity: 2,950 ohm-cm<br>Chloride: 3.3 ppm<br>Sulfate: 2.1 ppm |
| 983 | 17 | | | | | | | | | | | | | | | | | |
| 982 | 18 | | | | | | | | | | | | | | | | | |
| 981 | 19 | | | | | | | | | | | | | | | | | |
| 980 | 20 | | 5 | 50 | 50/6 | | | brownish gray | 100 | | | | 5.7 | | | | | |
| 979 | 21 | | | | | | | | | | | | | | | | | |
| 978 | 22 | | | | | | | | | | | | | | | | | Auger bit scraping |
| 977 | 23 | | | | | | | | | | | | | | | | | |
| 976 | 24 | | | | | | | | | | | | | | | | | |
| 975 | 25 | | 6 | 50 | 50/6 | | | | 100 | | | | | | | | | |
| 974 | 26 | | | | | | | | | | | | | | | | | |
| 973 | 27 | | | | | | | | | | | | | | | | | |
| 972 | 28 | | | | | | | | | | | | | | | | | |
| 971 | 29 | | | | | | | | | | | | | | | | | |
| 970 | 30 | | 7 | 50/1 | 50/1 | | | | 100 | | | | | | | | | |
| 969 | 31 | | | | | | | | | | | | | | | | | |
| 968 | 32 | | | | | | | | | | | | | | | | | |
| 967 | 33 | | | | | | | | | | | | | | | | | |
| 966 | 34 | | | | | | | | | | | | | | | | | Auger refusal grind down to 35 ft |
| 965 | 35 | | 8 | 50/1 | 50/0 | | | Bottom of borehole at 35.0 ft bgs | 0 | | | | | | | | | |


Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831
(916) 455-4225


PROJECT NO: 19-563.2
PROJECT: Gualala Road (CR 501) at PM 0.33
BORING: A-21-002
ENTRY BY: YYG
CHECKED BY: AC

# APPENDIX B

## LABORATORY AND FIELD TEST RESULTS SUMMARY

Project Name: **Gualala Road MP 0.33**
Project No: **19-563.2**
Date: **07/23/2021**

Crawford & Associates, Inc. Geotechnical Engineering, Design and Construction Services | Taber Since 1954
Sacramento | Modesto | Pleasanton | Rocklin | Ukiah

## Laboratory and Field Test Results Summary

| | Boring I.D. | Sample I.D. | Sample Type (inch) | Sampled Depth (ft) | Retained Sample Depth (ft) | USCS | Field Blows N (bpf) | SPT Blows $N_{60}$ (bpf) | Moisture/Density | | | Classification | | | | | | Chemical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dry Density (pcf) | Moist. Content (%) | In-Situ Density (pcf) | Atterberg Limits | | | Gravel (%) | Sand (%) | Fines (%) | pH | Minimum Resistivity (ohm-cm) | Chloride Content (ppm) | Sulfate Content (ppm) |
| | | | | | | | | | | | | Liquid Limit | Plastic Limit | Plasticity Index | | | | | | | |
| Gualala Road MP 0.33 | A-20-001 | BULK 1 | BULK | 0.0 - 2.5 | 0.0 - 2.5 | CL | - | - | | | | | | | | | 52 | | | | |
| | A-20-001 | 1B | CAL (2.5) | 2.5 - 4.0 | 3.0 - 3.5 | CL | 20 | 17 | | | | | | | | | | | | | |
| | A-20-001 | 1A | | | 3.5 - 4.0 | CL | | | 89.1 | 14.9 | 102.4 | 44 | 24 | | | | | | | | |
| | A-20-001 | 2B | CAL (2.5) | 5.0 - 6.5 | 5.5 - 6.0 | SC | 53 | 46 | 101.6 | 8.8 | 110.5 | | | | | | | 4.92 | 4,280 | 15.5 | 1.5 |
| | A-20-001 | 2A | | | 6.0 - 6.5 | Sandstone | | | 116.9 | 10.8 | 129.5 | | | | | | 44 | | | | |
| | A-20-001 | 3B | CAL (2.5) | 7.5 - 9.0 | 8.0 - 8.5 | Sandstone | 76 | 66 | | | | | | | | | | | | | |
| | A-20-001 | 3A | | | 8.5 - 9.0 | Sandstone | | | | | | | | | | | | | | | |
| | A-20-001 | 4B | CAL (2.5) | 10.0 - 11.5 | 10.5 - 11.0 | Sandstone | 90 | 79 | | | | | | | | | | | | | |
| | A-20-001 | 4A | | | 11.0 - 11.5 | Sandstone | | | | | | | | | | | | | | | |
| | A-20-001 | 5B | SPT (1.4) | 15.0 - 16.5 | 15.5 - 16.0 | Sandstone | 27 | 36 | | | | | | | | | | | | | |
| | A-20-001 | 5A | | | 16.0 - 16.5 | Sandstone | | | | 11.5 | | | | | | | 33 | | | | |
| | A-20-001 | 6B | SPT (1.4) | 20.0 - 21.5 | 20.5 - 21.0 | Sandstone | 38 | 51 | | | | | | | | | | | | | |
| | A-20-001 | 6A | | | 21.0 - 21.5 | Sandstone | | | 113.9 | 11.4 | 126.9 | | | | | | | | | | |
| | A-20-001 | 7A | SPT (1.4) | 25.0 - 25.1 | 25.0 - 25.1 | Sandstone | 50/1" | - | | | | | | | | | | | | | |
| | A-20-001 | 8A | SPT (1.4) | 30.0 - 30.1 | 30.0 - 30.1 | Sandstone | 50/1" | - | | | | | | | | | | | | | |
| | A-20-002 | BULK 1 | BULK | 0.0 - 2.5 | 0.0 - 2.5 | CL | - | - | | | | 33 | 20 | 13 | 7 | 36 | 57 | | | | |
| | A-20-002 | 1B | CAL (2.5) | 2.5 - 4.0 | 2.5 - 3.0 | CL | 50/5" | - | | | | | | | | | | | | | |
| | A-20-002 | 1A | | | 3.0 - 3.5 | Sandstone | | | 117.0 | 12.6 | 131.7 | | | | | | 26 | | | | |
| | A-20-002 | 2A | SPT (1.4) | 5.0 - 6.5 | 5.5 - 6.0 | Sandstone | 77 | 103 | | | | | | | | | | | | | |
| | A-20-002 | 2B | | | 6.0 - 6.5 | Sandstone | | | | | | | | | | | | | | | |
| | A-20-002 | 3A | SPT (1.4) | 10.0 - 11.0 | 10.0 - 10.5 | Sandstone | 50/5" | - | | | | | | | | | | | | | |
| | A-20-002 | 3B | | | 10.5 - 11.0 | Sandstone | | | 104.0 | 14.3 | 118.9 | | | | | | | | | | |
| | A-20-002 | 4B | SPT (1.4) | 15.0 - 16.5 | 15.5 - 16.0 | Sandstone | 43 | 58 | | | | | | | | | | 6.00 | 2,900 | 3.3 | 2.1 |
| | A-20-002 | 4A | | | 16.0 - 16.5 | Sandstone | | | 107.8 | 11.0 | 119.7 | | | | | | | | | | |
| | A-20-002 | 5A | SPT (1.4) | 20.0 - 20.5 | 20.0 - 20.5 | Sandstone | 50/6" | - | | 5.7 | | | | | | | | | | | |
| | A-20-002 | 6A | SPT (1.4) | 25.0 - 25.5 | 25.0 - 25.5 | Sandstone | 50/6" | - | | | | | | | | | | | | | |
| | A-20-002 | 7A | SPT (1.4) | 30.0 - 30.1 | 30.0 - 30.1 | Sandstone | 50/1" | - | | | | | | | | | | | | | |
| | A-20-002 | 8A | SPT (1.4) | 35.0 - 35.0 | N/A | Sandstone | 50/0" | - | | | | | | | | | | | | | |

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Gualala Rd. MP 0.33
CAInc File No: 19-563.2
Date: 4/28/21
Technician: YYG

## MOISTURE-DENSITY TESTS - D2216/D7263

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Sample No. | A-21-001-1A | A-21-001-2B | A-21-001-2A | A-21-001-5A | A-21-001-6A |
| USCS Symbol | CL | SC | RX | RX | RX |
| Depth (ft.) | 3.5 | 5.5 | 6 | 16 | 21 |
| Sample Length (in.) | 4.819 | 5.633 | 5.978 | - | 5.728 |
| Diameter (in.) | 2.403 | 2.386 | 2.386 | - | 1.409 |
| Sample Volume ($ft^3$) | 0.01265 | 0.01458 | 0.01547 | - | 0.00517 |
| Total Mass Soil+Tube (g) | 873.4 | 1009.8 | 1181.8 | - | 430.8 |
| Mass of Tube (g) | 286.1 | 279.4 | 273.4 | - | 133.2 |
| Tare No. | 113 | A13 | 2019 | H10 | D19 |
| Tare (g) | 14.1 | 13.8 | 124.4 | 13.3 | 13.7 |
| Wet Soil + Tare (g) | 77.5 | 94.0 | 521.5 | 76.6 | 82.0 |
| Dry Soil + Tare (g) | 69.3 | 87.6 | 482.9 | 70.1 | 75.0 |
| Dry Soil (g) | 55.1 | 73.8 | 358.5 | 56.8 | 61.3 |
| Water (g) | 8.2 | 6.5 | 38.6 | 6.6 | 7.0 |
| **Moisture (%)** | **14.9** | **8.8** | **10.8** | **11.5** | **11.4** |
| **Dry Density (pcf)** | **89.1** | **101.6** | **116.9** | **-** | **113.9** |

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Gualala Rd. MP 0.33
CAInc File No: 19-563.2
Date: 4/28/21
Technician: YYG

## MOISTURE-DENSITY TESTS - D2216/D7263

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Sample No. | A-21-002-1A | A-21-002-3A | A-21-002-4A | A-21-002-5A | |
| USCS Symbol | RX | RX | RX | RX | |
| Depth (ft.) | 3 | 10.5 | 16 | 20 | |
| Sample Length (in.) | 5.423 | 4.894 | 5.760 | - | |
| Diameter (in.) | 2.372 | 1.414 | 1.418 | - | |
| Sample Volume ($ft^3$) | 0.01387 | 0.00445 | 0.00526 | - | |
| Total Mass Soil+Tube (g) | 828.3 | 357.0 | 407.1 | - | |
| Mass of Tube (g) | 0.0 | 117.3 | 121.3 | - | |
| Tare No. | H3 | G18 | E7 | 2003 | |
| Tare (g) | 13.4 | 13.7 | 13.8 | 123.1 | |
| Wet Soil + Tare (g) | 84.0 | 74.4 | 80.1 | 366.1 | |
| Dry Soil + Tare (g) | 76.2 | 66.8 | 73.5 | 353.1 | |
| Dry Soil (g) | 62.8 | 53.2 | 59.7 | 230.0 | |
| Water (g) | 7.9 | 7.6 | 6.6 | 13.0 | |
| **Moisture (%)** | **12.6** | **14.3** | **11.0** | **5.7** | |
| **Dry Density (pcf)** | **117.0** | **104.0** | **107.8** | **-** | |

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Gualala Rd. MP 0.33
CAInc File No: 19-563.2
Date: 4/28/21
Technician: YYG

**200 Wash - ASTM D1140**
Method A

| Max Particle Size (100% Passing) | Standard Sieve Size | Recommended Min Mass of Test Specimens |
|---|---|---|
| 2 mm or less | No. 10 | 20 g |
| 4.75 mm | No. 4 | 100 g |
| 9.5 mm | 3/8 " | 500 g |
| 19.0 mm | 3/4 " | 2.5 kg |
| 37.5 mm | 1 1/2 " | 10 kg |
| 75.0 mm | 3 " | 50 kg |

Table from 6.2 of ASTM D1140

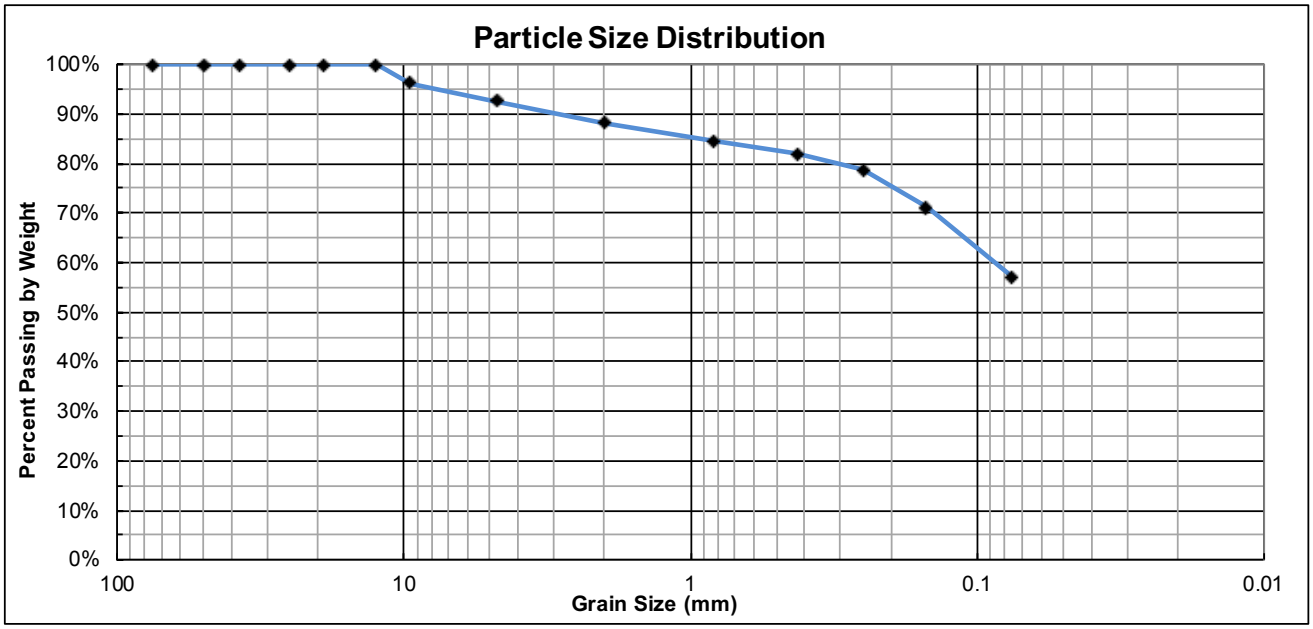
| Sample No. | A-21-001-BULK-1 | A-21-001-2A | A-21-001-5A | A-21-002-1A | |
|---|---|---|---|---|---|
| USCS Symbol | CL | RX | RX | RX | |
| Depth (ft.) | 0-5 | 6 | 16 | 3 | |
| Tare No. | 2001 | 2019 | 1011 | R5 | |
| Tare (g) | 125.8 | 124.4 | 127.2 | 126.1 | |
| Dry Soil + Tare (g) | 415.3 | 482.9 | 314.9 | 443.8 | |
| Dry Mass before (g) | 289.5 | 358.5 | 187.7 | 317.7 | |
| Dry Mass after (g) | 138.3 | 200.2 | 126.5 | 233.9 | |
| Percent Fines (%) | 52 | 44 | 33 | 26 | |

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Gualala Rd. MP
CAInc File No: 0.33 19-563.2
Date: 4/27/21
Technician: CAP
Sample ID: A-21-002-BULK 1
Depth (ft): 0-2.5
USCS Classification: Sandy Lean Clay (CL)

**ASTM 6913 - Method A**




| % Cobble | % Gravel | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt/Clay |
| | 0 | 7 | 5 | 6 | 25 | |
| **0** | **7** | | **36** | | | **57** |

| | | Sieve # | Opening mm | Cummulative Mass Retained (g) | % Passing % |
|---|---|---|---|---|---|
| Cobbles | | **3"** | 75 | 0.0 | 100% |
| Gravel | Coarse | **2"** | 50 | 0.0 | 100% |
| | | **1-1/2"** | 37.5 | 0.0 | 100% |
| | | **1"** | 25.0 | 0.0 | 100% |
| | | **3/4"** | 19.0 | 0.0 | 100% |
| | Fine | **1/2"** | 12.5 | 0.0 | 100% |
| | | **3/8"** | 9.50 | 13.6 | 96% |
| | | **#4** | 4.75 | 27.0 | 93% |
| Sand | Coarse | **#10** | 2.00 | 43.0 | 88% |
| | Medium | **#20** | 0.825 | 56.4 | 84% |
| | | **#40** | 0.425 | 65.4 | 82% |
| | Fine | **#60** | 0.250 | 77.2 | 79% |
| | | **#100** | 0.150 | 104.7 | 71% |
| | | **#200** | 0.075 | 155.8 | 57% |

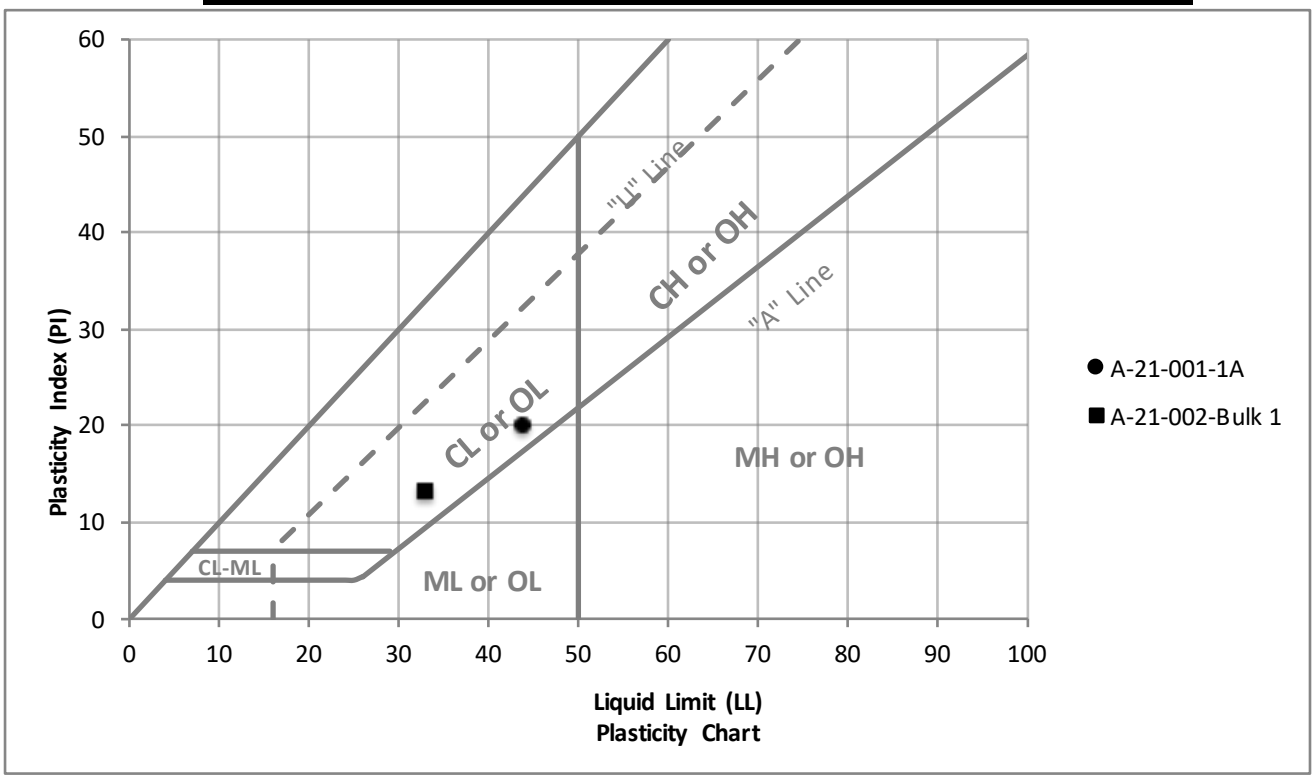
| Coefficient of Uniformity | Coefficient of Curvature |
|---|---|
| Cu = NA | Cc = NA |

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Gualala Rd. MP 0.33
CAInc File No: 19-563.2
Date: 4/28/21
Technician: YYG

**Plastic Index - ASTM D4318**

| Sample ID | Depth (ft) | Liquid Limit | Plastic Limit | PI |
|---|---|---|---|---|
| A-21-001-1A | 3.5 | 44 | 24 | 20 |
| A-21-002-Bulk 1 | 13 | 33 | 20 | 13 |
| | | | | |
| | | | | |
| | | | | |



CONFORMED COPY
Copy of Document Recorded on
03/25/2020 11:23:53 AM
as 2020-E0017
Mendocino County Clerk-Recorder

FILING REQUESTED BY
County of Mendocino
Department of Transportation
340 Lake Mendocino Drive
Ukiah, CA 95482

AND WHEN FILED MAIL TO
County of Mendocino
Department of Transportation
340 Lake Mendocino Drive
Ukiah, CA 95482

# NOTICE OF EXEMPTION

**Project Title:** 2019 Storm Damage Repair Program

**Project Locations:**

- Briceland Road, CR 435 , M.P. 4.79
- Peachland Road, CR 128, M.P. 1.60
- Windy Hollow Road, CR 508, M.P. 2.11
- Gualala Road, CR 501, M.P. 0.33
- Fish Rock Road, CR 122, M.P. 17.35

**Description of Nature, Purpose, and Beneficiaries of Project:**
During a series of strong winter storms in early 2019, numerous roads maintained by the County of Mendocino Department of Transportation were damaged as a result of heavy rain, surface water flooding, mudslides and ground saturation. The sections of roads listed above sustained significant damage involving cut bank and/or fill slope failure resulting in road surface cracking and/or partial collapse of the road sections and in some cases requiring road shoulder and/or traffic lane closures. Permanent repairs will be completed to restore the damaged road sections to pre-event conditions and traffic capacity, for the safety of the traveling public.

Permanent repair work will include excavating, backfilling, grading, and resurfacing of damaged road sections to restore pre-existing road surface elevations and drainage patterns. Damaged culverts will be replaced at two locations (Briceland Road, Peachland Road). Retaining walls and/or rock slope protection will be installed to repair road embankments and prevent erosion. The proposed work will not result in significant impact to sensitive cultural or biological resources.

Beneficiaries of the project are the traveling public.

**Name of Public Agency Approving Project:** County of Mendocino Department of Transportation

**Name of Public Agency Carrying Out Project:** County of Mendocino Department of Transportation

**Exempt Status:** *(check one)*

| | | |
|---|---|---|
| ☐ | Ministerial | [§15268] |
| ☐ | Declared Emergency | [§21080(b)(3); 15269(a)] |
| ☐ | Emergency Project | [§21080(b)(4); 15269(b) and (c)] |
| ☒ | Categorical Exemption | §15302 |

**Reasons Why Project is Exempt:**
The California Code of Regulations, Title 14, Division 6, Chapter 3, Article 19, Section 15302, provides a categorical exemption for the replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.

| **Lead Agency Contact Person:** | **Title:** | **(Area Code) Telephone No:** |
|---|---|---|
| Howard Dashiell | Director of Transportation | (707) 463-4366 |

*Signature* *Date* 3/2/20