# A Biological Resources

PRUNUSKE CHATHAM, INC.



# Biological Resources Assessment
# North Harbor Coastal Trail and Harbor Coastal Trail
# Bodega Bay, Sonoma County, CA
# September 2011 – *revised April 2013*

Prepared for:
Sonoma County Regional Parks
2300 County Center Drive, Suite 120A
Santa Rosa, CA 95403

Prepared by:
Prunuske Chatham, Inc.
400 Morris Street, Suite G
Sebastopol, CA 95472

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Project Photographs
Figure 1: Project Location Map
Figure 2: Special-Status Wildlife Occurrences
Table 1: Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys (*updated April 2013*)
California Department of Fish and Wildlife, Natural Diversity Database – Animals –Arched Rock, Bodega Head, Camp Meeker, Duncans Mills, and Valley Ford USGS Quadrangles (*updated April 2013*)
U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Federal Endangered and Threatened Species – Bodega Head USGS Quadrangle (*updated April 2013*)

# 1 Introduction

Sonoma County Regional Parks (Regional Parks) is planning a coastal trail in Bodega Bay, Sonoma County (Figure 1). The trail is comprised of two sections – the North Harbor Coastal Trail and the Harbor Coastal Trail, collectively referred to as the trail for the purposes of this report. The North Harbor Coastal Trail begins at the Bodega Dunes Sonoma Coast State Park and extends south to The Tides. The Harbor Coastal Trail begins at The Tides and ends at the Bird Walk Coastal Access Park. Sections of the trail bisect the Sonoma Coast State Park and Bodega Dunes Campground. The multiuse pedestrian and bike trail will extend approximately 10,100 linear feet (1.91 miles) through coastal upland communities and tidal mudflats.

For initial planning purposes and preliminary California Environmental Quality Act (CEQA) analysis, Regional Parks has requested an assessment of the project to address potential impacts on fish and wildlife resources. This report summarizes general wildlife surveys, addresses potential project impacts on fish and wildlife resources, and provides general measures to protect biological resources and recommendations for further study.

# 2 Field Survey Methodology

The purpose of the field surveys was to characterize biological communities within the project site and to determine whether or not suitable habitat for special-status animal species is present. The potential presence of and impacts on special-status species were determined based on a comparison of existing habitat conditions and presence of unique habitat features, proximity of the site to reported occurrences, and geographic range of subject species.

Surveys were completed by Jennifer Michaud, M.A., Senior Wildlife Biologist, from Prunuske Chatham, Inc. (PCI), who is familiar with the region's flora and fauna. The surveys consisted of evaluating a 100-foot wide linear corridor where the trail is proposed and evaluating all representative habitats within these boundaries. The surveys did not include focused surveys for special-status animals. They included a general inventory of species observed or potentially occurring within the project area. Observations were restricted to several days of field observations and limited in scope due to the seasonal distribution of some species and rarity of others. All surveys were conducted on land or along the shoreline where access was available. Surveys of the mudflats and other aquatic habitats were not completed. The surveys were conducted with the aid of binoculars (Swarovski™ 10 x 42). Visual cues, calls, songs, and direct observations were used to identify wildlife species. Unique habitat features (e.g., woody debris, water sources, etc.) and other plant materials were examined for presence of birds, mammals, amphibians, reptiles, and invertebrates. Surveys of the project site

were conducted on April 27, May 31, and June 23, 2011. A total of 12 person-hours were spent in the field surveying for wildlife and their habitats.

This level of assessment is standard at this stage of project review and is meant to guide Sonoma County staff in making initial determinations for compliance with the California Environmental Quality Act (CEQA), making recommendations for further study, and/or identifying mitigation, restoration, and enhancement opportunities. This report was updated in April 2013 to include additional information on biological resources in Bodega Harbor (e.g., true crabs) and current special-status species and policy information.

## 3 Project Setting

The proposed trail extends from the southern boundary of County-owned land near the Children's Bell Tower at the Bodega Bay Community Center and connects with the Bird Walk Coastal Access Park in Bodega Bay, Sonoma County, California. The project is located on the Bodega Head USGS quadrangle, with northern and southern end points located at approximately 38.33949°N 123.05153°W and 38.32018°N 123.05153°W, respectively. The proposed trail corridor ranges from approximately 100' in elevation to sea level. The trail corridor traverses currently undeveloped uplands, baylands, landscaped areas, commercial parking lots, roadways, and existing trails. Sections of the trail bisect the Sonoma Coast State Park and Bodega Dunes Campground. The approximate extent of the proposed trail is noted on Figures 1 and 2. Representative photographs of the trail alignment follow this report. Land uses surrounding the trail include open space, residences, commercial establishments, and roadways. Sonoma Coast State Beach lands lie to the west and Doran Regional Park lies to the south.

## 4 Existing Communities

The project area supports a mosaic of plant communities from non-native Monterey cypress and eucalyptus forest to tidal mudflats. Botanical resources were extensively studied by Jane Valerius, Jane Valerius Environmental Consulting, and have been provided in a separate report (Valerius 2011). In her report, Ms. Valerius mapped and described vegetation communities based on A Manual of California Vegetation, Second Edition (Sawyer et al. 2009). Eighteen distinct units were described and mapped based on membership rules of plant species composition, dominance, and cover. These included coyote brush scrub and coyote brush coastal scrub, purple needle grass grassland, Monterey cypress stand, pampas grass patch, coastal brambles, Eucalyptus grove, chamise chaparral, arroyo willow thickets, European beach grass sward, pickleweed mat, ice plant mat, salt rush swale, eelgrass, mudflat and shallow bay, bush monkeyflower scrub, perennial ryegrass field, velvet grass meadows, ornamental landscapes, and ruderal weeds. In addition to the botanical inventory, a formal delineation of wetlands and other waters was completed for the project by PCI and has

been provided in a separate report (PCI 2011). Figures of existing vegetation communities and wetlands/other waters are provided in Valerius (2011) and PCI (2011).

Relatively few animal species are restricted to a single vegetation type, as described in Sawyer et al (2009), and, indeed, most species require more than one vegetation community. Therefore, wildlife communities are described in a larger context and across broader plant communities. These communities are described based on the California Department of Fish and Wildlife (CDFW), A Guide to Wildlife Habitats of California (CWHR; CDFW 1998), CWHR revisions (CDFW 2002), and the expertise of the preparer of this report. For the purposes of this report, wildlife communities have been more broadly characterized into grassland and coastal scrub, non-native forest, coastal dune, riparian thicket and stream channel, saline emergent wetland, shoreline, tidal flats and eelgrass beds, wharf pilings, and ornamental landscape and ruderal habitats.

The following discussion includes a general summary of species typically associated with each community based on regional occurrence and field observations. Wildlife species' common names are used in the text because they are unequivocal. Plant species common names are also used following descriptions provided by Valerius (2011). A complete list of all animals observed within the project area is provided at the end of the section.

### *4.1 Grassland and Coastal Scrub*

Small patches of grassland and coastal scrub occur throughout the project area including at the northern limits near the Children's Bell Tower, in small isolated patches along Highway 1, and along the embankments and wetlands near the Bird Walk Coastal Access Park. Grassland areas are dominated by both annual and perennial grasses. Representative species within the grasslands include native purple needlegrass, blue-eyed grass, and non-native perennial ryegrass, rattlesnake grass, velvet grass, and a variety of annual forbs. Scrub communities support patches of coyote brush, California blackberry, chamise, yellow bush lupine, and a mixture of native and non-native perennial and annual understory species.

Grassland and coastal scrub plant communities provide habitat and foraging opportunities for a range of wildlife species. Grasses, shrubs, and associated invertebrates provide foraging opportunities for a variety of ground-foraging birds, such as American robin, sparrows (e.g., white-crowned, golden-crowned, song), dark-eyed junco, northern flicker, spotted towhee, and numerous other resident and migratory birds. Predatory hawks, including northern harrier, American kestrel, and red-shouldered and red-tailed hawks, frequent these areas as well. Small vertebrates and invertebrates within the habitat are likely to serve as a food source for these birds and other predatory vertebrates. Existing shrubs and small trees provide nest structures for breeding birds. Flowering plants provide important food sources for pollinators.

Subterranean foragers, such as Botta's pocket gopher and California mole, commonly occur in grassland and coastal scrub habitats. In addition, small mice (e.g., deer and harvest), California vole, black-tailed jackrabbit, coyote, and black-tailed deer are frequently observed. American badgers are known to occur within grassland and scrub habitats to the north/northeast of the project site in the vicinity of the Bodega Dunes Sonoma Coast State Park and may frequent the project site. Reptiles of this community include western fence lizard, alligator lizard, and snakes (e.g., gopher and garter). Bat species may also forage over this habitat.

### *4.2 Non-native Forest*

A large stand of non-native forest extends from the northern limits of the project near the Children's Bell Tower and extends downslope into the riparian thicket below Ranch Road. This area is dominated by blue gum, Monterey pine, and Monterey cypress. Smaller, isolated patches of Monterey cypress occur further to the southern along the length of the trail alignment to the corner of Smith Brothers Road and Highway 1.

Despite being composed primarily of non-native tree species, this habitat is utilized extensively by native wildlife. More expansive stands are most commonly used by larger birds for breeding, roosting, and perching. Owls (e.g., barn and great horned) are commonly observed using these areas, and egrets and herons have an affinity for establishing heronries within stands of blue gum, Monterey pine, and Monterey cypress. Several rookeries are well established within Bodega Bay and are quite successful and persistent. The nearest reported rookery is less than one mile from the site on the west side of the harbor (Kelly et al. 2006). Within the project area, osprey were observed on several occasions and appeared to be nesting in the large Monterey cypress trees. Some of the more common mammal species (e.g., deer, raccoons) are also frequently observed; however, black-tailed deer was the only terrestrial mammal species observed during field surveys. Bats may roost within the larger trees and hoary bats have been reported within the project site. While a number of bird species frequent eucalyptus trees, eucalyptus flowers can be detrimental to small native songbirds. The birds' feathers and nasal passages can become clogged with gum produced by the flowers. Locally, non-native forests are known to provide winter roost sites for monarch butterflies. There are reported occurrences of monarch within the project site.

### *4.3 Coastal Dune*

A small patch of coastal dune occurs along the riparian thicket to the southwest of the property line with the Bodega Dunes. This area is dominated by non-native European beachgrass intermixed with additional non-native grasses. The dune habitat extends beyond the projects limits and is separated from a larger network of dunes by a narrow band of Monterey cypress trees.

Coastal dunes provide habitat and foraging opportunities for a range of wildlife species. Locally, northern harriers are often seen coursing low to the ground over dunes in search of small mammals and songbirds. Some of the more common bird species observed within dunes include horned lark, white-crowned sparrow, house finch, and American goldfinch. In dunes adjacent to the ocean, American pipet and snowy plover are frequently seen. Black-tailed jackrabbit and deer are abundant as well as voles and mice. Some invertebrates, such as bumblebee scarab beetle and globose dune beetle, are found exclusively in coastal dune habitats.

### *4.4 Riparian Thicket and Stream Channel*

A well-developed stream channel originates near Ranch Road and extends downstream through a dense riparian thicket before flowing under Bay Flat and Eastside Roads. Vegetation along the stream channel is dominated by arroyo willow. At its southern end near the Bay Flat Road intersection, the riparian area is a complex of stream channels within extremely dense vegetation. A second channel, Johnson Gulch, enters the project site at the stop sign at the corner of Bay Flat and Eastshore Roads. These channels are joined at this juncture and flow to Bodega Harbor through an underground culvert. At the outlet of the channel, there is a small fragment of arroyo willow-dominated riparian thicket. At the southern end of the project, there is another arroyo willow-dominated thicket at the outlet of a culvert that flows from the north side of Highway 1 near the fire department before entering the bay. Several patches of moist scrub habitat dominated by thimbleberry and blackberry occur along the trail alignment.

Aquatic resources within the stream channels are likely limited due to their seasonal nature, typically drying by October, with persistent water possible during wetter years. Due to their size and seasonal nature, the channels are unlikely to support fish within the project site. However, the channels are important habitat for a variety of aquatic organisms and associated species. Aquatic salamanders (e.g., California and rough-skinned newts, California giant salamander) utilize channels seasonally. Macroinvertebrates serve as the food base for terrestrial and other aquatic species. Common reptiles found in the moist woodlands adjacent to the stream channels include sharp-tailed, ring-necked, and aquatic garter snakes. Stream channels also provide an important water source for local wildlife. Primary breeding bird members of structurally diverse riparian habitats include tree swallow, Wilson's warbler, yellow warbler, Swainson's thrush, song sparrow, and black-headed grosbeak.

The stream channels at the northern end of the project site are likely to support seasonal habitat for California red-legged frog. Frogs are unlikely to breed there due to a lack of deep persistent pools and backwater habitats; however, they may use the area for foraging and seasonal aestivation. California red-legged frogs are known to occur within surrounding lands and this species is capable of traveling long distance from breeding sites to non-breeding habitats. Radio tracking of frogs in Marin County by

Fellers and Kleeman (2007) noted the dispersal of frogs at a median distance of 500' from breeding sites (range of 100 to 4,500'). This demonstrates the importance of uplands and non-breeding aquatic habitat for non-breeding season and migratory corridor habitat.

### *4.5 Saline Emergent Wetland*

Saline emergent wetlands occur along the length of the trail alignment within the bay. Directly adjacent to the bay, several wetlands occur above the intertidal zone where the proposed trail enters the bay at Porto Bodega Marina and along the shoreline. These wetlands occur above the intertidal mudflats and below upland plant communities. They are dominated by saltgrass, jaumea, pickleweed, alkali heath, salt rush, bulrush, and other halophytes.

As the trail approaches the Bird Walk Coastal Access Park, extensive wetlands occur along the bayshore and within the park. As the proposed trail approaches the existing gravel trail, it crosses through a seasonal wetland dominated by western mannagrass. The levee for the ponds along the existing trail forms the eastern boundary of this wetland. Historically, it was likely to be continuous with tidal wetlands to the west. A similar wetland occurs to the south of the access road to the park. To the west of the existing levee, there is a constructed pond. The dominant species is velvetgrass. The proposed trail follows the levee/wetland to the end of the project.

Saline emergent wetlands provide habitat for a variety of wildlife species, especially birds. Many species of birds utilize wetlands extensively including the Virginia rail, a year-round resident in Sonoma County, and sora, an uncommon winter resident. Saline wetlands are also important breeding and foraging habitat for many other bird species including song sparrow, marsh wren, common yellowthroat, ducks, shorebirds, herons and egrets, and swallows. Characteristic mammals include shrews, mice, and northern raccoon. Snakes, including several species of garter snake, are frequently observed in salt marshes. Few amphibian species occur in saline wetlands.

### *4.6 Shoreline*

A narrow bank of shoreline consisting of rocky substrate extends along the length of the proposed trail alignment from Porto Bodega Marina south along Smith Brothers Road. The shoreline forms the transition zone between the tidal flats and upland habitats. This habitat is largely unvegetated and barren.

Sea lions and harbor seals may haul-out in these areas. Rocky shorelines are extensively used by birds, especially shorebirds, egrets, and herons. Ground-nesting species like the killdeer rely on open ground for constructing small scrape nests. Along the water's edge, rocks provide habitat for fixed animals such as barnacles, limpets, periwinkles, seaweeds, and algae.

### *4.7 Tidal Flats and Eelgrass Beds*

Tidal flats (mudflats) occur along the length of the trail alignment within the bay. They occur within the intertidal zone, which is subject to the daily tidal cycle of inundation and exposure. Mudflats are largely unvegetated, except for eelgrass (*Zostera marina*). The substrate is typically sand or mud and rich in dissolved nutrients and organic debris. Valerius (2011) mapped one area of tidal mud flats that support eelgrass near the outlet of Johnson Gulch.

Tidal flats support a wide variety of fauna. Infauna[1] and epifauna are both diverse and abundant. These include species such as diatoms, worms, and shellfish, which are attractive to foraging birds at low tide. At higher tide, macroinvertebrates and fish are abundant and feed extensively on these species. Common bay fish include topsmelt, Pacific herring, shiner surfperch, Pacific tomcod, striped bass, starry flounder, and bay pipefish. Mudflats provide extensive foraging opportunities for shorebirds, egrets and herons, waterfowl, gulls, and diving birds. Mudflats support few mammals; however, harbor seals occasionally use the habitat for hauling out. Purple shore and green shore crab, barnacles, limpets, chitons, etc. are all abundant along the shoreline in Bodega Harbor, especially where small rocks and debris are found.

Eelgrass is a vascular, perennial marine plant that grows in large colonies or beds in soft-bodied bays and estuaries. Eelgrass typically occurs in shallow waters from 0 to 6 feet below mean low tide (Jepson Interchange 2011). Along the outer navigation channel and lower portions of the flats, extensive eelgrass beds may occur within the area of potential impact. As viewed from Google Earth™, large areas of dark green vegetation, possibly eelgrass or algae, occur between the navigation channel and the shoreline. More extensive above- and underwater surveys would be needed to accurately determine species composition and distribution (see ***Eelgrass Regulations*** below).

Eelgrass provides a number of ecologically important functions. Eelgrass stands undergo tremendous growth in spring and summer, then foliage decays in fall and winter, and regenerates the following spring. This rapid growth enables eelgrass stands to trap sediment, stabilize habitat, improve water clarity, and generate oxygen. Eelgrass also provides valuable habitat for a number of marine plant and animal species. It serves as a food source for many invertebrates, fish, and birds; provides a physical structure that supports epiphytic plants and animals; and serves as a nursery site for many commercially and recreationally important fish and shellfish. It is used by nearly all coastal salmonid species and a number of oceanic species that enter bays and estuaries

[1] "Infauna" refers to animals that live burrowed in substrates. "Epifauna" refers to benthic fauna living on the substrate or on other organisms.

to spawn and/or rear. Dungeness, red, and Pacific rock crabs also utilize eelgrass beds extensively in Bodega Harbor (see ***True Crabs of Bodega Harbor*** below).

### *4.8 Wharf Pilings*

Wharf pilings occur throughout Bodega Harbor and the proposed trail will cross over or require the retrofit of existing structures. While this habitat does not technically constitute a separate biological community, it is extremely complex and supports species seldom observed in other habitats. Species commonly observed attached to solid surfaces include sea anemones, tube-dwelling worms, tunicates, barnacles, mussels, sea stars, sea cucumbers, sponges, hydroids, and seaweeds. Free-swimming species such as jellyfish, fish, and shrimp can also be observed within the water column in and around pilings. In some locations, sea lions haul out on old docks; however, use within the project area is not certain.

### *4.9 Ornamental Landscape and Ruderal Habitats*

Ornamental landscaping and ruderal habitats occur in areas of more intense development along the length of the proposed trail alignment. These areas are dominated by mostly invasive non-native species including English ivy, periwinkle, myoporum, camphor tree, cape weed, Italian thistle, sea fig, and a number of other weeds and ornamental plantings.

The wildlife habitat values of disturbed or landscaped areas are generally considerably less than those of the surrounding natural habitats. Wildlife in these areas are typically more acclimated to human activity and include species common in urban and suburban habitats such as western scrub-jay, California towhee, mourning dove, house finch, house sparrow, mockingbird, Norway rat, house mouse, northern raccoon, and Virginia opossum. Ornamental trees and shrubs do provide roosting and potential nesting substrate for numerous species of birds.

### *4.10 True Crabs of Bodega Harbor*

Bodega Harbor and the surrounding marine habitats support a variety of true crabs[2]. While these species does not technically constitute a separate biological community, they are of relative importance ecologically and of local interest as some crab species are harvested by commercial and recreational fishermen. Because the effects on the proposed trail on harvested crab are of concern to the local community, background information and potential for occurrence with the project area are described below for the three mostly commonly harvested species in Bodega Harbor (Dungeness crab, red rock, and Pacific rock crab; UC Davis 2013). Brief information is also included for the other true crab species occurring in Bodega Harbor.

[2] True crabs include those species belonging to the infraorder Brachyura. For example, other decapod crustacean "crabs", such as hermit crabs, belong to a separate infraorder.

The **Dungeness crab** (*Metacarinus magister*; formerly *Cancer magister*) is the mostly widely recognized species and the one taken by most fishermen. This species prefers sandy to sandy-mud substrates, but are common elsewhere. Beds of eelgrass and other aquatic vegetation are important nurseries for juvenile crabs. This species is characterized by it saw-toothed edges, white-tipped pinchers, reddish-brown to purple coloration, and grows to 8 inches. Dungeness crabs are opportunistic feeders and take a variety of invertebrates and fish. They are also cannibalistic. Dungeness crabs (including eggs, juveniles, and adults) are an important food resource for a variety of marine worms, fish, sharks, and skates. The Dungeness crab is the most commonly harvested species in Bodega Harbor (Fawcett 2013). **All life stages of Dungeness crab are likely to occur within the tidal flats, eelgrass beds, and wharf pilings where the trail is proposed.** Dungeness crab may utilize the pilings associated with the proposed boardwalk.

The **Pacific or California rock crab** (*Romaleon antennarius*; formerly *Cancer antennarius*) is too small to be taken for commercial harvest, but is frequently caught by sport fishermen. It is common in the low rocky intertidal often under rocks and crevices; however, they are occasionally found in bays. This species is characterized by it black tipped claws, deep brick red coloration, and wide fan-shaped shell. The Pacific rock crab closely resembles the red rock crab (see below), but has longer antennae and hairier legs. Rock crabs are both scavengers and predators. They feed on a variety of barnacles, clams, snails, abalone, and other marine invertebrates. Pacific/California rock crabs, especially juveniles, are important food source for fish, octopus, sea stars, and otters. Pacific/California rock crab is the most commonly harvested species by recreational fishermen following Dungeness crab (Fawcett 2013). This species is frequently caught along piers, pilings, and jetties within Bodega Harbor. **All life stages of Pacific/California rock crab are likely to occur within the tidal flats, eelgrass beds, and wharf pilings where the trail is proposed.** Pacific/California rock crab may utilize the pilings associated with the proposed boardwalk.

The **red rock crab** (*C. productus*) is too small to be taken for commercial harvest, but is frequently caught by sport fishermen. It is common in hard substrate habitats including piling and rocky areas and kelps beds in bays and estuaries. Juveniles utilize eelgrass beds and macroalgae extensively. This species is characterized by it black tipped claws, deep brick red coloration, and wide fan-shaped shell. Red rock crabs are both scavengers and predators. They feed on a variety of barnacles, clams, snails, abalone, and other marine invertebrates. Red rock crabs, especially juveniles, are important food source for fish, octopus, sea stars, and otters. This species is frequently caught along piers, pilings, and jetties within Bodega Harbor. **All life stages of red rock crab are likely to occur within the tidal flats, eelgrass beds, and wharf pilings where the trail is proposed.** Red rock crab may utilize the pilings associated with the proposed boardwalk.

In addition to these above-mentioned species, marine habitats in the Bodega Harbor area are also home to kelp crab and a number of smaller, non-harvested crab species (UC Davis 2013). **All of these species are likely to occur within the tide flats, eelgrass beds, and/or wharf pilings where the trail is proposed.**

**Kelp crab** (*Pugettia producta*) are not typically found in Bodega Harbor tidal flats, but are common at the Doran Park jetties, Bodega Harbor marinas, and Bodega Head (UC Davis 2013). They occupy rocky areas and pilings; 2 – 4 inches.

**Lined shore crab** (*Pachygrapsus crassipes*) are common in Bodega Harbor tidal flats. They are typically found among rocks and mud; 1 to 2 inches

**Yellow or green shore crab** (*Hemigrapsus oregonensis*) are common in Bodega Harbor tidal flats. They typically occupy mudflats; 1 to 2 inches

**Purple shore crab** (*H. nudus*) are uncommon, but present in Bodega Harbor tidal flats. They occupy rocky areas; 1 to 2 inches.

### *4.11 Wildlife Species Observed*

Within the project area, wildlife observations (direct and indirect: scat, tracks, burrows) included the following birds: osprey, Wilson's warbler, red-tailed hawk, raven, turkey vulture, song sparrow, red-winged blackbird, house finch, Anna's hummingbird, Allen's hummingbird, house sparrow, American goldfinch, mallard, Canada goose, snowy egret, great egret, great blue heron, brown-headed cowbird, western scrub-jay, marsh wren, Swainson's thrush, European starling, California towhee, chestnut-backed chickadee, crow, black oystercatcher, mourning dove, American coot, double-crested cormorant, Brewer's blackbird, willet, western gull, and common loon. One amphibian species (Sierran treefrog) and two mammal species (black-tailed deer and California sea lion) were also observed.

# 5 Special-status Species

## *5.1 Definition of Special-status Species*

In California, special-status species include those animals that are afforded legal protection under the federal and California Endangered Species Acts (ESA and CESA, respectively) and other regulations. Consideration of these species must be included during project evaluation in order to comply with the California Environmental Quality Act[3] and in consultation with state and federal resource agencies.

Special-status animal species of California include, but may not be limited to:

- Species listed or proposed for listing as threatened or endangered under the federal ESA;
- Species listed or proposed for listing as threatened or endangered under CESA;
- Species that are recognized as candidates for future listing by agencies with resource management responsibilities such as U.S. Fish and Wildlife Service (USFWS), NOAA's National Marine Fisheries Service (NMFS), and California Department of Fish and Wildlife (CDFW);
- Species defined by CDFW as California Species of Special Concern;
- Species classified as Fully Protected by CDFW;
- Species that otherwise meet the definition of rare, threatened, or endangered pursuant to §15380 of the CEQA Guidelines.

## *5.2 Background Research*

A background literature and database search was conducted to determine the potential occurrence of special-status animal species within the project site based on a comparison of existing habitat conditions and presence of unique habitat features, proximity to reported occurrences, and geographic range of subject species. The search focused on reported occurrences for the Bodega Head 7.5' USGS quadrangle where the project site is located and the surrounding quads (i.e., Arched Rock, Duncans Mills, Camp Meeker, and Valley Ford). General references were also consulted to evaluate the potential for unique biological communities and special-status animal species. The review included, but was not limited to, the following sources:

[3] Projects undertaken, funded, or requiring a permit by a state or local public agency must comply with the California Environmental Quality Act (CEQA). The primary purpose of CEQA is to inform decision makers and the public about the potential environmental impacts of the proposed activities.

- CDFW Natural Diversity Database[4] (CNDDB) (CDFW 2013a);
- CNDDB/Spotted Owl Viewer on-line database for the reported sightings of northern spotted owl (CDFW 2011b);
- Sacramento U.S. Fish and Wildlife Service (USFWS) Office Species Lists for the Bodega Head USGS Quadrangle (USFWS 2013); and
- Field guides and general references for birds, mammals, reptiles, amphibians, and invertebrates (e.g., Burridge 1995; Bolander and Parmeter 2000; Brown 1997; Goals Project 2000; Jameson and Peeters 2004; Jennings and Hayes 1994; Kays and Wilson 2002; McGinnis 2006; Rickerts and Calvin 1985; Shapiro and Manolis 2007; Shuford and Gardali 2008; Sibley 2000; Stebbins 2003; Zeiner et al. 1990).

The background literature review identified the potential presence of a number of special-status or animal species of interest within the project area's region (Table 1 and Figure 2). Based on the suitability of habitat within the project area and surrounding habitats and proximity of recorded sightings, these species were evaluated for potential occurrence within the project site. For the animal species that occur in habitat types found within the area and/or that have reported sightings within close proximity to the project site, status and life history characteristics and potential for occurrences within the project site are described in Table 1.

Not included in the table or further discussion are those species that do not occur in habitat types found within the project area and/or have no local occurrences and are unlikely to occur there. These include marine turtles (e.g., loggerhead, green, leatherback, olive ridley) and whales (e.g., sei, blue, finback, right, sperm). While the project is located within a marine environment (i.e., baylands), the likelihood of occurrence of these species is extremely low.

The special-status animal species that were identified as having moderate to high potential for occurrence within the project site based on the background literature review or species observed during field surveys include the following:

- Monarch butterfly
- Myrtle's silverspot butterfly (suitable host plant not present)

[4] The California Natural Diversity Data Base (CNDDB) is a repository of information on sightings and collections of rare, threatened, or endangered plant and animal species within California. It is maintained by the California Department of Fish and Wildlife (CDFW). CNDDB reports occurrences of special-status species that have been entered into the database and does not generally include inventories of more common animals or plants. The absence of a species from the database does not necessarily mean that they do not occur in the area, only that no sightings have been reported. In addition, sightings are subject to observer judgment and may not be entirely reliable as a result.

- California red-legged frog
- Western pond turtle
- Great blue heron
- Western snowy plover
- Osprey
- Double-crested cormorant
- Pallid, Townsend's big-eared, western red, hoary, long-eared myotis, and fringed myotis bats
- American badger
- Longfin smelt
- Steelhead – central California coast DPS

### *5.3 Protected Bird Species*

Nesting native bird species are protected under both federal and state regulations. Under the federal Migratory Bird Treaty Act (MBTA), it is unlawful to take, kill, and/or possess migratory birds at any time or in any manner, unless the appropriate permits are obtained. Protections extend to active nests, eggs, and young birds still in the nest. Birds and their nests are also protected under the California Fish and Wildlife Code (§3503 and §3503.5).

Most bird species, with a few specific exceptions, are protected under the MBTA and California Fish and Wildlife Code. Vegetation removal and/or construction activities in areas with suitable nesting habitat during the breeding period, typically mid-March to mid-August in this region (RHJV 2004), could result in nest abandonment or loss of native nesting birds unless appropriate actions are taken (e.g., preconstruction surveys, avoidance, monitoring, etc.).

Heron and egret rookeries are also protected under the above-mentioned regulations. In addition, while not formally listed, CDFW considers rookeries to be a sensitive resource.

### *5.4 Marine Mammal Protection Act*

The Marine Mammal Protection Act of 1972 was enacted to protect all marine-dwelling mammals. The law protects whales, dolphins, seals, walruses, sea lions, sea otters, polar bears, dugongs, and manatees. The MMPA prohibits the take (i.e., hunting, killing, capture, and/or harassment) of marine mammals, and provides for a moratorium on the import, export, and sale of marine mammal parts and products, and regulates scientific research and public display of captive animals. NOAA's National Marine Fisheries Service is the primary government agency responsible for enforcing the MMPA, and for managing and conserving cetaceans (whales and dolphins) and pinnipeds other than the walrus. U.S. Fish and Wildlife Service is responsible for all other species.

Within Bodega Harbor, California sea lion can be found year-round. They are frequently observed foraging around the fish docks at The Tides and throughout the harbor. They are well established on the island just off Bodega Head. Pacific harbor seals are also year-round residents along coastal Sonoma County; they frequently enter the harbor and can be observed hauling out near the harbor entrance on jetties and adjacent beaches. They have a well-established haul-out site at the mouth of the Russian River. California sea lion and Pacific harbor seal are the most common marine mammals observed within harbor. Northern elephant seal and Steller sea lion are occasionally reported along the coast. A number of whale species are also known to occur seasonally; however, it is very uncommon for them to enter the harbor. All marine mammals will need to be protected in accordance with the MMPA for this project and NMFS may need to be consulted.

### *5.5 Essential Fish Habitat*

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended in 1996, established procedures to identify, conserve, and enhance Essential Fish Habitat (EFH) for federally managed species covered under Fishery Management Plans (FMP). In California, these include groundfish (various rockfish, flatfishes, sharks, skates, etc.), coastal pelagic species (northern anchovy, Pacific sardine, Pacific mackerel, jack mackerel, and market squid), and Pacific salmon (Chinook and coho salmon). EFH is defined as "those waters or substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (MSA Section 3). Impacts on EFH can result from the reduction in the quality and quantity of habitat, direct effects (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), and site-specific or habitat-wide impacts. Compliance with the MSA is accomplished through consultation with NMFS.

Within Bodega Harbor, several species covered under the Pacific groundfish FMP could be present. Coho salmon (covered under the Pacific salmon FMP) may stray into the bay on occasion; however, Bodega Harbor tributaries are not currently known to support this species. Coastal pelagic species covered under the Coastal Pelagic Species FMP typically occupy offshore or nearshore habitats not present in the harbor. A programmatic consultation for Essential Fish Habitat has been completed by NMFS and U.S. Army Corps of Engineers for overwater structures in the San Francisco Bay area (NMFS 2011b), excluding dredging or fill activities other than pilings to support overwater structures. Specific restrictions apply to the use of this programmatic consultation. For example, newly constructed piers/docks must be less than 10,000 square feet. NMFS will need to be consulted to determine if this programmatic consultation would apply to this particular project.

### *5.6 Eelgrass Regulations*

Eelgrass beds are recognized by both federal and state agencies as being sensitive and highly valuable habitat for a suite of species. They are identified as EFH for Pacific salmon, coastal pelagic, and Pacific groundfish managed under the MSA. Eelgrass beds are listed as a Habitat Area of Particular Concern (HAPC) because they are susceptible to human-induced degradation, especially ecologically important, and/or located in an environmentally stressed area. While no comprehensive mitigation policy for eelgrass beds has been adopted, it is managed in compliance with the draft California Eelgrass Mitigation Policy (NMFS 2011a). The policy establishes protocols for mitigating adverse impacts on eelgrass, provides guidelines for mapping beds, and establishes criteria for mitigation planting, monitoring, and evaluation. The programmatic consultation for Essential Fish Habitat (NMFS 2011b), noted above, also provides additional information specific to eelgrass. These documents should serve as the basis for completing any eelgrass mitigation and monitoring requirements associated with this project.

### *5.7 Jurisdictional Waters*

Jurisdictional tidal waters are regulated by several resource agencies. Tidelands are regulated by the Corps under the provisions of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Any disposal of dredged or fill material and structures, as well as work in waters, require a permit from the Corps. Under Section 401 of the federal Clean Water Act, the Corps is required to meet state water quality regulations prior to granting a Section 404 permit. This is accomplished by application to the local Regional Water Quality Control Board for Section 401 certification that requirements have been met. Placement of structures in tideland may also be subject to the local city or county regulations. *See PCI's (2011) formal delineation of wetlands and other waters completed for the project.*

# 6 Conclusions and General Recommendations

Sonoma County Regional Parks is planning a coastal trail in Bodega Bay, Sonoma County. The trail is comprised of two sections – the North Harbor Coastal Trail and the Harbor Coastal Trail, collectively referred to as the trail for the purposes of this report. The North Harbor Coastal Trail begins at the Bodega Dunes Sonoma Coast State Park and extends south to The Tides. The Harbor Coastal Trail begins at The Tides and ends at the Bird Walk Coastal Access Park. The multiuse pedestrian and bike trail will extend approximately 10,100 linear feet (1.91 miles) through coastal upland communities and tidal mudflats. It traverses currently undeveloped uplands, baylands, landscaped areas, commercial parking lots, roadways, and existing trails. Sections of the trail bisect the Sonoma Coast State Park and Bodega Dunes Campground. The trail will be constructed of paved material and elevated boardwalks, within riparian and bayland habitats.

The field surveys and this report are considered a preliminary assessment of potential biological resource issues and are meant to guide the County in making preliminary CEQA determinations and recommendations for further analysis. Since the project is in the initial planning stages and engineered plans and construction specifications have not been developed, additional analysis may be required to determine the full extent of impacts.

Portions of the project will be constructed in environmentally sensitive areas. Upland non-native forests support winter roosting habitat for monarch butterflies, breeding birds, and potential habitat for several bat species. Adjacent riparian thickets and stream channels also support breeding birds, potential foraging and aestivation habitat for California red-legged frog, and other aquatic species. The baylands where elevated boardwalks are proposed are extremely rich in fauna and support potential beds of eelgrass, which are a Habitat Area of Particular Concern. Adjacent saline emergent wetlands are also highly productive and provide habitat for a variety of species.

The special-status animal species that were identified as having moderate to high potential for occurrence within the project site, based on the background literature review and/or field surveys, are:

- Monarch butterfly
- Myrtle's silverspot butterfly (suitable host plant not present)
- California red-legged frog
- Western pond turtle
- Great blue heron
- Western snowy plover
- Osprey

- Double-crested cormorant
- Pallid, Townsend's big-eared, western red, hoary, long-eared myotis, and fringed myotis bats
- American badger
- Longfin smelt
- Steelhead – central California coast DPS

In addition to the above-mentioned special-status species, the project site also supports additional species protected under the Marine Mammal Protection Act, breeding birds protected under the Migratory Bird Treaty Act and California Fish and Wildlife Code, species covered under Fishery Management Plans specific to Bodega Harbor and identified Essential Fish Habitat, eelgrass beds identified as a Habitat Area of Particular Concern, as noted above, jurisdictional wetlands and waters, covered in PCI (2011), and species of local interest harvested for commercial and recreational purposes.

The following includes a list of potential additional studies needed and some general recommendations to protect biological resources.

1. Following completion of engineered plans and construction specifications, a comprehensive habitat restoration and mitigation plan should be developed for native habitats impacted during construction and/or those habitats that are permanently altered. This should include specifications for special-status species habitat restoration and enhancement.

2. A thorough examination of the extent of eelgrass beds should be completed and a mitigation and monitoring plan developed, as needed. Aquatic surveys were not completed as part of this project, and, therefore, accurate determinations on the potential presence of eelgrass could not be made. Appropriate eelgrass mitigation should be completed for any impacts to existing beds, with particular attention to enhancement/restoration of fish and crab nurseries.

3. More comprehensive inventories of native wildlife and fish species should be completed, as deemed necessary by the resource agencies. This may include surveys for species such as the California red-legged frog, breeding birds, butterflies, bats, and marine fish and invertebrates.

4. A comprehensive dewatering plan should be developed upon completion of engineered plans and construction specifications. This would include developing a set of procedures and protective measures to follow during any project dewatering and while working within the baylands. The plan would need to be

developed under guidance from California Department of Fish and Wildlife and NOAA National Marine Fisheries Service.

5. A comprehensive species protection plan should be developed. This should include protection measures for marine mammals covered under the Marine Mammal Protection Act, breeding birds protected under the Migratory Bird Treaty Act and California Fish and Wildlife Code, state and federally listed species (i.e., California red-legged frog, Myrtle's silverspot), California species of special concern, and species of local interest for commercial and recreation harvest (i.e., true crabs). The plan should also describe protection measures to Essential Fish Habitat and fish species covered under Fishery Management Plans specific to Bodega Harbor. Details in the plan should include preconstruction surveys, relocation techniques and sites, fish and wildlife exclusion, on-going construction monitoring, worker education, and habitat enhancement and restoration guidelines.

6. All resource agencies with jurisdiction over the project site and potential biological resources should be consulted to provide guidance on required protection and mitigation measures.

The following are general recommendations to protect fish and wildlife resources; additional measures should be developed with the dewatering and species protection plans (see #4 and #5).

7. Before any construction begins, a qualified biologist should conduct a training session for all construction crew personnel. The training should include a discussion of the sensitive biological resources within the project site and the potential presence of special-status species. This should include a discussion of fish and wildlife species' habitats, protection measures to ensure species are not impacted by project activities, project boundaries, and biological conditions outlined in the project permits.

8. To protect special-status and common bats species within the project site, protection measures should be in place. These should include limiting construction to daylight hours to prevent interference with foraging abilities, preconstruction surveys prior to removal of any trees, worker education, and protection of occupied roosts.

9. To protect aquatic species within the project site, relocation efforts should be conducted prior to construction and during dewatering. As practical, work should occur under dry conditions. Temporary fish screens should be installed

following the relocation efforts and remain in place for the duration of construction.

10. To protect terrestrial wildlife (e.g., butterflies, reptiles, amphibians, and mammals) within the project site, preconstruction surveys should be performed prior to the disturbance of the site to ensure no special-status species are occupying the area and all species are relocated. If wildlife are observed within the work area or immediate surroundings, these areas should be avoided until the animal(s) has (have) vacated the area, and/or the animal(s) should be relocated out of the area by a qualified biologist, upon approval by the regulatory agencies. Active nests (i.e., pond turtle) or burrows (i.e., American badger) should be left undisturbed until they are unoccupied and appropriate buffers established.

11. Temporary wildlife exclusionary fencing (e.g., silt fence, which is a piece of synthetic filter fabric [also called geotextile]) should be installed around work areas during construction. Openings should be restricted to areas of construction site access. This fencing will preclude animals from entering the work area and prevent construction debris and workers from entering adjacent aquatic habitats.

12. To protect nesting native birds, construction activities should occur outside of the critical breeding period (mid-March through mid-August). If activities must occur during the normal breeding season, work areas should be surveyed by a qualified biologist prior to commencing. If active nests or behavior indicative of nesting are encountered, those areas plus a 50-foot buffer for small songbirds and 250-foot buffer for larger birds (e.g., owls, raptors, egrets, herons) designated by the biologist should be avoided until the nests have been vacated. Ongoing construction monitoring should occur to ensure no nesting activity is disturbed. If state and/or federally listed birds are found breeding within the area, activities should be halted, and consultation with the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service should occur, as necessary.

13. Due to a lack of suitable host plants and recent observations in the project vicinity, the likelihood of occurrence of Myrtle's silverspot is low; however, native plantings of violets (*Viola adunca*) as part of post-construction restoration efforts could encourage colonization of the site if the species were to ever recover in the project area's region.

14. If work must occur within the nonnative forest during the winter roosting season (fall through spring) for monarch butterfly, the site should be surveyed prior to

construction to determine whether butterflies are utilizing the site. If present, appropriate avoidance measures should be implemented (e.g., no disturbance during cold events when monarchs are clustered; no removal of occupied habitat).

The following are specific recommendations for harvested crabs of local concern. Additional measures should be developed with the dewatering and species protection plans (see #4 and #5 above).

15. Install boardwalk structures during winter months[5], as feasible, when fish and crab populations are typically at lower densities within estuarine environments, and to avoid the peak mating season for Dungeness crab (March through May).

16. Install boardwalk structures during low-tide periods when substrates are exposed in intertidal areas. This will minimize impacts on crabs from sound waves and direct disturbance.

17. During installation of boardwalk structures encircle work areas with a silt curtain that extends from the surface of the water to the substrate to control sediment and minimize the potential for crabs and other aquatic life from becoming trapped within the immediate area.

18. During boardwalk installation and removal/retrofit of existing over-water structures, efforts to minimize mortality to crabs should be employed. A best professional effort should be made to relocate any crabs or other aquatic life within the work area to alternative off-site locations. This work should be overseen by a qualified biologist.

[5] Local studies have shown that fish/invertebrate populations in estuarine environments are lower in winter (Merritt Smith Consulting 1996). This is likely attributed to life cycle stages, salinity, availability of protective cover (eelgrass), food resources, and/or movement of species into open oceans.

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## Project Photographs

*Photographs are shown in north-south order; all photos taken in 2011.*



Area of proposed trail alignment at northern limits of the project near Ranch Road; non-native forest is in the background with low-growing shrubs in the foreground.



View within the non-native forest; stake represents the proposed trail alignment.



Stream channel under canopy of non-native forest near the end of Ranch Road.



Riparian thicket downstream of Ranch Road.



Riparian thicket (right) and small patch of coastal dune habitat (left) within area of proposed trail alignment.



Outlet of Johnson Gulch, looking upstream. Trail will follow existing paved road.




PRUNUSKE CHATHAM, INC.

Date Created: August 4, 2011
Created By: Joan Schwan

Figure 2. Special-Status Wildlife Occurrences
North Harbor Coastal Trail and Harbor Coastal Trail
Sonoma County Regional Parks

Scale: 0 0.5 1 2 Miles

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Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| **Invertebrates** | | | | |
| San Bruno elfin butterfly | *Callophrys mossii bayensis* | FE/-- | Coastal, mountainous areas with grassy ground cover. Typically, restricted to San Bruno Mountain, San Mateo County. Host plant is Pacific sedum (*Sedum spathulifolium* ). | Not present. Suitable host plants were not observed during field surveys (see Valerius 2011). The project is outside of the range of this species. |
| globose dune beetle | *Coelus globosus* | --/-- | Occurs in coastal sand dunes from Bodega Head south to Mexico. Lives in sand below dune vegetation feeding on below-ground plant structures and detritus. | High. A small amount of suitable habitat is present within the project site. This species is not currently listed and there are no recent observations; however, impacts may occur. |
| monarch butterfly | *Danaus plexippus* | --/-- | Winters in coastal California where it utilizes wind-protected tree groves (e.g., eucalyptus, Monterey pine and cypress) along the coast. Roost sites typically located close to nectar and water sources. | Present. Suitable roosting habitat is present within the project site. Wintering occurrences are reported in the immediate area. Precautionary measures should be in place to avoid impacts. |
| black abalone | *Haliotis cracherodii* | FE/-- | A herbivorous gastropod occurring in rocky intertidal and subtidal habitats. Range extends from Point Arena south to the tip of the Baja Peninsula, Mexico along the Pacific Ocean. Feed on kelp and algae. Average size is 1.75 pounds, with life span of 20 to 30 years. | Not present. Suitable habitat is not present within the project site. |
| white abalone | *Haliotis sorenseni* | FE/-- | A herbivorous gastropod occurring in rocky open water habitats. Historic range extended from Point Conception south to Baja, Mexico along the Pacific Ocean. Feed on algae. Average size is 1.7 pounds, with life span of 35 to 40 years. | Not present. Suitable habitat is not present within the project site. |
| bumblebee scarab beetle | *Lichnanthe ursina* | --/-- | Coastal sand dunes from Sonoma County south to San Mateo County. Typically flies near the crest of sand dunes near the surface. | High. A small amount of suitable habitat is present within the project site. Occurrences of this species reported for Bodega Head and Doran Park from the 1970s. This species is not currently listed. Impacts may occur. |
| Myrtle's silverspot | *Speyeria zerene myrtleae* | FE/-- | Historically, occupied coastal dune, prairie habitat, dunes, and bluffs from San Mateo County north to the Russian River in Sonoma County. Four remaining populations occur in western Marin County and southwestern Sonoma County. Similar in appearance and life history to Behren's silverspot butterfly. Larvae typically feed on violets (*Viola adunca* ) where eggs are laid. Adult flight season from late June to early September. Adults known to use a number of nectar plants [i.e., gum plant, yellow sand verbena, mints (*Monardella* ssp.), seaside daisy, and nonnative bull thistle and false dandelion]. | Moderate. Suitable host plants were not observed during field surveys (see Valerius 2011). Occurrences of this species reported for Bodega Head and Doran Park from the 1970s. Due to a lack of suitable host plants and recent sightings, likelihood of occurrence is low. However, precautionary measures should be in place to avoid impacts. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| California freshwater shrimp | *Syncaris pacifica* | FE/SE | Low elevation and gradient perennial streams in Marin, Sonoma, and Napa. Typically found under ledges, and among roots, rootwads, attached aquatic or emergent vegetation, and terrestrial vegetation trailing in the water. Feed primarily on detritus and, to a lesser extent, on decomposing vegetation, dead fish, and invertebrates. Breeding occurs in autumn. Young hatch following May to early June. | Not present. Suitable habitat is not present within the project site. There are no reported occurrences of freshwater shrimp in Bodega Harbor tributaries. |
| mimic tyronia (=California brackish water snail) | *Tryonia imitator* | --/-- | An aquatic gastropod mollusk in the family Hydrobiidae. Species is very small and occurs in brackish water. | High. Suitable habitat is present within the project site. Occurrences of this species reported for Salmon Creek from 1945; however, population is thought to be extirpated as it was not found during surveys in the 70s and 80s. This species is not currently listed. Impacts may occur. |
| Marin hesperian | *Vespericola marinensis* | --/-- | Moist spots in coastal brush and chaparral vegetation in Marin County. Microhabitat includes seeps, leaf mold along streams, and alder and mixed evergreen forests. | Not present. A small amount of suitable habitat is present within the project site; however, the project is outside of the expected range of this species. |
| **Amphibians** | | | | |
| California red-legged frog | *Rana draytonii* | FT/SSC | Breeding habitat includes marshes, streams, lakes, reservoirs, ponds, and other water sources with plant cover. Breeding occurs in deep, slow-moving waters with dense, shrubby, or emergent vegetation. Breeds November through April depending on location. Eggs hatch after 6 to 14 days and attain metamorphosis after 4 to 5 months. During the non-breeding season, California red-legged frogs can remain at the breeding site (in the presence or absence of water) or move into surrounding non-breeding habitats. | High. There are documented occurrences for this species within 1.3 miles of the site from mainstem Salmon Creek. Suitable breeding habitat is absent; however, foraging, aestivation, and migratory corridor habitat is present. Focused surveys would be needed to confirm presence or negative findings. Precautionary measures should be in place to avoid impacts. |
| foothill yellow-legged frog | *Rana boylii* | --/SSC | In or near partly shaded rocky streams that are shallow, slow, and of moderate size, from sea level to 6,300 feet. Breeding occurs from spring to early summer after high flows have receded. Eggs are laid at downstream end of rocks. Tadpoles require 3 to 4 months to attain metamorphosis. Never found far from water at any time of year. | Not present. Suitable habitat is not present within the project site. There are no reported occurrences of foothill yellow-legged frogs in Bodega Harbor tributaries. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| **Reptiles** | | | | |
| Pacific pond turtle | *Emys marmorata* | --/SSC | The only native turtle in the North Bay region. Size varies from 3.5 to 7.5 inches. Found in or near permanent or semi-permanent water sources (e.g., ponds, lakes, rivers, streams) with suitable basking sites and underwater retreats. Eggs are laid in shallow holes dug by the female from April through August. Eggs hatch in late summer or fall. In northern California, hatchlings remain buried until the following spring. | Moderate. There are documented occurrences for this species within 1.5 miles of the site from mainstem Salmon Creek. Marginally suitable habitat is present within the project site. Focused surveys would be needed to confirm presence or negative findings. Precautionary measures should be in place to avoid impacts. |
| **Birds** | | | | |
| tricolored blackbird | *Agelaius tricolor* | --/SSC (nesting colony) | Colonial-nesting bird in fields, pastures, and wetlands. Nests in tules, cattails, and to a lesser degree willow and brambles. Breeding occurs from mid-April into late July. Typically forage on the ground in large flocks. An uncommon, sporadic summer resident in Sonoma County. Rare visitor in winter. | Low. There are no documented occurrences for this species within close proximity to the site. Marginally suitable breeding habitat is present; however, foraging habitat is present. Precautionary measures should be in place to avoid impacts. |
| great blue heron | *Ardea herodias* | --/-- (nesting colony) | Great blue herons feed primarily in saline and freshwater habitats. Their diet is comprised primarily of fish, but they will also take smaller animals. Colonial nests are built in large trees or snags, often in association with great egrets. For herons and egrets, pre-laying and courtship can begin as early as January to March with the nesting season extending into June to August or later (Kelly, et al., 2006). Year-round resident in Sonoma County. | Present. Herons were observed during field surveys. Suitable foraging and breeding habitat is present within the project site. Precautionary measures should be in place to avoid impacts. |
| burrowing owl | *Athene cunicularia* | --/SSC (burrowing and some wintering sites) | A small, ground-dwelling species of grasslands, prairies, rolling hills, and ranchlands. They are active both day and night and can frequently be seen standing at burrow entrances during the day. They are subterranean nesters and utilize abandoned burrows of ground squirrels and other mammals. They feed on a variety of prey items, including ground insects and small vertebrates. This species no longer breeds in Sonoma County and is only infrequently observed during winter. | Low. There are no documented occurrences for this species within close proximity to the project site; however, burrowing owls are known to winter along the Sonoma Coast. Recent breeding occurrences have not been reported. The project site supports only small portions of open habitat; however, extensive wintering habitat is present adjacent to the project site. Precautionary measures should be in place to avoid impacts. |
| marbled murrelet | *Brachyramphus marmoratus* | FT/SE (nesting) | Seabird that nests inland in old-growth coast redwood and Douglas-fir forests, 150 feet above ground. A solitary or semi-colonial nester. When coming to land to breed, does not touch land. Forages for small fish by diving in the near shore ocean and harbor entrances. There are no confirmed breeding records in Sonoma County. | Not present. Suitable habitat is not present within the project site. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| rhinoceros auklet | *Cerorhinca monocerata* | --/WL (nesting colony) | Species range widely across North Pacific. Breeds from California north to Alaska, and to the east. Nests in burrows in larger seabird colonies. Feeds primarily on fish. Forages both in offshore and inshore waters. An uncommon winter visitor and rare summer resident in Sonoma County. | Low. Species may occur occasionally within Bodega Harbor; however, the likelihood of occurrence is low. |
| western snowy plover | *Charadrius alexandrinus nivosus* | FT/SSC (nesting) | Small shorebird that occupies sandy beaches, sand spits, tidal estuaries, bay shore sandflats, and salt-evaporation ponds. Takes small invertebrates by utilizing a run-and-stop foraging technique. Breeding occurs from early March through late September. Nests consist of shallow scrapes or depressions in sand. Plovers are a fairly common winter resident along the coast. Several nesting attempts have been made at Salmon Creek beach but few have been successful. | Moderate. Suitable habitat is present within the project site. Snowy plovers are known to occur at the mouth of Salmon Creek. Precautionary measures should be in place to avoid impacts. |
| western yellow-billed cuckoo | *Coccyzus americanus occidentalis* | Candidate/SE (nesting) | A rare summer resident of valley foothill and desert riparian woodlands. Requires extensive thickets with low growing understory vegetation adjacent to water. Open cup nest constructed on horizontal branch from 2 to 25 feet off the ground. Breeds from June to July departing for South America in late August to early September. Feeds primarily on insects, but will also consume frogs, lizards, and fruit. Cuckoos have declined from former range due to a loss of riparian habitat. Historically nested in Sonoma County, but is currently extirpated from the county. It was last noted as breeding in Sonoma County in 1944. | Not present. Suitable habitat is not present within the project site. |
| black swift | *Cypseloides niger* | --/SSC (nesting) | A fast-flying swift and the largest in North America. Forages in open sky for insects, preferring mountain country and sea cliffs. Breeds in these habitat types often behind waterfalls in deep canyons and sea-bluffs above the surf. A semi-colonial nester. A casual migrant in Sonoma County. | Not present. Suitable habitat is not present within the project site. |
| tufted puffin | *Fratercula cirrhata* | --/SSC (nesting colony) | Breeds in the Arctic in colonies. Nests in burrows, sea cliffs, and rock slopes. Feeds on fish. Outside of nesting, observed as solitary birds at sea. A rare visitor to Sonoma County. | Not present. Suitable habitat is not present within the project site. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| osprey | *Pandion haliaetus* | --/WL (nesting) | Occupies lakes, reservoirs, rivers, estuaries, and open seacoast. Forages exclusively for fish which it captures with specialized feet. Nests on exposed treetops or other man-made structures from 10 to 250 feet above ground. Year-round resident in Sonoma County. | Present. Osprey were observed during field surveys. Suitable foraging and breeding habitat is present within the project site. Precautionary measures should be in place to avoid impacts. |
| California brown pelican | *Pelecanus occidentalis californicus* | Delisted /Delisted and FP (nesting colony and communal roosts) | California subspecies occurs only along the west coast of North America. Breeds in colonies on islands without mammal predators, primarily in southern California within the state. Forages near the coast; rarely seen either inland or far out at sea. A wingspan of nearly 8 feet. Plunge dives for fish. Common in summer and fall along the Sonoma Coast. | Not present. Suitable habitat is not present within the project site. Brown pelicans are known to occur along the Sonoma Coast; however, they rarely utilize baylands. |
| double-crested cormorant | *Phalacrocorax auritus* | --/WL (nesting colony) | Found throughout California in most bodies of water including coastal habitats and inland lakes, reservoirs, river, and wetlands. Feeds primarily for fish but will also take amphibians and invertebrates. Dives underwater up to 30 feet to capture prey. Often seen with wings spread in an attempt to dry flight feathers. A year-round resident in Sonoma County. Known to nest on offshore islands near Jenner. | Present. Cormorants were observed during field surveys. Suitable foraging habitat is present within the project site. Precautionary measures should be in place to avoid impacts. |
| short-tailed albatross | *Phoebastria albatrus* | FE/SSC | A medium-size albatross with a wingspan of 85 to 91 inches. Nests on islands off Japan and spends most of its life at sea. During the non-breeding season, males and juveniles congregate in the Bering Sea, while females frequent coastal waters off Japan and eastern Russia. Feeds primarily on squid. There is only a single published record of this species in Sonoma County (Bolander and Parmeter 2000). | Not present. Suitable habitat is not present within the project site. |
| bank swallow | *Riparia riparia* | --/ST (nesting) | Nests on earthen banks and bluffs, especially along riverbanks up to 5 feet into the bank. Nests colonially from mid-April to mid-August. Forages over a variety of habitats for flying insects. Drinks water from flight. There are no recently reported occurrences of bank swallow in Sonoma County. Historically, this species may have occurred in Sonoma County during the breeding season. | Not present. Suitable habitat is not present within the project site. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| northern spotted owl | *Strix occidentalis caurina* | FT/SSC | Dense forest habitats in northern California. Requires multi-layered canopy cover for roosting sites. Breeding sites include tree or snag cavities or broken tops of large trees. Nocturnal hunter eating mostly small mammals. Permanent year-round resident in Sonoma County where it is known from breeding occurrences in old-growth and mixed forest habitats. | Low. Suitable habitat is not present within the project site. Species typically occupies multi-layered forested habitats. There are documented occurrences for this species within upland forests approximately 2.5 miles from the site. |
| **Mammals** | | | | |
| pallid bat | *Antrozous pallidus* | --/SSC | Grassland, shrubland, forest, and woodland habitats at low elevations up through mixed coniferous forests. A social species forming small colonies. Roosting sites include caves, mines, crevices, buildings, and hollow trees during day, more open sites used at night. At low elevations, locally common in California. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. Precautionary measures should be in place to avoid impacts. |
| Sonoma tree vole | *Arborimus pomo* | --/SSC | A climbing vole which inhabits coastal coniferous forests. Highly specialized feeders eating only conifer leaves. Within California, feed exclusively on Douglas-fir leaves. Nests constructed 6 to 150 feet above ground, typically in conifers. | Not present. Suitable habitat is not present within the project site. |
| Townsend's big-eared bat | *Corynorhinus townsendii* | --/SSC | Low to mid-elevation mesic habitats including riparian, mixed forest, coniferous forest, prairies, and agricultural lands. Utilizes edge habitat for foraging. Roosting sites include caves, mines, tunnels, buildings, and other man-made structures. Occurs throughout California but distribution not well known. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. There are documented occurrences for this species within 2 miles of the site. Precautionary measures should be in place to avoid impacts. |
| Guadalupe fur seal | *Arctocephalus townsendi* | FT/FT and FP | Resides primarily in tropical waters of southern California and Mexico, but non-breeding individuals have occasionally been seen farther north. Near-shore habitat is typically coastal rocky habitats and caves. | Not present. Suitable habitat is not present within the project site. |
| Steller (=northern) sea lion | *Eumetopias jubatus* | FT/-- | Breeds from northern Channel Islands to north Pacific Ocean. Uncommon along the California coast. Haul-outs and rookeries usually consist of beaches (gravel, rocky or sand), ledges, rocky reefs. | Low. Steller sea lions occur occasionally along the Sonoma Coast. Species may enter the bay on occasion. Precautionary measures should be in place to avoid impacts. |
| western red bat | *Lasiurus blossevillii* | --/SSC | Forages over grasslands, shrublands, open woodlands, and agricultural areas. Roosts in forests and woodlands from low elevations up through mixed coniferous forests. Winters in lowlands and coast areas. Largely solitary. Feeds on moths, crickets, beetles, and cicades. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. Precautionary measures should be in place to avoid impacts. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| hoary bat | *Lasiurus cinereus* | --/-- | Occurs in open habitat or habitat mosaics. Requires medium to large trees for cover and habitat edges and/or open areas for foraging habitat. Tends to be solitary roosting in trees and foliage. Widespread in California except patchy in desert regions. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. Occurrence for this species reported within the project site from 1975; however, location is only approximate. Precautionary measures should be in place to avoid impacts. |
| long-eared myotis | *Myotis evotis* | --/-- | Occurs in woodland and forest habitats but will also use chaparral, coastal scrub, and other shrub habitats. Roosts singly or small groups under bark, bridges, rocks, in buildings, hollow trees, mines, etc. Widespread but uncommon. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. Precautionary measures should be in place to avoid impacts. |
| fringed myotis | *Myotis thysanodes* | --/-- | Occurs in a variety of habitats including deserts, grassland, and woodland habitats. Maternity colonies include caves, mines, crevices, and buildings. Widespread in California except Central Valley and desert regions. | Moderate. Suitable habitat is present within the project site. Bats may utilize the area for foraging and larger trees for roosting. Precautionary measures should be in place to avoid impacts. |
| American badger | *Taxidea taxus* | --/SSC | Occurs in a variety of habitat types (e.g., herbaceous, shrub, or forest habitats) with dry, friable soils. Badgers are carnivorous and dig their own burrows. Consumes primarily fossorial rodents but will also eat reptiles, insects, eggs, birds, and carrion. They are active year-round, although less active in winter. Mating occurs in summer and early fall with young (average 2 to 3) born in early spring. | Moderate. There are known occurrences for this species in coastal grassland habitat near the project site. The project site supports only small portions of suitable habitat; however, precautionary measures should be in place to avoid impacts. |
| **Fish** | | | | |
| tidewater goby | *Eucyclogobius newberryi* | FE/SSC | Small gray-brown fish, rarely exceeding 2 inches in length. Occupies shallow coastal lagoons, brackish marshes, and lower stream reaches with still water along California coast. Breeding occurs in late-spring after sandbars close and conditions are favorable. Nests dug in the substrate. Gobies are an annual species. They feed on mostly small animals. | Low. There are historic occurrences of tidewater goby in Cheney Gulch at the north end of the Bird Walk Coastal Access Park. However, gobies are thought to have been extirpated from there prior to 1984. Gobies may stray into Bodega Harbor on occasion; however, impacts are unlikely. |

Table 1. Special-status Animals or Species of Interest Considered in the Evaluation of the Project Based on the Background Literature Review and Field Surveys

| Common Name | Scientific Name | Listing Status* (Federal/ State) | Description | Potential for Occurrence** within the Project Site and Local Observations |
|---|---|---|---|---|
| longfin smelt | *Spirinchus thaleichthys* | --/ST, SSC | Small fish, rarely exceeding 5 inches in length. Occupies bay and estuaries from San Francisco Bay north. Occurs in bays throughout the summer months before moving to lower reaches of rivers in the fall in preparation for winter and spring spawning. Primary food source is zooplankton. | Moderate. There are known occurrences for this species in the Russian River estuary to the north of the project site. Species may utilize the baylands. Precautionary measures should be in place to avoid impacts. |
| coho salmon-central California coast ESU | *Oncorhynchus kisutch* | FE/SE | Majority of life spent in open ocean. Reproduces in cool freshwater streams. Federal listing applies to naturally spawning populations between Punta Gorda in northern California south to the San Lorenzo River in central California and State listing south of Punta Gorda. | Low. Coho salmon are not known to occur in tributaries to Bodega Harbor. However, species has recently been reintroduced to adjacent watersheds and species may stray into the harbor on occasion. Precautionary measures should be in place to avoid impacts. |
| steelhead-central California coast DPS | *Oncorhynchus mykiss* | FT/-- | Majority of life spent in open ocean. Reproduces in cool freshwater streams. Federal listing applies to all coastal runs from Russian River south to Soquel Creek; it includes San Francisco and San Pablo Bay basins but excludes the Sacramento-San Joaquin Rivers. | High. There are known occurrences for this species in Cheney Gulch at the north end of the Bird Walk Coastal Access Park. Species may utilize the baylands. Precautionary measures should be in place to avoid impacts. |
| Chinook salmon-California coastal ESU | *Oncorhynchus tshawytscha* | FT/-- | Majority of life spent in open ocean. Reproduces in perennial coastal streams and rivers. Includes naturally spawned fish from south of the Klamath River to the Russian River and seven artificially propagated stocks. | Low. Chinook salmon are not known to occur in tributaries to Bodega Harbor. However, species may stray into the harbor. Precautionary measures should be in place to avoid impacts. |

***Listing Status Codes:**

**Federal:**

FE = Listed as endangered (in danger of extinction) by the federal government.

FT = Listed as threatened (likely to become endangered within the foreseeable future) by the federal government.

Candidate = Candidate for listing as threatened or endangered by the federal government.

**State of California (State):**

SE = Listed as endangered by the State of California.

ST = Listed as threatened by the State of California.

SSC = California Species of Special Concern.

FP = Fully protected.

WL = Watch list.

****Potential for Occurrence Definitions:**

Not Present – Suitable habitat is not present within the project area and/or project area is outside the range of the species.

Unknown – Further information is needed to determine potential for species occurrence within the project area.

Low – One or more key habitat components is absent from the project area. Species is unlikely to occur within the project area.

Moderate – Some of the habitat components required by this species are present within the project area and/or marginally suitable habitat is

High – All of the habitat components required by this species are present within the project area and/or it is known to occur in surrounding areas.

Present – Species has reported occurrences within the project area and/or was observed on the project site during field surveys.

# Selected Elements by Scientific Name

## California Department of Fish and Wildlife

## California Natural Diversity Database

| Species | Element Code | Federal Status | State Status | Global Rank | State Rank | Rare Plant Rank/CDFW SSC or FP |
|---|---|---|---|---|---|---|
| **American badger**<br>*Taxidea taxus* | AMAJF04010 | None | None | G5 | S4 | SSC |
| **bank swallow**<br>*Riparia riparia* | ABPAU08010 | None | Threatened | G5 | S2S3 | |
| **black swift**<br>*Cypseloides niger* | ABNUA01010 | None | None | G4 | S2 | SSC |
| **bumblebee scarab beetle**<br>*Lichnanthe ursina* | IICOL67020 | None | None | G2 | S2 | |
| **burrowing owl**<br>*Athene cunicularia* | ABNSB10010 | None | None | G4 | S2 | SSC |
| **California freshwater shrimp**<br>*Syncaris pacifica* | ICMAL27010 | Endangered | Endangered | G1 | S1 | |
| **California red-legged frog**<br>*Rana draytonii* | AAABH01022 | Threatened | None | G4T2T3 | S2S3 | SSC |
| **double-crested cormorant**<br>*Phalacrocorax auritus* | ABNFD01020 | None | None | G5 | S3 | WL |
| **foothill yellow-legged frog**<br>*Rana boylii* | AAABH01050 | None | None | G3 | S2S3 | SSC |
| **fringed myotis**<br>*Myotis thysanodes* | AMACC01090 | None | None | G4G5 | S4 | |
| **globose dune beetle**<br>*Coelus globosus* | IICOL4A010 | None | None | G1 | S1 | |
| **great blue heron**<br>*Ardea herodias* | ABNGA04010 | None | None | G5 | S4 | |
| **hoary bat**<br>*Lasiurus cinereus* | AMACC05030 | None | None | G5 | S4? | |
| **long-eared myotis**<br>*Myotis evotis* | AMACC01070 | None | None | G5 | S4? | |
| **longfin smelt**<br>*Spirinchus thaleichthys* | AFCHB03010 | None | Threatened | G5 | S1 | SSC |
| **Marin hesperian**<br>*Vespericola marinensis* | IMGASA4140 | None | None | G2G3 | S2S3 | |
| **mimic tryonia (=California brackishwater snail)**<br>*Tryonia imitator* | IMGASJ7040 | None | None | G2G3 | S2S3 | |
| **monarch butterfly**<br>*Danaus plexippus* | IILEPP2010 | None | None | G5 | S3 | |
| **Myrtle's silverspot**<br>*Speyeria zerene myrtleae* | IILEPJ6089 | Endangered | None | G5T1 | S1 | |
| **osprey**<br>*Pandion haliaetus* | ABNKC01010 | None | None | G5 | S3 | WL |
| **pallid bat**<br>*Antrozous pallidus* | AMACC10010 | None | None | G5 | S3 | SSC |

| Species | Element Code | Federal Status | State Status | Global Rank | State Rank | Rare Plant Rank/CDFW SSC or FP |
|---|---|---|---|---|---|---|
| **rhinoceros auklet**<br>*Cerorhinca monocerata* | ABNNN11010 | None | None | G5 | S3 | WL |
| **San Bruno elfin butterfly**<br>*Callophrys mossii bayensis* | IILEPE2202 | Endangered | None | G4T1 | S1 | |
| **Sonoma tree vole**<br>*Arborimus pomo* | AMAFF23030 | None | None | G3 | S3 | SSC |
| **steelhead - central California coast DPS**<br>*Oncorhynchus mykiss irideus* | AFCHA0209G | Threatened | None | G5T2Q | S2 | |
| **tidewater goby**<br>*Eucyclogobius newberryi* | AFCQN04010 | Endangered | None | G3 | S2S3 | SSC |
| **Townsend's big-eared bat**<br>*Corynorhinus townsendii* | AMACC08010 | None | None | G4 | S2S3 | SSC |
| **tricolored blackbird**<br>*Agelaius tricolor* | ABPBXB0020 | None | None | G2G3 | S2 | SSC |
| **tufted puffin**<br>*Fratercula cirrhata* | ABNNN12010 | None | None | G5 | S2 | SSC |
| **western pond turtle**<br>*Emys marmorata* | ARAAD02030 | None | None | G3G4 | S3 | SSC |
| **western red bat**<br>*Lasiurus blossevillii* | AMACC05060 | None | None | G5 | S3? | SSC |
| **western snowy plover**<br>*Charadrius alexandrinus nivosus* | ABNNB03031 | Threatened | None | G4T3 | S2 | SSC |
| **western yellow-billed cuckoo**<br>*Coccyzus americanus occidentalis* | ABNRB02022 | Candidate | Endangered | G5T3Q | S1 | |

**Record Count: 33**

# U.S. Fish & Wildlife Service
# Sacramento Fish & Wildlife Office
## Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the BODEGA HEAD (503D) U.S.G.S. 7 1/2 Minute Quad

Database last updated: September 18, 2011
Report Date: April 29, 2013

## Listed Species

### Invertebrates

Haliotes cracherodii
black abalone (E) (NMFS)

Haliotes sorenseni
white abalone (E) (NMFS)

Speyeria zerene myrtleae
Myrtle's silverspot butterfly (E)

Syncaris pacifica
California freshwater shrimp (E)

### Fish

Eucyclogobius newberryi
critical habitat, tidewater goby (X)
tidewater goby (E)

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)
Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
California coastal chinook salmon (T) (NMFS)

### Amphibians

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
green turtle (T) (NMFS)

Dermochelys coriacea
leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Birds

Brachyramphus marmoratus
marbled murrelet (T)

Charadrius alexandrinus nivosus
Critical habitat, western snowy plover (X)
western snowy plover (T)

Diomedea albatrus
short-tailed albatross (E)

Pelecanus occidentalis californicus
California brown pelican (E)

Strix occidentalis caurina
northern spotted owl (T)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus

blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Eubalaena (=Balaena) glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Plants

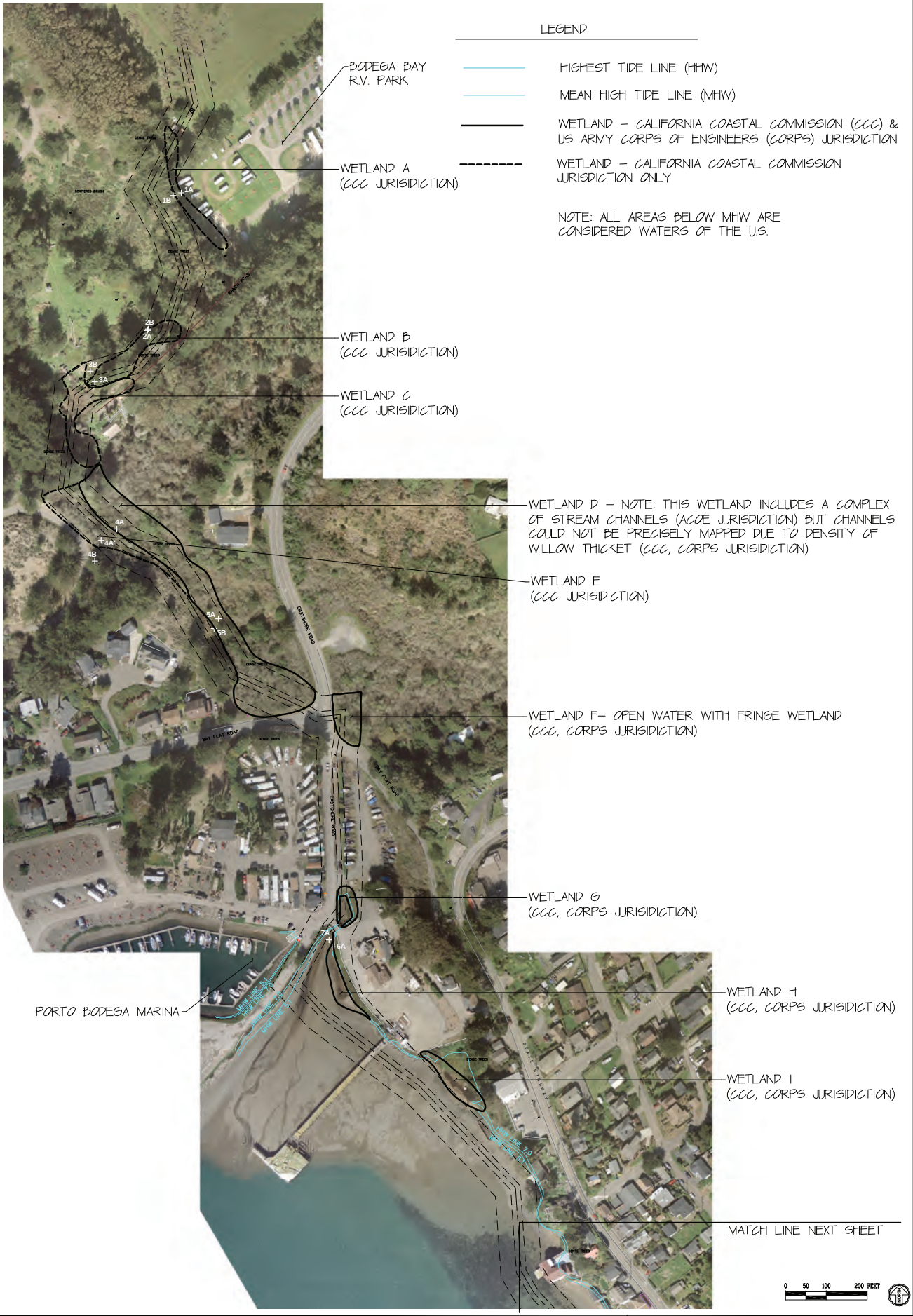
Delphinium luteum
Critical habitat, yellow larkspur (X)
yellow larkspur (E)

Lupinus tidestromii
clover lupine [Tidestrom's lupine] (E)

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## Key:

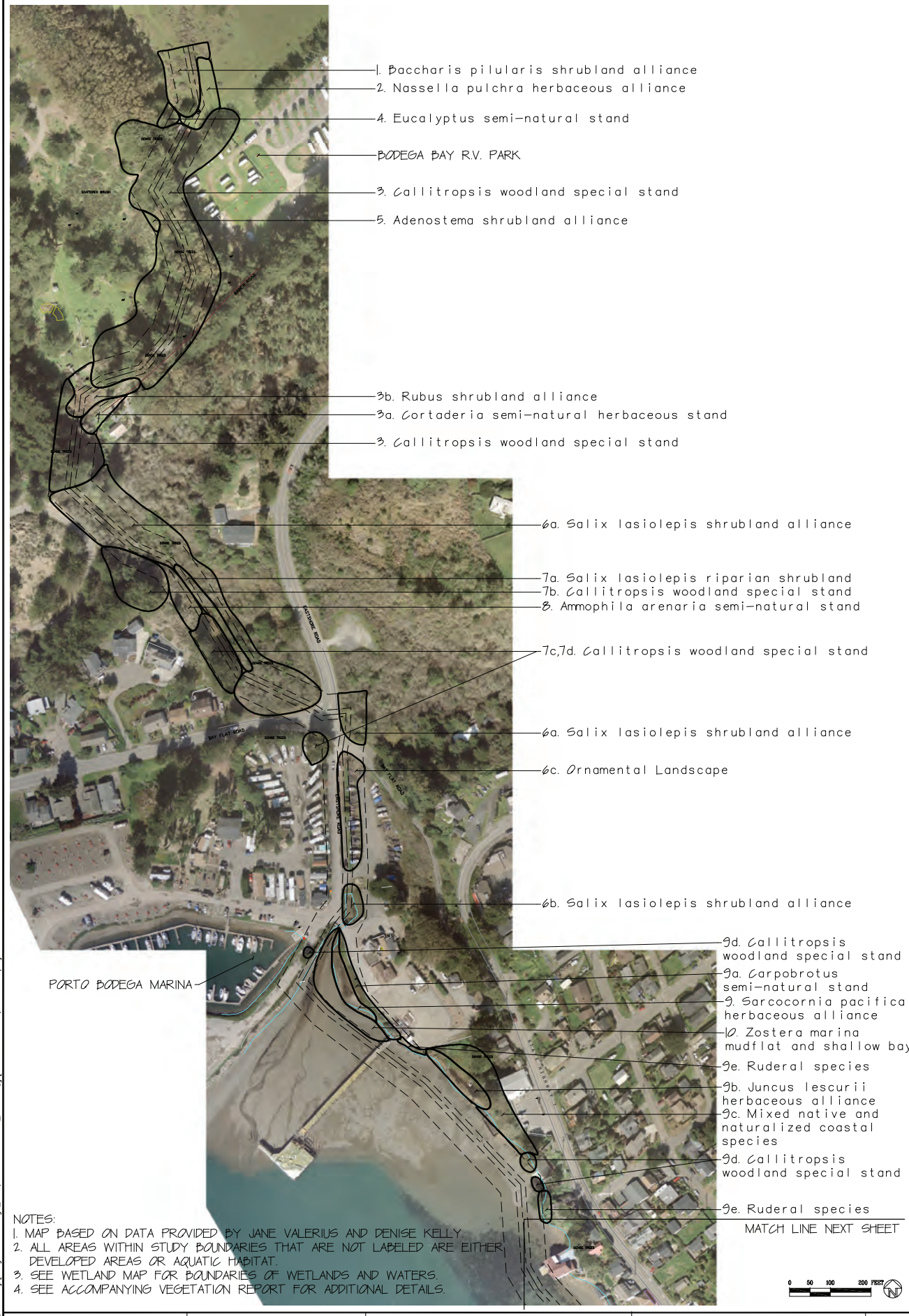
- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species




| | | | |
|---|---|---|---|
| **PRUNUSKE CHATHAM, INC.**<br>400 MORRIS STREET, SUITE G<br>SEBASTOPOL, CA 95472<br>(707) 824-4600 | DATE: 01/04/12<br>SCALE: 1"= 100'<br>CHECKED BY: JS<br>DRAFTED BY: JP/LW | PREPARED FOR:<br>**SONOMA COUNTY REGIONAL PARKS** | **NORTH HARBOR COASTAL TRAIL AND HARBOR COASTAL TRAIL CORPS AND CCC WETLAND MAP** | FIGURE **4** |

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[AutoCAD file names: G:\ACAD Drawings\Misc Small Jobs\SCRP Harbor Coastal Trail\dwg\SCRP Wetland Map.dwg ]
[Xref files: topo_091010 ] [Image files: Bodega_2010; CP Trail 08-070_Extended;] [Plot Date:Jan 04, 2012 1:56pm]




NOTES:
1. MAP BASED ON DATA PROVIDED BY JANE VALERIUS AND DENISE KELLY.
2. ALL AREAS WITHIN STUDY BOUNDARIES THAT ARE NOT LABELED ARE EITHER DEVELOPED AREAS OR AQUATIC HABITAT.
3. SEE WETLAND MAP FOR BOUNDARIES OF WETLANDS AND WATERS.
4. SEE ACCOMPANYING VEGETATION REPORT FOR ADDITIONAL DETAILS.


**PRUNUSKE CHATHAM, INC.**
400 MORRIS STREET, SUITE G
SEBASTOPOL, CA 95472
(707) 824-4600


DATE: 01/04/12
SCALE: 1"=100'
CHECKED BY: JS
DRAFTED BY: LW/JP

PREPARED FOR:
SONOMA COUNTY REGIONAL PARKS

# NORTH HARBOR COASTAL TRAIL AND HARBOR COASTAL TRAIL HABITAT MAP

FIGURE 7

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[AutoCAD file names: G:\ACAD Drawings\Misc Small Jobs\SCRP Harbor Coastal Trail\dwg\SCRP Habitat Map.dwg ]
[Xref files: topo_091010 ] [Image files: Bodega_2010; CP Trail 08-070_Extended;] [Plot Date:Jan 04, 2012 2:00pm]

# B Cultural Resources

(none found in study area)

# C Geology/Soils

# GEOTECHNICAL INVESTIGATION

## BODEGA HARBOR COASTAL TRAIL
## BODEGA BAY, SONOMA COUNTY, CALIFORNIA

Project Number 12174.02

BACE GEOTECHNICAL
A Division of Brunsing Associates, Inc.

DRAFT

**April 7, 2011**

# GEOTECHNICAL INVESTIGATION

## Bodega Harbor Coastal Trail
## Bodega Bay, Sonoma County, California

Project Number: 12174.02

prepared for

Sonoma County Regional Parks Department
2300 County Center Drive, #120 A
Santa Rosa, CA 95403

prepared by

BACE Geotechnical
Division of Brunsing Associates, Inc.
5468 Skylane Blvd., Suite 201
Santa Rosa, CA 95403
(707) 528-6108

April 7, 2011

DRAFT

Sarah C. Lockwood
Professional Geologist - 8742

Keith A. Colorado
Geotechnical Engineer – 2894

Erik E. Olsborg
Engineering Geologist – 1072

Gary F. Sitton
Geotechnical Engineer – 784

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## 1.0 INTRODUCTION

This report by BACE Geotechnical, a division of Brunsing Associates, Inc. (BAI) presents the results of our geotechnical investigation for the Bodega Harbor Coastal Trail in Bodega Bay, California. This report has been prepared for the Sonoma County Regional Parks Department (SCRPD), Project Manager, Mr. Joseph Kase, Park Planner II. The SCRPD's Request For Proposals (RFP), was emailed to BAI on September 30, 2010, and subsequently modified through emails on October 7, 13, and November 8, 2010. The planned trail location is shown on the Vicinity Map, Plate 1.

According to Exhibit A of the RFP, the planned trail will extend along the easterly shoreline of Bodega Harbor from the Cheney Creek Bridge Trail, at the south, to State of California, Bodega Dunes Campground connecting to Coastal Prairie Trail, at the north. The planned trail will partially be paved along road shoulders, and partially be an elevated boardwalk in mudflat and dune areas. The proposed boardwalk location is shown on the Area Geologic Map – North, - Central, and – South, Plates 2A, 2B, and 2C, respectively.

The scope of our services, as outlined in our Proposal dated November 9, 2010, consisted of researching published geologic maps and BAI's previous file data on projects in the site vicinity, subsurface exploration, laboratory testing, and engineering and geologic analyses, in order to provide conclusions and recommendations regarding:

- Geologic hazards;
- Soil, bedrock and groundwater conditions encountered;
- Suitable foundation type(s) with design criteria and estimated settlement behavior;
- Seismic design criteria per California Building Code (CBC), 2010 edition;
- Site preparation and grading;
- Pavement design section for asphalt paved areas;
- Anticipated geotechnical construction problems, if appropriate.

Our services were performed under a Request for Consulting Services (RFCS), dated November 18, 2010, per our Agreement for Professional Services dated June 16, 2009, amended September 1, 2010. Our RFCS was modified on January 13, 2011, to compensate for our slower use of hand sampling tools instead of portable drilling equipment (not allowed in the mudflats by California Coastal Commission and North Coast Regional Water Quality Control Board).

## 2.0 INVESTIGATION AND LABORATORY TESTING

### 2.1 Research

Prior to awarding us the RFCS, SCRPD provided the following Consultant reports to BAI:

- Report, Soil Investigation, Proposed Cheney Gulch Pedestrian Bridge, Bodega Bay, California, December 24, 1996, prepared by Giblin Associates

- Geotechnical Investigation Report, Coastal Prairie Trail, Bodega Bay, California, February 25, 2009, prepared by Questa Engineering Corporation.

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As part of our reconnaissance, we reviewed the following published geologic maps and references:

- Blake, M.C., Jr., Terry-Smith, J., Wentworth, C.M., and Wright, R.H., 1971, Preliminary Geologic Map of Western Sonoma County and Northernmost Marin County, California: United States Geological Survey San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contribution 12.
- Bryant, W.A., and Hart, E.W., 2007 Interim Revision, Fault Rupture Hazard Zones in California: Alquist-Priolo Earthquake Fault Zoning Act with Index to Fault Zones Maps: California Geological Survey (CGS), Special Publication 42.
- California Division of Mines and Geology (CDMG), 1998, Uniform Building Code, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada: International Conference of Building Officials (ICBO).
- Geologic Map of the Santa Rosa Quadrangle, 1982, CDMG.
- Huffman, M.E., and Armstrong, C.F., 1980, Geology for Planning in Sonoma County: California Division of Mines and Geology Special Report 120.
- Slosson, J.E., 1974, State of California Special Studies Zones: CDMG, Bodega Head 7.5-minute Quadrangle.
- Wagner, D.L., and Bortugno, E.B., 1982, Geologic Map of the Santa Rosa Quadrangle: California Division of Mines and Geology (CDMG) Regional Geologic Map Series Map No. 2A.

We also obtained oblique-angle aerial photographs from the California Coastal Records Project (www.californiacoastline.org). We qualitatively compared photographs of the site from 1972, 1979, 1987, 2002, 2005, and 2009. Because the project site is located inside an enclosed harbor, wave erosion is relatively slow relative to sites experiencing constant ocean (wind and swell) wave action.

## 2.2 Field Reconnaissance

BAI's Principal Engineering Geologist and Senior Geotechnical Engineer first visited the site on October 7, 2010, to gain a perspective on what tide level conditions would be necessary for the different phases of the investigation. Additional reconnaissances were performed by our Principal and/or Project Engineering Geologists, on November 24, December 1 and 3, 2010, and January 17 and 25, 2011 to look at possible drill sites and the site vicinity geologic conditions. Our field reconnaissance consisted of examination of bedrock and soil exposed on the lower bluffs and the lower (tidal zone) terrace. Our Principal Engineering Geologist returned to the site on March 1, 2011 to map areas of exposed bedrock along the shoreline during a low tide of 0.0 feet, per published tide tables.

During a previous investigation (July 3, 2007) for a residential property in Bodega Harbor, BAI's Staff Geologist and Project Engineer performed a field reconnaissance during a minus one-foot tide. They measured site surface topographic profiles from an existing house extending into the tidal mud zone. They excavated several hand-dug test pits in order to create a subsurface, depth-to-rock profile extending 50 feet out into the tidal mud. They combined our subsurface data with the topographic profile and surface observations to create a geologic cross section. The location

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of our profile is shown on the Area Geologic Map, Plate 2B. Geologic Cross Section A-A' is presented on Plate 3.

## 2.3 Subsurface Exploration

Our subsurface drilling exploration was conducted on December 1, 2, and 3, 2010, and January 17, 25, and 26, 2011. Light, portable drilling equipment was used for the test borings at the dredge storage pond embankment; along Smith Brothers Road; on the highway embankment in front of Lucas Wharf; within easements on Porto Bodega property; and in the sand dunes north of Bay Flat Road. Hand drilling and sampling tools were used in the mudflats between Lucas Wharf, Tides Wharf, and Porto Bodega. Our Staff Geologists prepared a descriptive log of the test borings and obtained samples of the soil and rock materials encountered for visual classification and laboratory testing.

Relatively undisturbed tube samples of the soil and rock materials encountered were obtained using a 3-inch or 2-1/2-inch outside diameter California modified split-barrel sampler, or a 2-inch outside diameter "Standard Penetration Test" (SPT) sampler. The samplers were driven by a 70-pound drop hammer falling 30 inches per blow. The inside of the 3-inch outside diameter sampler barrel contained 2.4-inch inside diameter liners for retaining the soil and rock materials; the inside of the 2-1/2-inch sampler barrel contained 2-inch diameter liners, and the SPT sampler contained 1.4-inch inside diameter liners. The blows required to drive the 3-inch and 2-1/2-inch samplers were converted to equivalent SPT blow counts for correlation with empirical test data. Sampler penetration resistance ("blow count") provides a relative measure of soil/rock consistency and strength. At the end of our subsurface exploration, the test borings were backfilled with drill cuttings.

The test boring locations are shown on the Area Geologic Map – North, - Central, and – South, Plates 2A, 2B, and 2C, respectively. Graphic logs of the test boring, showing the various soil and rock types encountered, and the depths of the samples taken, are presented on Plates 4 through 36. The soils are classified in accordance with the Unified Soil Classification System outlined on Plate 37. The various descriptive properties used to describe the soils are listed on Plate 38, and the rock descriptive properties used to describe the rock materials are listed on Plate 39.

## 2.4 Laboratory Testing

Selected samples obtained during our subsurface drilling exploration were tested in our laboratory to evaluate their pertinent geotechnical engineering characteristics. Laboratory testing consisted of grain-size classification (sieve analysis), moisture content-dry density, and unconsolidated-undrained triaxial compression tests. The test results are presented opposite the samples tested on the test boring logs (see Key to Test Data on Plate 37). In addition, triaxial compression test data are presented on Plates 40 and 41.

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## 3.0 SITE CONDITIONS

Bodega Harbor is an enclosed body of water on the Sonoma County coast. The mainland is on the northeast side of the harbor. Sand dunes are on the northwest and west sides of the harbor. A narrow sand spit (Doran Beach) encloses the harbor on the south. The harbor opens to the ocean at the southwest end at Campbell Cove, between Bodega Head peninsula to the west-southwest, and Doran Beach. The Bodega Harbor navigation channel extends north-south along the west side of the harbor. It channel has two, rip rap (large rock) jetties where it meets the ocean, and a wide turning area at the north end near Porto Bodega. The navigation channel then runs southeast just offshore of the shoreline.

A few deep-water areas do exist, mostly at the north-northwest end of the harbor and the navigation channel. The rest of the harbor consists of mud flats that are exposed at low tides. The mudflats surround the navigation channel along the northeast shoreline.

The southeast end of the proposed trail will connect with the Bird Walk Coastal Access Trail along the dredge spoil storage pond embankment. The trail will then go alongside the Highway 1 Right of Way to Smith Brothers Road. The trail will continue along the outer, westerly shoulder of Smith Brothers Road, before entering the Lucas Wharf property. The trail will either stay within the Lucas Wharf parking lot, or go around on the inside of the Highway 1 embankment fill. The highway embankment alternative would require a crossing at the driveway entrance to the Lucas Wharf property from Highway 1.

After leaving Lucas Wharf, the trail will go out over the mudflats up to the Tides Wharf, as shown on Site Photographs A and B, C and D, E and F, and G, Plates 42, 43, 44, and 45, respectively. Site Photographs C and D, Plate 43, show an area previously (2007) investigated by BAI during a high tide of + 6.3 feet and a low tide of – 1.1 feet, respectively.

The trail will then either go through the Tides parking lot, or around (adjacent to) the westerly side of the Tides buildings. The westerly alignment alternative (Site Photographs H and I, Plate 45) will place the trail just within the deep, navigation channel. North of the Tides Wharf (Site Photographs J, K, and L, Plate 46), the trail will cross the mudflats to the front of a dilapidated warehouse with a paved parking area. The long, rectangular warehouse extends from the land out to the navigation channel.

Site Photographs M and N, Plate 47, show the area north of the warehouse. The trail continues across the mudflats up past a house (1159 Highway 1) with an elevated deck that extends out to a deep-water area (Site Photographs O and P, Plate 48. Site Photographs Q and R, and S, Plates 49 and 50, show the area just south of Porto Bodega. Photograph T, Plate 50, shows test boring being "drilled" for the southerly bridge abutment at Johnson Creek on the south side of Porto Bodega. Site Photograph U, Plate 50, shows the trail area within the sand dunes north of Bay Flat Road. The trail continues through the grass, brush and tree-covered sand dunes, crossing` several creek channels up to the amphitheater vicinity at Bodega Dunes campground.

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## 4.0 SITE GEOLOGY AND SOIL CONDITIONS

### 4.1 Regional Geologic and Seismic Setting

The bedrock in this part of the Sonoma County coastal area, within and east of the San Andreas Fault zone, is comprised of sedimentary and volcanic rocks of the Cretaceous-Jurassic Period Franciscan Complex. According to the geologic references we reviewed, these rocks consist of graywacke sandstone and shale with lesser amounts of greenstone, conglomerate, chert, and limestone. The coastal bedrock has been carved into a series of steps, or terraces, during the Pleistocene Epoch when sea level fluctuations were caused by periods of glaciation. Sediments, comprised mostly of sand and silt, with some gravel and clay, were deposited on the generally flat terrace surfaces while they were submerged by the elevated sea levels. Marine terrace deposits typically mantle the coastal bedrock terraces in this region. Highway 1 is on the most recently-uplifted marine terrace in Bodega Bay. The proposed trail will be on the younger, modern wave-cut platform within the harbor tidal flats.

The seismicity and tectonics of the Sonoma County Coastal region are controlled by a network of generally northwest-trending strike-slip faults of the San Andreas Fault Zone. The proposed trail will cross several active traces of the San Andreas Fault (north coast segment), which runs directly through Bodega Bay. Movement on the fault is responsible for creating Bodega Bay by moving Bodega Head (island) northward to form a peninsula with sand trapped from Salmon Creek.

The San Andreas Fault Zone forms the boundary between the Pacific and North American tectonic plates. The east side of Bodega Harbor is on the southeasterly moving (relatively) North American plate. The west side of Bodega Harbor, including Bodega Head, is on the northwesterly moving Pacific Plate. Cretaceous granitic rocks of the Salinian Block comprise this portion of the Pacific Plate. Bodega Head is comprised of these Salinian Block, grantic rocks, as are Point Reyes, Tomales Point, Cordell Bank and the Farallon Islands.

The active Point Reyes Fault is located approximately 14 miles southwest of the site. The active Rodgers Creek Fault is located approximately 20 miles northeast of the site. Future, large magnitude earthquakes originating on the San Andreas, or other nearby faults are expected to cause strong ground shaking at the site.

Many active faults are complex, and movement (including surface rupture or warping) is actually distributed among multiple branches, or across a zone. As explained by the California Geological Survey:

> "Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1992 Landers Earthquake, in San Bernardino County, extended for 50 miles with displacements of an inch to 20 feet. Not all earthquakes result in surface rupture. The Loma Prieta Earthquake of 1989 caused major damage in the San Francisco Bay Area but the movement deep in the earth did not break through to the surface.

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"Fault rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking."[1]

## 4.2 Site Geology and Soils

### 4.2.1 Geology and Native Soils

The rock outcrops we observed in the tidal flats and within the bluff face are consistent with the mapped Franciscan Complex sandstone, shale and greenstone (altered basalt). The upper sandstone is tan to brown, and is generally closely fractured, moderately hard to hard, and deeply weathered. The lower sandstone in the tidal zone is dark gray, little to closely fractured, friable to very hard, and little to moderately weathered. The brown deeply weathered sandstone tends to form steep slopes, but its susceptibility to erosion is greater than the underlying gray, little weathered sandstone that forms the very steep to near vertical portions of the lower bluff face. The change in sandstone color occurs at the approximate high tide line on the bluff face. The gray little weathered sandstone and greenstone observed in the lower part of the bluff face also crops out within the tidal flats.

The bluff top along the easterly side of the harbor, above and below Highway 1, is mantled with a few feet to several tens of feet of poorly consolidated, Pleistocene marine terrace deposits. The terrace deposits consist of yellow to tan silty sands and sandy silts that are medium dense/medium stiff. Terrace deposits were encountered beneath the sand dunes at depths of approximately 13, 3.5, and 6 feet below ground surface (bgs) in our Test Borings B-22, B-23, and B-24, respectively.

Holocene mud (soft sandy silt and loose silty sand) covers the tidal flats in Bodega Harbor. Close to the bluff toe, the mud zone is covered with gravels and strewn with occasional larger cobbles. Bedrock outcrops are common within the mudflats near the bluff toe, as shown on Plate 2. With increased distance from the bluff toe, fewer outcrops, gravels and cobbles are exposed and the mud layer increases in thickness (Plate 3).

Alluvial fan deposits are present at the mouth of Johnson Creek near Porto Bodega. These deposits are very loose to medium dense. The depth of these fan deposits could not be determined by our hand sampling equipment.

The bay mud thickness (depth to bedrock) varies from zero (rock outcrop areas) to over approximately 13 feet (previously disturbed area north of Tides Wharf) The Bay mud (and fill) thicknesses encountered in our borings are as follows:

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1 California Geological Survey. "Alquist-Priolo Earthquake Fault Zones." 2010. http://www.conservation.ca.gov/cgs/rghm/ap/index.htm#what_is_rupture>

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| Test Boring | Bay mud thickness (feet) | Fill Thickness (feet) |
|---|---|---|
| B-1 | N/A * | 7.5 |
| B-2 | N/A | 4.25 |
| B-3 | N/A | 3.5+ |
| B-4 | 4.5 | 0.0 |
| B-5 | 0.5 | 0.0 |
| B-6 | 2.0 | 0.0 |
| B-7 | 1.25 | 0.0 |
| B-8 | 12.0 | 6.5 |
| B-9 | 2.5 | 0.0 |
| B-10 | 0.5 | 0.0 |
| B-11 | N/A | 5.5 |
| B-12 | N/A | 6.5 |
| B-13 | N/A | 1.75 |
| B-14 | 13.0 (?) | 4.5 (?) |
| B-15 | 2.75 | 5.25 |
| B-16 | 4.0 | 0.0 |
| B-17 | N/A | 5.75 |
| B-18 | N/A | 8.25 |
| B-19 | 4.0 | 0.0 |
| B-20 | 14.0 (?) | 6 (?) |
| B-21 | N/A | 6 (?) |
| B-22 | N/A | 4.0 (?) |
| B-23 | N/A | 0.0 |
| B-24 | N/A | 0.0 |
| B-25 | 2.0 (?) | 8.0 (?) |
| B-26 | N/A | 6 (?) |
| B-27 | N/A | 2+ |

* N/A denotes boring outside of mudflats

4.2.2 Fill Soils

Man-placed fill soils, including riprap (large rocks), are present in localized areas along the proposed trail route. The south end of the trail starts at the fill embankment for the dredge spoil storage pond. From there, the trail goes along the fill shoulders of Highway 1 and Smith Brothers Road. The trail through Lucas Wharf may go through their parking lot, or along the Highway 1 fill embankment. Minor fills and scattered debris are located between Lucas and Tides Wharves.

The area between Tides Wharf and the dilapidated wharehouse appears to have been graded (dredged and/or filled) in the not too distant past. A small, southwest-trending, riprap covered "peninsula" is located between two areas that have been previously excavated. North of the dilapidated wharhouse, there are minor fills and scattered debris. Significant fills are associated with the Porto Bodega development. Except for areas near the northeasterly bluffs, much of Porto Bodega has a cover of fill soils from past grading, marina dredging and filling, and/or

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utility installations. Additional areas disturbed by grading and/or past fill placement were found in the northerly dune areas, as indicated by our borings.

## 5.0 GEOLOGIC HAZARDS

### 5.1 Seismicity

The trail area is located in a region of high seismic activity associated with the San Andreas Fault System. Future, large magnitude earthquakes on the San Andreas Fault, and/or other, nearby faults, are expected to cause strong ground shaking at the site. The amount of shaking will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the materials underlying the site.

With an average of only a few feet of bay mud over weathered rock, the potential effects of earthquake-induced liquefaction or lurching along the trail route within the harbor, should be minimal. It should be possible for future boardwalk foundations to avoid areas of thickened fill or mud that may have a liquefaction or lurching potential.

The south abutment area of the bridge over Johnson Creek near Porto Bodega is underlain by alluvial fan deposits of uncertain thickness. These very loose to medium dense fan deposits are prone to liquefaction.

Portions of the trail within the northerly dunes underlain by loose sands may be prone to densification (above the water table), liquefaction (below the water table), or lurching (lateral movement toward a creek channel) during a seismic event. The dredge spoil pond embankment fill is comprised of loose to medium dense silty and clayey sands and soft, sandy clay. These fill soils are underlain by medium stiff clay over loose to very loose clayey and clean (little or no clay or silt) sands. The dredge spoil embankment and the underlying native soils are prone to liquefaction and/or lurching during a strong seismic event.

### 5.2 Faulting

According to the geologic references we reviewed, the proposed trail is located within an "Earthquake Fault Zone", as identified and mapped pursuant to the requirements of the Alquist-Priolo Fault-Zoning Act of 1972. The main purpose of the Act is to prevent structures from being built across traces of active faults. The fault rupture hazard posed to a structure sited astride an active fault cannot be mitigated except by relocation of the structure.

We did not observe evidence of fault rupture within the shallow bedrock exposed in the mudflats or lower bluffs. Some signs of past fault rupture include sudden change in depth to bedrock, loss of continuity within the rock unit, sheared or stair-stepped zones, and/or the presence fault gouge or clay seams. We did not observe signs of surface offset or shearing in the bedrock exposed on the bluffs or in the mudflats.

Our undersigned Principal Engineering Geologist, Erik E. Olsborg, has performed numerous fault studies throughout the Bodega Bay area over the last 30+ years. He uncovered the 1906

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ruptured trace of the San Andreas Fault near Porto Bodega in 1985. The approximate locations of the trenches excavated by Mr. Olsborg for fault investigations in the Bodega Bay vicinity are shown on Plate 51. The location of the active San Andreas Fault trace found during previous investigations is shown on Plate 2A.

### 5.3 Wave Run-up Hazard

In order to determine the hazard presented by wave action to a previous project located between Lucas Wharf and Tides Wharf, BAI's subconsultant evaluated the wind wave conditions at the site. For their evaluation, BAI's subconsultant utilized site profiles and depth-to-bedrock data surveyed by BAI (Plate 3). The results of their evaluation are summarized below.

## 6.0 CONCLUSIONS

### 6.1 General

Based on the results of our investigation, including our previous fault rupture and wave run-up analyses (presented below), we conclude that the site is geotechnically suitable for the proposed trail. However, as with most harbor/bluff sites, some risk of instability exists and must be accepted by the property owner. The current standard of practice in geotechnical engineering makes it possible to identify most areas of existing instability, and/or to make recommendations which lower the risk of instability to levels that are generally acceptable, but cannot make total assurances of mitigating possible future instability.

### 6.2 Seismicity

Generally, wood-framed structures, such as an elevated boardwalk, founded in firm earth materials, and designed in accordance with current building codes, are well suited to resist the effects of ground shaking. A major earthquake on this segment of the San Andreas Fault is not expected for another approximately 200 years, given the established recurrence rate of 300 years. However, given the uncertainties of fault rupture hazards, a major earthquake could occur at any time.

Densification, liquefaction, and/or lurching potential is practically unavoidable in the northerly dunes, the south abutment area of Johnson Creek, and the dredge spoil pond embankment (where a park trail currently exists). Careful project design can minimize earthquake damage, but cannot eliminate damage entirely without unreasonable construction expense. An earthquake strong enough to damage a well-constructed trail or boardwalk is likely to also cause widespread damage to area buildings, roads, bridges, and utilities. Other than moving the trail out of the harbor, away from the fault zone, there is little that can be done to eliminate the risk of damage during an earthquake.

One specific area that could be subject to liquefaction or lurching is the south abutment area near Johnson Creek. This area should be avoided by moving the abutment to the south (increasing the bridge span length), or by moving the abutment closer to the driveway fill pad alongside the former Sandpiper Restaurant site. With regard to the dredge spoil pond embankment and dune

areas, BAI, in consultation with the project designer and/or structural engineer will decide if further analysis is needed when specific pier bent locations are determined.

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### 6.3 Fault Rupture

Based on our previous investigations, the proposed trail will cross an active trace of the San Andreas in at least three locations. One such crossing is at the southeast end of Porto Bodega; another is at the intersection of Eastshore and Bay Flat Roads, and the third is in the northerly sand dunes. The location of the fault trace in the southeasterly Porto Bodega vicinity could be further defined by additional trenching. However, the trench would have to be excavated outside of fill and/or bay mud areas, placing the trench on Porto Bodega property.

The active fault trace in the Eastshore and Bay Flat Roads intersection can be avoided by crossing Bay Flat Road on the west side of the intersection. However, since this section of the trail will be "at-grade" (not elevated), the fault rupture risk will be no greater than for the adjacent roadways.

The fault crossing in the northerly dunes can be visually estimated in the field as being located within the creek channel in that area (see Plate 2A). However, the fault can't be precisely located by trenching due to the presence of environmentally sensitive areas within the fault zone. Assuming the active fault trace lies within or very close to the creek channel, a bridge structure could be designed to span the fault zone using special design features to minimize damage due to surface fault rupture.

The extreme proximity of the site to the main trace of the San Andreas Fault continues to be a significant geologic hazard. Because over 100 years have lapsed since the last significant earthquake causing surface rupture in the area of Bodega Bay, the probability of a large magnitude earthquake occurring on this segment of the San Andreas Fault can't be disregarded. As discussed in Section 4.1 of this report, surface fault rupture is more likely to occur on pre-existing surface traces, so avoidance of the known traces or structural mitigation in those areas is recommended.

### 6.4 Wave Run-up

In general, the site is located inside a harbor that is protected from open ocean swells and storm waves. Wave action is limited to wind waves generated within the harbor. The fetch lengths within the harbor (distance over water that winds can generate waves) for the northeastern shore are relatively short. According to our subconsultant's previous wave evaluation report, predicted wave heights coming from the principal wind directions range from 1.5 feet up to 1.8 feet, for return periods from 25 years to 100 years. These wave heights must be combined with the stillwater or tide level to estimate the wave runup level. Their report concludes that at or above 11 feet above Mean Lower-Low Water (MLLW), there is a "low likelihood of annual highest tides, combining with lesser return period waves, causing wave runup exposure." Taking into account the projected effects of sea level rise, structural elements at or below 12 feet above MLLW should be designed to resist wave runup action. The proposed boardwalk at or near this

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elevation should be designed to resist possible wave uplift forces. A wave evaluation report update should be performed during the design phase of this project.

### 6.5 Tsunami Potential

The harbor is protected from tsunamis by the narrow outlet channel and supporting jetty. However, there is a very remote possibility that a large tsunami wave could wash over Doran Beach and enter Bodega Harbor from the south or wash over at Horseshoe Cove and enter from the west. Assuming a 60-foot high tsunami wave (Pt. Cabrillo Lighthouse north of Mendocino was hit by an approximately 60-foot high storm wave in February, 1960) the proposed boardwalk, as well as most other facilities in low-lying areas within Bodega Harbor could be severely damaged. To help mitigate this concern the trail should adheres to current building codes.

## 7.0 RECOMMENDATIONS

### 7.1 Boardwalk Foundations

#### 7.1.1 General / Construction Considerations

Boardwalk foundations should be supported in firm soil or weathered rock beneath existing, weak fill soils or bay mud using cast-in-drilled-hole piers or driven piles. Regardless of foundation type, there should be no concrete cold joints below the boardwalk soffit. Certain boardwalk construction methods may work in some areas, but not in other areas. Hard rock masses and areas of thick, soft soil deposits that are locally present should be avoided by selective positioning of boardwalk pier bents. Site-specific geotechnical evaluations during the design phase are recommended to delineate such areas.

Additional considerations:

- Timing will be of the essence while working between tides. Areas near shore can be worked at low tides; further out, minus tides will be necessary.
- Excavation spoils should be contained to prevent sediment runoff into the harbor. A vacuum rig may be needed to pick up the spoils from the foundation excavation operations, and for dewatering of pier holes during concrete placement.
- Construction equipment will sink into the soft bay muds. Temporary mats or booms will be needed for access. Contractors should anticipate equipment damage from the salt-water environment.
- In the dune sand areas, temporary casing of holes during pier drilling, or wetting of the upper loose sands, may be necessary to prevent caving.

#### 7.1.2 Drilled Piers

Support for the proposed structure can be obtained using a cast-in-drilled-hole (CIDH) concrete pier and grade beam foundation system. Piers should be a minimum of 12 inches in diameter (18 inches for easier clean-out) and spaced no closer than three pier diameters, center to center. The piers should penetrate a minimum of four feet into supporting material, as identified by BAI.

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The bay mud and upper, weak fill soils should be neglected for support. BAI should verify pier depths in the field.

Support for the piers may be gained from skin friction resistance as shown in Table 1 for dead plus live loads. For total downward loads, including wind, wave or seismic forces, the pier capacity can be increased by one-third. Uplift frictional capacity for piers should be limited to 2/3 of the allowable downward capacity. Both downward and uplift frictional capacity should be neglected in the weak near-surface zones.

**Table 1**

| | Skin Friction (psf) | Passive Earth Pressure (psf) |
|---|---|---|
| Terrace Deposits | 180 | 0 + 240 per foot of depth |
| Bedrock | 700 | 1200 + 60 per foot of depth |

Resistance to lateral loads should be neglected within the weak materials. Resistance to lateral loads can be obtained in the supporting soils using passive earth pressure shown in Table 1. Passive pressures can be projected over two pier diameters and should be limited to depths above 7 times the pier diameter.

7.1.3 Driven Piles

We anticipate 12- or 14-inch square pre-stressed, precast concrete piles will be most appropriate for foundation support where drilled piers may be unsuitable due to soft soils and high groundwater. Piles should develop their required capacities by skin friction in the stiff sandy clays , clayey sands or weathered bedrock encountered below the depth of suitable supporting material. At specific locations, the piles may encounter practical refusal in bedrock (approximately 5 to 10 feet below grade). These piles may be designed to support vertical downward loads to their full structural capacity provided they meet refusal criteria discussed below.

Skin friction values for driven piles are shown in Table 1 for dead plus live loads. For total downward loads, including wind or seismic forces, the pile capacity can be increased by one-third. Uplift capacity for piers should be limited to two-thirds of the allowable downward capacity.

Piles should be driven continuously with a hammer developing at least 40,000 foot pounds of energy to their design tip elevations or to practical refusal. A refusal blow count criteria should be determined during construction when the hammer size is known and its efficiency is evaluated. For planning purposes, we anticipate that refusal driving criteria will be within the following range for a 60- to 70-ton pile:

| Hammer Size (foot pounds) | Practical Refusal Blow Count (blows per foot) |
|---|---|
| 40,000 | 60 |
| 60,000 | 40 |

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Resistance to lateral loads for piers and piles can be obtained using passive earth pressures shown in Table 1. Passive pressures can be projected over two pier diameters and should be limited to depths above 7 times the pier diameter.

## 7.2 Seismic Design Criteria

The boardwalk structures and retaining walls should be designed and/or constructed to resist the effects of strong ground shaking (on the order of Modified Mercali Intensity IX) in accordance with current building codes. The California Building Code (CBC) 2010 edition indicates that the site classification for the area of the trail closest to the known fault trace (Porto Bodega) is Site Class D, due to the weak soils overlying the bedrock, in other areas where bedrock is close to the surface Site Class C can be used. BAI is anticipating that the fundamental period of vibration will be equal to or less than 0.5 seconds, for which a site-response analysis is not required in accordance with ASCE 7-05. However, if the structural engineer determines that the fundamental period of vibration is greater than 0.5 seconds, BAI will need to re-evaluate the site and may need to perform a site response analysis. For design purposes Site Class D and/or C and CBC indicates that the following seismic design parameters are appropriate for the site:

Site Class = D
Mapped Spectral Response Acceleration at 0.2 sec Ss = 2.241g
Mapped Spectral Response Acceleration at 1.0 sec $S_1$ = 1.286g
Design Spectral Response Acceleration at 0.2 sec $S_{DS}$ = 1.494g
Design Spectral Response Acceleration at 1.0 sec $S_{D1}$ =1.286g
Seismic Design Category = E

Site Class = C
Mapped Spectral Response Acceleration at 0.2 sec Ss = 2.241g
Mapped Spectral Response Acceleration at 1.0 sec $S_1$ = 1.286g
Design Spectral Response Acceleration at 0.2 sec $S_{DS}$ = 1.494g
Design Spectral Response Acceleration at 1.0 sec $S_{D1}$ =1.115g
Seismic Design Category = E

## 7.3 Retaining Wall Design Criteria

If retaining or subsurface walls are utilized, walls should be provided with permanent back drainage to prevent buildup of hydrostatic pressure. Drainage and backfill details are presented on Plate 52. Quality, placement and compaction requirements for backfill behind subsurface walls are the same as previously presented for select fill. Light compacting equipment should be used near the wall to avoid overstressing the walls.

Retaining walls should be designed to resist the lateral earth pressures presented on Plate 53. These pressures do not consider additional loads resulting from adjacent foundations, vehicles, or other downward surcharge loads. BAI can provide consultation regarding surcharge loads, if needed.

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In addition to static loads, the retaining walls should also be designed to resist potential seismic loads, in accordance with California Building Code requirements. For seismic loads, a pressure increment equivalent to an inverted triangular distribution is recommended, varying from 0 (zero) pounds per square foot (psf) at the bottom of the wall to 27H psf at the top of the embedded portion, where "H" is the height of the embedded portion (resultant dynamic thrust act at 0.6H above the base of the wall). The resultant distribution of both static and seismic pressures will thus be trapezoidal.

Retaining wall foundations should consist of CIDH piers gaining support in firm soil or weathered rock beneath weak natural or fill soils. CIDH piers should be designed according to the criteria given in Section 6.5.2 and Table 1.

### 7.4 Trail Pavement Sections

For the pavement design we assumed an R-value of 5 and Traffic Index of 4 (pedestrian and light vehicle traffic) as shown below and Caltrans flexible pavement design procedures. Based on the above, we recommend 2.5 inches of asphalt concrete over 8 inches of Class 2 aggregate base.

These thicknesses are the recommended minimums. Increasing Asphalt Concrete thickness in place of Class 2 aggregate base would increase the life and durability of the pavement section.

Before aggregate base placement within asphalt-paved areas, subgrade soils (upper six inches) beneath the trail and extending three feet beyond either side should be moisture conditioned to near optimum moisture content and compacted to at least 95 percent relative compaction. Prior to subgrade preparation, underlying weak soils should be removed and replaced with compacted fill that is placed in thin lifts, moisture conditioned as necessary to near optimum moisture content and compacted to a minimum of 90 percent RC. The depth of weak soils will vary along the trail and their removal should be approved by BAI in the field. Expansive subgrade soils should be moisture conditioned to, and maintained at, 4 percent above optimum moisture content and compacted to at least 90 percent relative compaction. Subgrade soils should be finished to provide a smooth unyielding surface.

Class 2 aggregate base should conform to the requirements contained in Section 26 of Caltrans (State of California) Standard Specifications, latest edition. Aggregate base should be placed in thin lifts and in a manner to prevent segregation, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent RC to provide a smooth unyielding surface.

## 8.0 ADDITIONAL SERVICES

BAI should perform a geotechnical evaluation in order to provide recommendations for foundation support and retaining wall design criteria at specific locations, such as pier bent spacing to avoid thick deposits of soft soils and hard rock masses. These recommendations would include foundation depths, pier/pile spacing, bearing pressures, and seismic parameters.

During construction, BAI should be retained to provide periodic observations, together with field and laboratory testing, during site preparation, placement and compaction of fills, if required, and foundation construction. Foundation excavations should be reviewed by BAI while the

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excavation operations are being performed. Our reviews and tests would allow us to verify conformance of the work to project guidelines, determine that soil and rock conditions are as anticipated, and to modify our recommendations, if necessary.

## 9.0 LIMITATIONS

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

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

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

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

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

# ILLUSTRATIONS

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**REFERENCE:**
Bodega Head Quadrangle, 1972
7.5 Minute Series (Topographic)

NORTH

APPROXIMATE SCALE (FEET)
0 1000 2000 4000

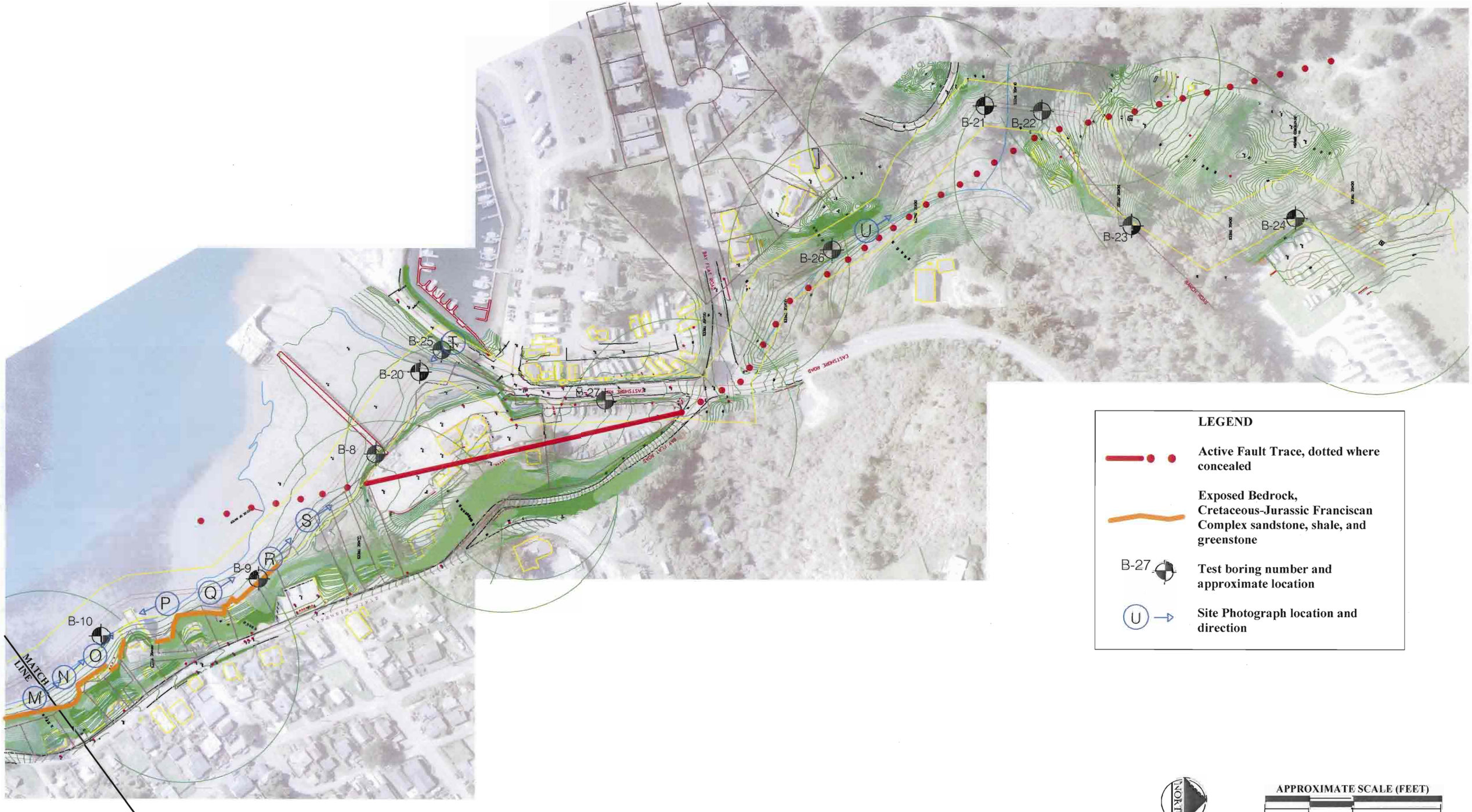
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Appr.: EEO
Date: 04/07/11

VICINITY MAP
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
1




**LEGEND**

- **Active Fault Trace, dotted where concealed**
- **Exposed Bedrock, Cretaceous-Jurassic Franciscan Complex sandstone, shale, and greenstone**
- B-27 **Test boring number and approximate location**
- U **Site Photograph location and direction**

NORTH

**APPROXIMATE SCALE (FEET)**

0 100 200 400

**REFERENCE: Harbor Coastal Trail Topographic Site Map Figure 1, by Sonoma County Regional Parks Department**

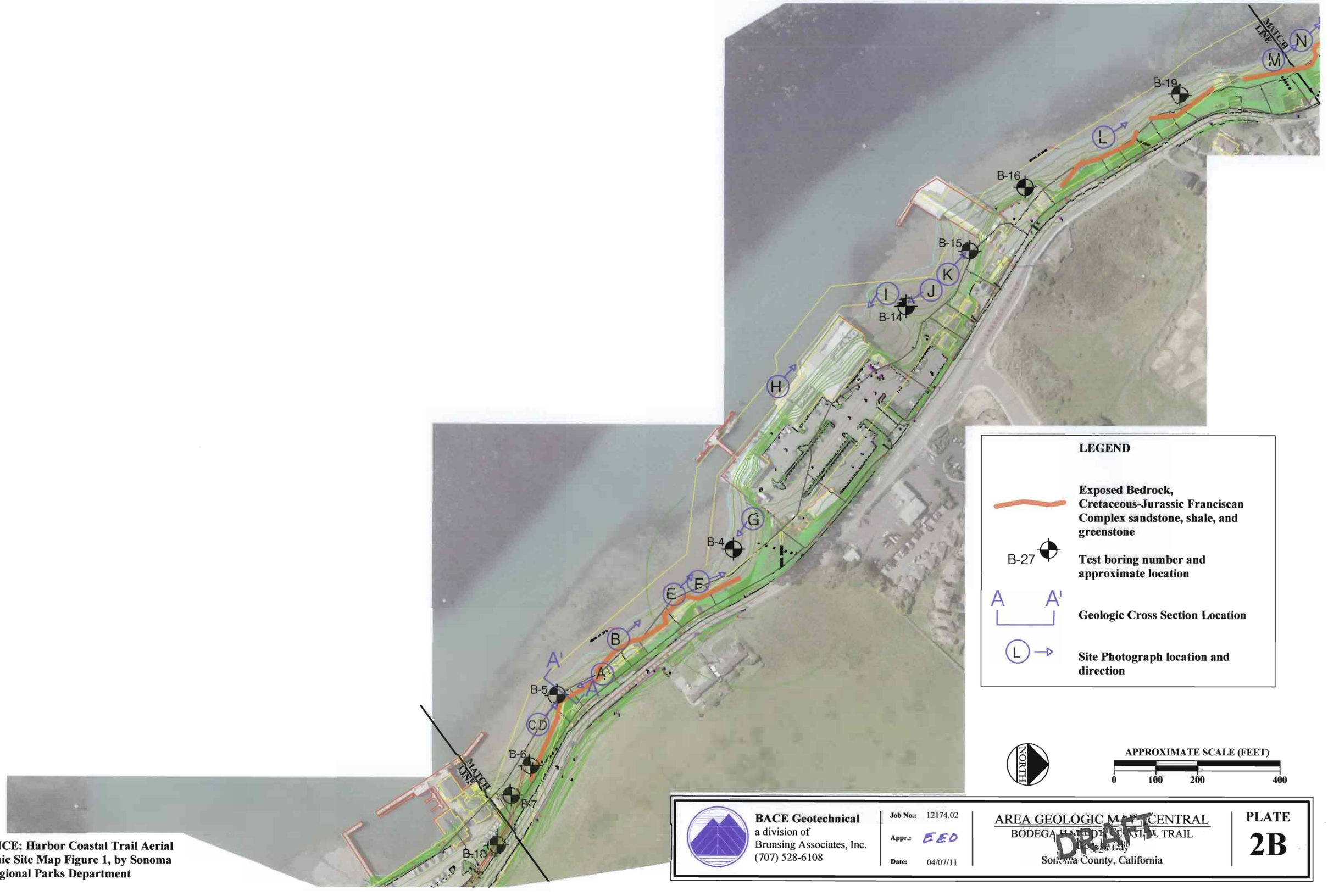
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AREA GEOLOGIC MAP - NORTH
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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**PLATE 2A**




**REFERENCE: Harbor Coastal Trail Aerial Topographic Site Map Figure 1, by Sonoma County Regional Parks Department**

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AREA GEOLOGIC MAP - CENTRAL
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
**2B**




**LEGEND**

**Exposed Bedrock, Cretaceous-Jurassic Franciscan Complex sandstone, shale, and greenstone**

B-27 **Test boring number and approximate location**

NORTH

**APPROXIMATE SCALE (FEET)**

0 100 200 400

**REFERENCE: Harbor Coastal Trail Aerial Topographic Site Map Figure 1, by Sonoma County Regional Parks Department**

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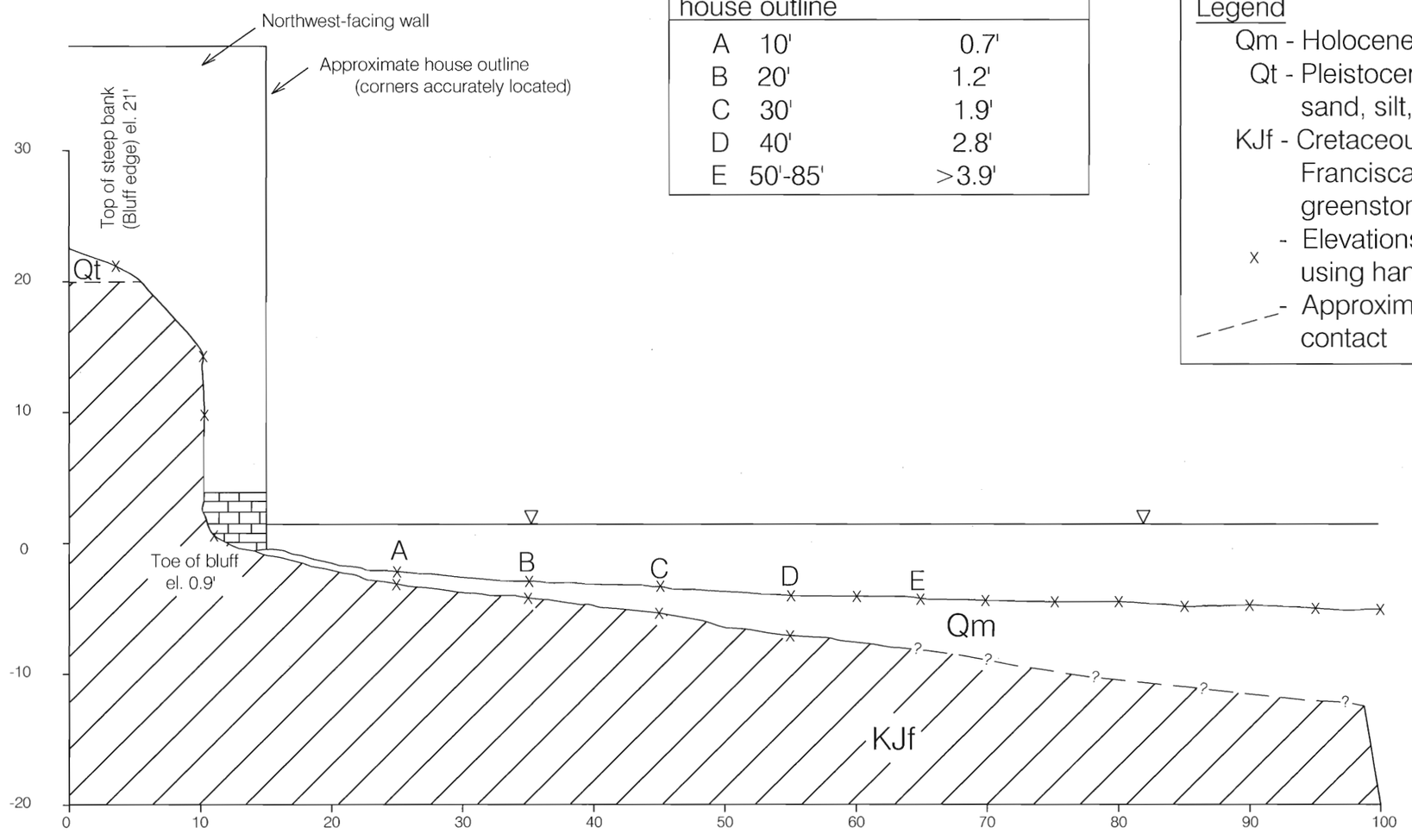
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AREA GEOLOGIC MAP - SOUTH
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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**PLATE 2C**

Northeast
A




Southwest
A'

| Depths to bedrock on A-A' | | |
|---|---|---|
| Distance from house outline | | Depth to bedrock |
| A | 10' | 0.7' |
| B | 20' | 1.2' |
| C | 30' | 1.9' |
| D | 40' | 2.8' |
| E | 50'-85' | >3.9' |

Legend

Qm - Holocene tidal zone muds

Qt - Pleistocene terrace deposits, sand, silt, clay, gravel

KJf - Cretaceous - Jurassic Franciscan Complex greenstone (altered basalt)

X - Elevations by BACE measured by using hand level in the field.

\- - - - - - Approximate location of geologic contact

+6.3' Tide water level
(above Mean Lower Low Water datum)

Tidal Flat ground surface

Bedrock surface; dashed/queried where deeper than could be accurately measured.

APPROXIMATE SCALE (FEET)
0 5 10 20

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GEOLOGIC CROSS SECTION A-A'
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
3

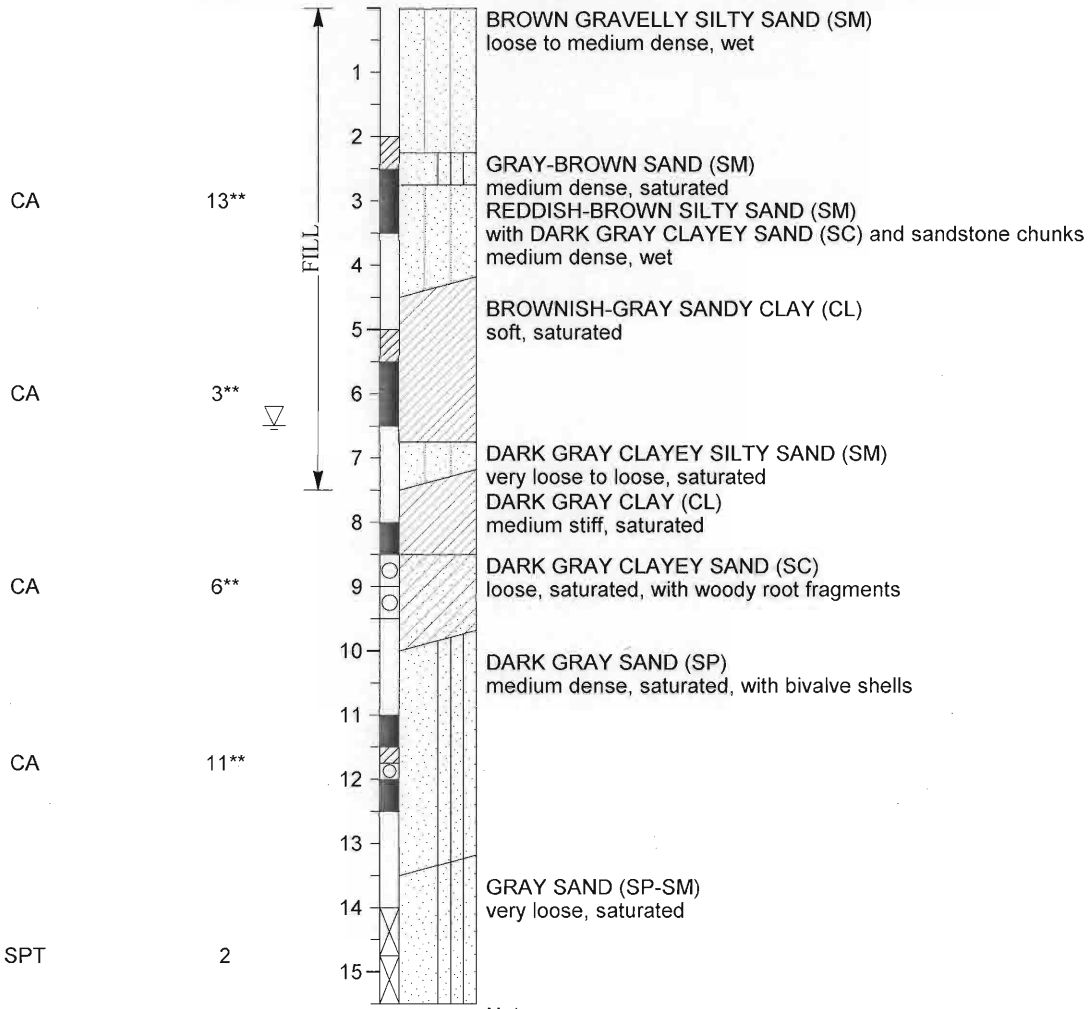
DRAFT

# Log of Boring B- 1

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/1/10

**Logged By:** SCL **Elevation:** 18 feet ***




Notes:
1. Water encountered at 6.5 feet
2. Some caving at 8 feet
3. Backfilled with cuttings

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**


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**LOG OF BORING B- 1**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

Draft

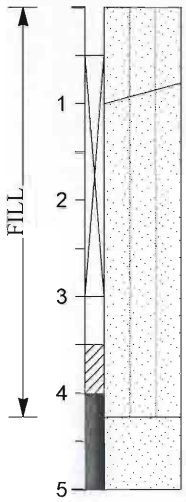
PLATE 4

# Log of Boring B- 2

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/1/10

**Logged By:** SCL **Elevation:** 22 feet ***




| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | | BROWN SILTY SAND (SM)<br>loose, wet; large gravels |
| | | 1 | ORANGE-BROWN GRAVELLY CLAYEY SILTY SAND (SM)<br>loose, wet, smaller gravels |
| | | 2 | |
| | | 3 | |
| | | 4 | |
| CA | 8** | | BROWN SAND (SP)<br>loose, wet |
| | | 5 | |

Notes:
1. No free water encountered
2. Backfilled with cuttings

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B- 2**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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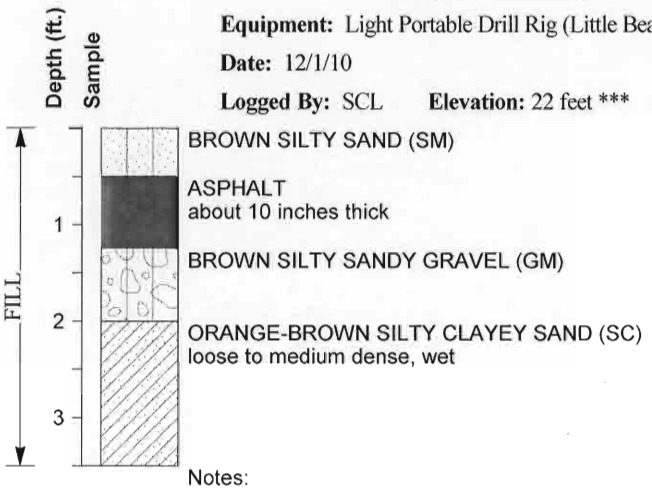
PLATE 5
SHEET 1 of 1

# Log of Boring B- 3

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/1/10

**Logged By:** SCL **Elevation:** 22 feet ***




Notes:
1. No free water encountered

*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B- 3**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
6
SHEET 1 of 1

# Log of Boring B- 4

**Equipment:** Hand Sampling Tools
**Date:** 12/1/10
**Logged By:** SCL **Elevation:** 1.5 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | CA | | | 2** | 1 | BROWN ORGANIC MUD WITH SAND (PT) soft, saturated<br>DARK GRAY SILTY CLAYEY SAND (SC-SM) very loose, saturated, with bivalve shells |
| | | | | | 2 | |
| | | | | | 3 | |
| | | | | | 4 | |
| | | | | | 5 | DARK GRAY SANDSTONE crushed, low hardness, deep weathering; fragments mixed with sand |
| | SPT | | | 8 | | |
| Tx 149 (720) | | 19.9 | 106 | | 6 | |
| | CM | | | 9** | 7 | |
| | CM | | | 16** | 8 | DARK GRAY SANDSTONE crushed, moderate hardness, moderate weathering |
| | | | | | 9 | |
| | SPT | | | 21 | | |
| | | | | | 10 | |
| | | | | | 11 | |

Notes:
1. Difficulty extracting rod after last sample; boring terminated at 11 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

# Log of Boring B- 5

**Equipment:** Hand Sampling Tools
**Date:** 12/1/10
**Logged By:** SCL **Elevation:** 1.5 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | | BROWNISH-GRAY CLAYEY SAND (SC) very loose, saturated |
| | | | | | | DARK GRAY SANDSTONE AND SHALE crushed, moderate hardness to hard, moderate weathering |
| Tx 1669 (720) | CA | 6.3 | 133 | 15** | 1 | |
| | CA | | | 96** | 2 | |

Notes:
1. Sampling refusal at 2.25 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B- 5**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
8
SHEET 1 of 1

# Log of Boring B- 6

**Equipment:** Hand Sampling Tools
**Date:** 12/1/10
**Logged By:** SCL **Elevation:** 5 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | | BROWNISH-GRAY SAND (SC) very loose, saturated |
| | CM | | | 3** | 1 | |
| | | | | | 2 | DARK GRAY SHALE sheared/crushed, hard, moderate weathering, green discolored areas |
| Tx 2778 (720) | | 7.9 | 141 | | | |
| | CM | | | 30** | 3 | |
| | | | | | | DARK GRAY SHALE WITH SANDSTONE sheared/crushed, hard, little weathering |
| | SPT | | | 47/11" | 4 | |

Notes:
1. Sampling refusal at 4.5 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B- 6**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE 9
SHEET 1 of 1

# Log of Boring B- 7

**Equipment:** Hand Sampling Tools
**Date:** 12/1/10
**Logged By:** SCL **Elevation:** 9 feet ***

| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | | GRAY SAND (SP)<br>loose to medium dense, wet |
| CM | 28/11.5"** | | |
| | | 1 | GRAY-GREEN-ORANGE GRAVEL (GM)<br>dense, saturated<br>DARK GRAY SHALE<br>sheared/crushed, hard, moderate weathering |
| CM | 28/6"** | | |
| | | 2 | |

Notes:
1. Sampling refusal at 2 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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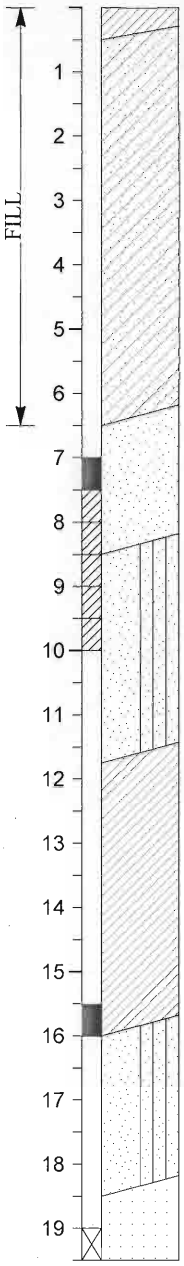
**LOG OF BORING B- 7**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE **10**
SHEET 1 of 1

# Log of Boring B- 8

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 12/2/10
**Logged By:** SCL **Elevation:** 4 feet ***




| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | 0–6 | BROWN SANDY CLAY (CL)<br>soft, saturated<br>DARK GRAY CLAYEY FINE SAND (SC)<br>loose to very loose, saturated |
| | | 6–7 | DARK GRAY SAND (SP)<br>medium dense, saturated |
| CM | 24** | 7–8 | |
| CM | 4** | 8–9 | DARK GRAY SAND (SP-SM)<br>very loose, saturated |
| | | 9–10 | |
| | | 10–12 | DARK GRAYISH BROWN CLAY (CL)<br>medium stiff, saturated, with bivalve shells |
| SPT | 5 | 12–13 | |
| SPT | 6 | 13–14 | |
| SPT | 10 | 14–15 | |
| SPT | 10 | 15–16 | |
| SPT | 12 | 16–17 | DARK GRAY SILTY COARSE SAND (SP-SM)<br>medium dense, saturated |
| SPT | 21 | 17–18 | |
| SPT | 39 | 18–19 | DARK GRAY SANDSTONE<br>close fracturing, hard, little weathering |

Notes:
1. Boring terminated at 19.5 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**


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**LOG OF BORING B- 8**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE 11
SHEET 1 of 1

# Log of Boring B- 9

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 12/2/10

**Logged By:** SCL **Elevation:** 2.5 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) | Sample | |
|---|---|---|---|---|---|---|---|
| | | | | | 1 | | BROWN SILTY CLAYEY SAND (SC)<br>very loose, saturated<br>DARK GRAY SAND (SM)<br>loose to medium dense, saturated, some coarse rounded sands |
| | | | | | 2 | | |
| | CM | | | 15** | 3 | | DARK GRAY SANDSTONE<br>close fracturing, moderate hardness, little weathering |
| | | | | | 4 | | |
| Tx 738 (720) | CM | 8.5 | 134 | 14** | 5 | | DARK GRAY SHALE<br>sheared/crushed, low to moderate hardness, moderate weathering |
| | | | | | 6 | | |
| | SPT | | | 30 | 7 | | |

Notes:
1. Difficulty extracting rods after last sample; boring terminated at 7.5 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B- 9**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

DRAFT

PLATE 12
SHEET 1 of 1

# Log of Boring B-10

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 12/2/10

**Logged By:** SCL **Elevation:** -0.5 feet ***

| Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample |
|---|---|---|---|---|
| | | | | BROWN CLAYEY SILTY SAND (SM) very loose, saturated |
| CM | | | 19** | 1 |
| | 11.3 | 115 | | DARK GRAY SANDSTONE close fracturing, hard, little weathering |
| | | | | 2 |
| SPT | | | 12 | |
| | | | | 3 |
| SPT | | | 25/6" | |
| | | | | 4 |

Notes:
1. Sampling refusal at 4 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-10**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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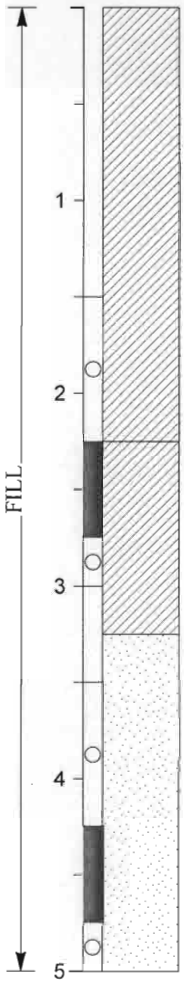
PLATE 13
SHEET 1 of 1

# Log of Boring B-11a

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/3/10

**Logged By:** GDS **Elevation:** 29 feet ***




| Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| CA | | | 6** |
| | | | |
| | | | |
| | 4.7 | 92 | |
| | | | |
| CA | | | 7** |

DARK BROWN SANDY SILTY CLAY (CL)
medium stiff, very moist, with yellow-brown sandstone fragments, minor organics, moderate plasticity

YELLOW-BROWN WITH ORANGE MOTTLING SANDY CLAY (CL)
medium stiff, very moist, with sandstone fragments, patches of yellow-brown clay

GRAYISH BROWN FINE SAND (SP)
loose, moist; broken utility (sewer) pipe pieces in sample tube

Notes:
1. No free water encountered
2. No caving
3. Boring terminated at 5 feet
4. Boring moved 5 feet north, see boring B-11b

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B-11a**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE **14**
SHEET 1 of 1

# Log of Boring B-11b

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/3/10

**Logged By:** GDS **Elevation:** 29 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | 0 | MOTTLED BROWN AND GRAY-BROWN CLAYEY SILT (ML) medium stiff, very moist; with sand and local yellow-brown sandstone fragments, increasing sand |
| | CA | | | 7** | 3 | FILL |
| | CA | | | 16** | 4 | BLUISH-GRAY SANDY GRAVEL (GM) moist |
| | | 22.8 | 103 | | 5 | MOTTLED GRAY AND YELLOW-BROWN SANDY SILTY CLAY (CL) stiff, moist, with small sandstone fragments (Mn rinds), and locally sandy pockets |
| | CA | | | 24** | 6 | MOTTLED DARK YELLOW-BROWN SANDSTONE fractured, low hardness, deep weathing; locally gray in color, with white fragments and small veins |
| Tx 1643 (1296) | CM | 12.9 | 111 | 41** | 10 | |
| | SPT | | | 43 | 13 | |

Notes:
1. No free water encountered
2. No caving observed

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**

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**LOG OF BORING B-11b**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE 15
SHEET 1 of 1

# Log of Boring B-12

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 12/3/10

**Logged By:** GDS **Elevation:** 26 feet ***

| Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) | Sample | |
|---|---|---|---|---|---|---|
| | | | | 1 | | DARK GRAYISH-BROWN AND DARK GRAY GRAVELLY CLAYEY SAND (SC)<br>loose, moist; subangular yellow-brown and gray-brown sandstone fragments |
| CA | | | 6** | 2 | | |
| | | | | 3 | | VERY DARK GRAY TO BLACK SANDY SILT (ML)<br>medium stiff, very moist; with sand and small roots |
| CA | | | 11** | 4 | | |
| | | | | 5 | | |
| | | | | 6 | | |
| | | | | 7 | | GRAY AND BROWN SANDSTONE<br>close fracturing, low hardness, deep weathering with gray clay seams |
| CA | 15.2 | 108 | 18** | 8 | | |

FILL

Notes:
1. No free water encountered
2. No caving

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-12**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE 16
SHEET 1 of 1

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# Log of Boring B-13

**Equipment:** Light Portable Drill Rig (Little Beaver)
**Date:** 12/3/10
**Logged By:** GDS **Elevation:** 27 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | FILL 1 | DARK GRAYISH-BROWN VERY SANDY SILT (ML) medium stiff, moist, with gravel and organics |
| | CA | | | 5** | 2 | VERY DARK GRAY SILTY CLAY (CL) medium stiff, very moist, with sand and small roots, pockets of mottled yellow-brown clay |
| | | | | | 3 | |
| 62% Passing #200 | | 23.2 | 96 | | | MOTTLED GRAY AND YELLOW-BROWN SANDY CLAY (CL) medium stiff, moist, with some sandstone fragments, grades into unit below |
| | CA | | | 15** | 4 | LIGHT GRAY AND ORANGE MOTTLED CLAYEY SAND (SC) medium dense, moist |
| | | | | | 5 | |
| | SPT | | | 26 | 6 | |

Notes:
1. No free water encountered

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-13**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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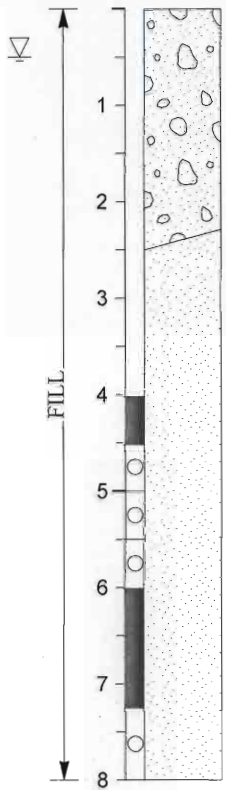
PLATE 17
SHEET 1 of 1

# Log of Boring B-14a

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 12/3/10

**Logged By:** GDS **Elevation:** 3 feet ***




| Sampler Type* | Blows/foot | Sample |
|---|---|---|
| | | GRAY GRAVELLY SAND (SP-GP)<br>saturated |
| | | GRAY AND BROWN GRAVELLY SAND (SP)<br>loose to medium dense, saturated, with fines and subangular to rounded gravels |
| CM | 8** | |
| CM | 17** | |

Notes:
1. Caving below 5 feet after sampler removed; boring terminated

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-14a**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
18
SHEET 1 of 1

# Log of Boring B-14b

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 12/3/10
**Logged By:** GDS **Elevation:** 3 feet ***

| Sampler Type* | Blows/foot | Depth (ft.) | Sample | |
|---|---|---|---|---|
| | | 0 | | GRAY AND BROWN GRAVELLY SAND (SP)<br>loose, saturated, with fines and subangular to rounded gravels |
| | | 1 | | FILL |
| | | 2 | | |
| | | 3 | | |
| | | 4 | | |
| CM | 10** | 5 | | |
| | | 6 | | |

Notes:
1. No recovery; boring terminated at 6 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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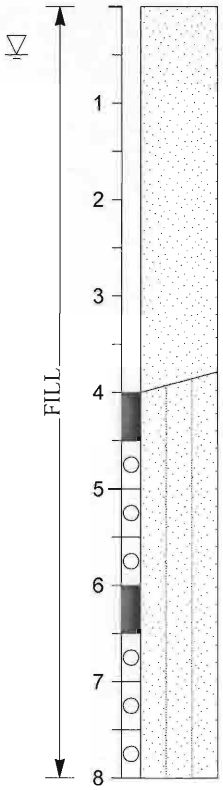
**LOG OF BORING B-14b**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
19
SHEET 1 of 1

# Log of Boring B-14c

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 12/3/10
**Logged By:** GDS **Elevation:** 3 feet ***




| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | | GRAY AND BROWN GRAVELLY SAND (SP)<br>loose, saturated, with fines and subangular to rounded gravels |
| | | 4 | DARK GRAY SILTY SAND (SM)<br>loose, saturated, with some clay and gravel; with rounded chert and subangluar sandstone fragments |
| CM | 8** | 5 | |
| | | 6 | |
| CM | 9** | 7 | |
| | | 8 | |

Notes:
1. Caving to 4 feet after sampler removed, boring terminated

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-14c**
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Bodega Bay
Sonoma County, California

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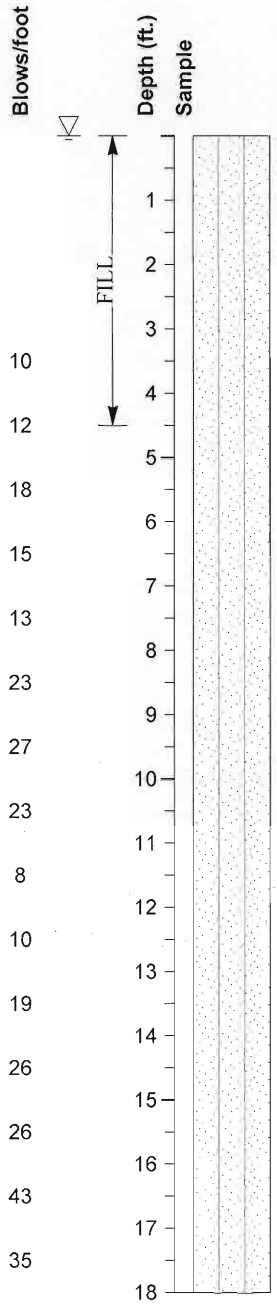
PLATE **20**
SHEET 1 of 1

# Log of Boring B-14d

**Equipment:** Modified AW rod

**Date:** 1/17/11

**Logged By:** GDS **Elevation:** 3 feet ***




GRAY SILTY SAND (SM)
loose to dense, saturated
with gravel on surface

Notes:
1. Water level at surface during low tide
2. Hole closed to about 3 feet after rods pulled
3. Modified SPT (AW rod): 2-inch washer mounted at lower end of sampling rods

** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**


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Date: 04/07/11

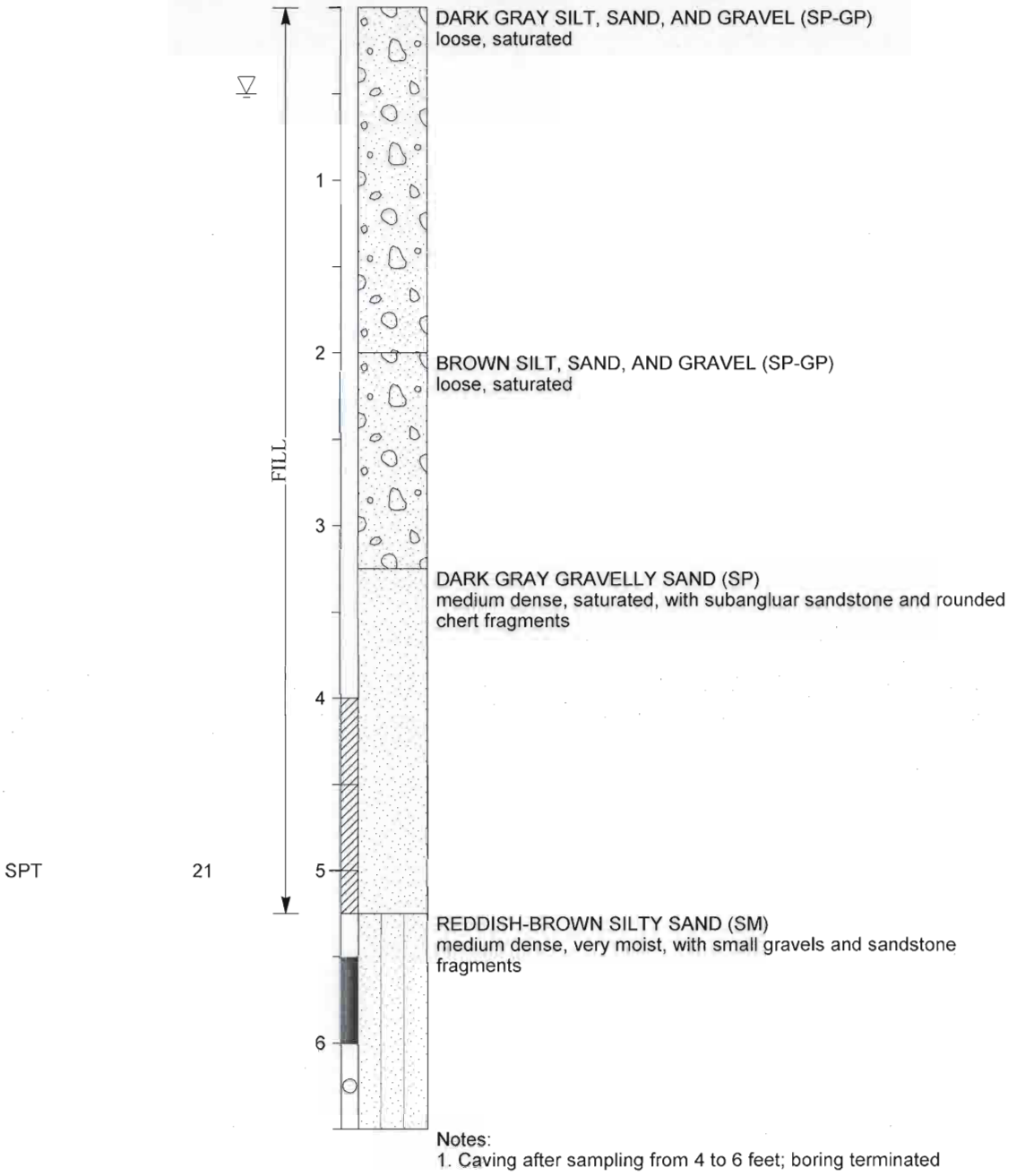
**LOG OF BORING B-14d**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
**21**
SHEET 1 of 1

# Log of Boring B-15

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 12/3/10
**Logged By:** GDS **Elevation:** 4.5 feet ***




Notes:
1. Caving after sampling from 4 to 6 feet; boring terminated

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**


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**LOG OF BORING B-15**
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Bodega Bay
Sonoma County, California

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PLATE **22**
SHEET 1 of 1

# Log of Boring B-16

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 12/3/10
**Logged By:** GDS **Elevation:** 2.5 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample |
|---|---|---|---|---|---|
| | | | | | DARK GRAY SILT, SAND AND GRAVEL (SP-GP) loose, saturated |
| | | | | | 1 |
| | | | | | 2 — VERY DARK GRAY SAND with silt (SP-SM) medium dense, very moist; with some gravel and sandstone fragments |
| | | | | | 3 |
| 6% Passing #200 | | 13.9 | 124 | | |
| Tx 2744 (864) | CM | 14.3 | 124 | 15** | 4 — GRAY SANDSTONE fractured, low hardness, deep weathering |
| | | | | | 5 — BLUISH GRAY SHEARED SHALE and SANDSTONE fractured, low to moderate hardness, deep weathering |
| | SPT | | | 16 | 6 |
| | | | | | 7 |
| | SPT | | | 25 | 8 |

Notes:
1. Caving after final sample removed; boring terminated

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-16**
BODEGA HARBOR COASTAL TRAIL
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Sonoma County, California

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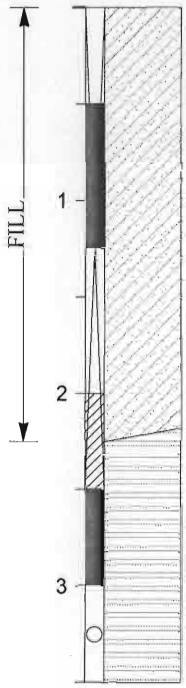
PLATE 23
SHEET 1 of 1

# Log of Boring B-17a

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 1/17/11

**Logged By:** GDS **Elevation:** 22 feet ***




| Sampler Type* | Blows/foot | Depth (ft.) Sample |
|---|---|---|
| CA | 23/9"** | |
| CA | 25** | |

GRAY CLAYEY SAND (SC)
dense, moist
with abundant greenstone fragments
with abundant organics

DARK GRAY SHALE AND SANDSTONE
intense fracturing to crushed, moderate hardness, moderate weathering

Notes:
1. No free water encountered
2. Drilling refusal at 3.5 feet

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B-17a**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
**24**
SHEET 1 of 1

# Log of Boring B-17b

**Equipment:** Light Portable Drill Rig (Little Beaver)
**Date:** 1/17/11
**Logged By:** GDS **Elevation:** 22 feet ***

| Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample |
|---|---|---|---|---|
| | | | | GRAY CLAYEY SAND (SC) medium dense, moist with greenstone and/or sandstone fragments |
| CM | | | 21** | |
| CM | 6.7 | 127 | 30** | DARK GRAY GREENSTONE fractured, friable to low hardness, moderate weathering greenstone fragments with clayey seams, lenses and pockets |
| CM | | | 25/7"** | |

Notes:
1. No free water encountered

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-17b**
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Bodega Bay
Sonoma County, California

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PLATE 25
SHEET 1 of 1

# Log of Boring B-18

**Equipment:** Light Portable Drill Rig (Little Beaver)
**Date:** 1/17/11
**Logged By:** GDS **Elevation:** 21 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) | Sample | |
|---|---|---|---|---|---|---|---|
| | | | | | | | BROWN CLAYEY GRAVEL (GC)<br>loose, wet,<br>with roots, fines moderate to high plasticity |
| | CA | | | 5** | 1 | | |
| | | | | | 2 | | |
| | CM | | | 5** | 3 | | |
| | | | | | 4 | | MOTTLED BROWN GRAVELLY SANDY CLAY (CL)<br>medium stiff, wet<br>some roots |
| Tx 465 (1008)<br>19% Passing #200 | CA | 8.1 | 112 | 6** | 5 | | |
| | | | | | 6 | | |
| | | | | | 7 | | YELLOWISH-BROWN SILTY SAND (SM)<br>loose, moist to wet |
| | CM | | | 6** | 8 | | YELLOW-BROWN AND GRAY SANDY CLAY (CL)<br>medium stiff, wet |
| | | | | | 9 | | |
| | | | | | 10 | | |
| | | | | | 11 | | DARK GRAY MELANGE - SHALE AND SANDSTONE<br>fractured, friable to low hardness, moderate weathering |
| | CM | | | 48** | 12 | | |

FILL

Notes:
1. No free water observed

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-18**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE 26
SHEET 1 of 1

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# Log of Boring B-19

**Equipment:** Hand Sampling Tools
**Date:** 1/17/11
**Logged By:** GDS **Elevation:** 1.5 feet ***

| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | ▽ | GRAY SILTY SAND (SM)<br>very loose to medium dense, saturated<br>with gravel and rocks at surface |
| CA | 3** | 1 | |
| | | 2 | |
| CA | 13** | 3 | |
| | | 4 | GRAY-BROWN SANDSTONE<br>intensely fractured, low hardness, moderate weathering |
| SPT | 39 | | |

Notes:
1. Water level at the surface at low tide

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B-19**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

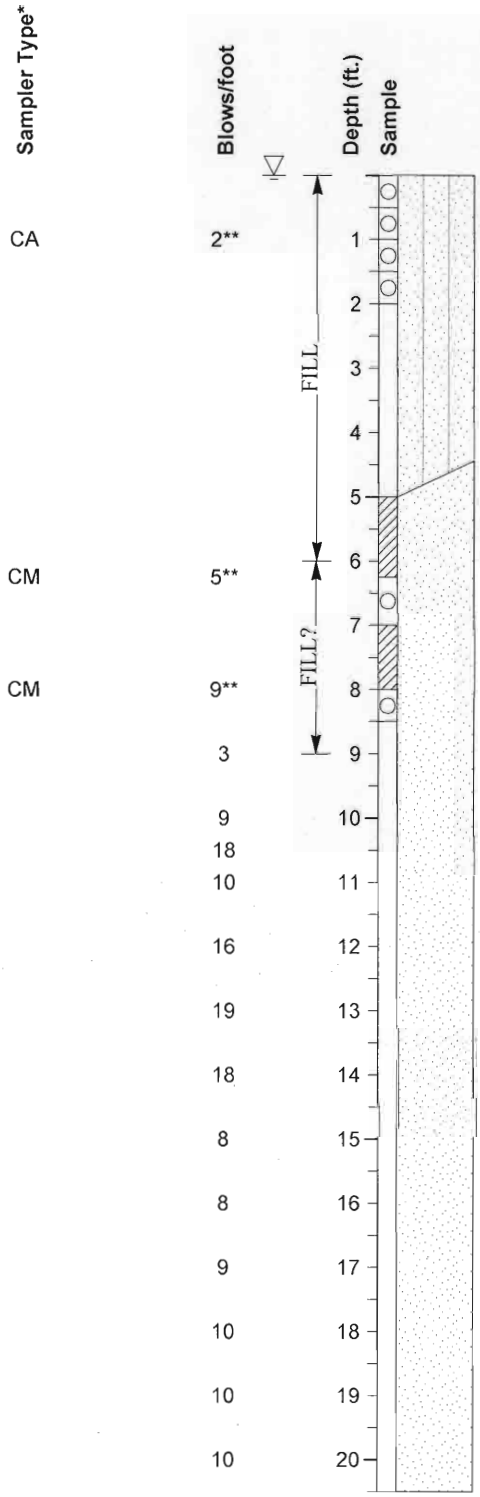
PLATE 27
SHEET 1 of 1

# Log of Boring B-20

**Equipment:** Manual hand sampler and modified AW rod

**Date:** 1/17/11

**Logged By:** GDS **Elevation:** 3 feet ***




GRAY SILTY SAND (SM)
very loose, saturated
with gravel at surface

GRAY SAND (SP)
loose to medium dense, saturated
fine to medium grained

Notes:
1. Hole collapsed to about 2 feet after rods removed
2. Modified SPT (AW rod) used from 7.5 to 20.5 feet: 2-inch washer mounted on lower end of sampler rods.

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**

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**LOG OF BORING B-20**
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Bodega Bay
Sonoma County, California

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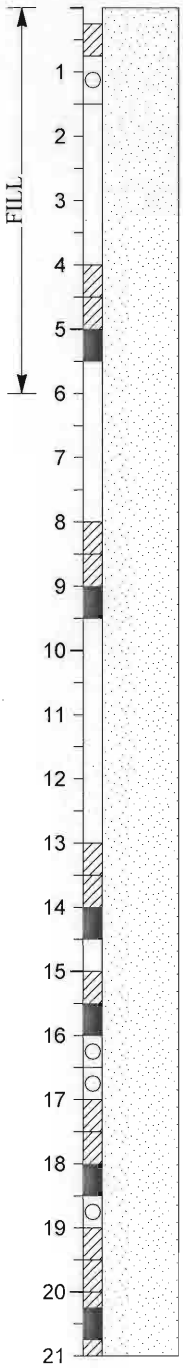
PLATE
28
SHEET 1 of 1

# Log of Boring B-21

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 1/25/11

**Logged By:** GDS **Elevation:** 23.5 feet ***




| Sampler Type* | Blows/foot | Description |
|---|---|---|
| CA | 5** | BROWN TO YELLOW-BROWN SAND (SP) loose to medium dense, moist, with some small roots (dune sand) |
| CA | 12** | |
| CM | 16** | |
| CM | 12** | |
| CA | 6** | |
| CM | 9** | |
| SPT | 26 | |

Notes:
1. No free water encountered

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**


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**LOG OF BORING B-21**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE **29**
SHEET 1 of 1

# Log of Boring B-22

**Equipment:** Light Portable Drill Rig (Little Beaver)
**Date:** 1/25/11
**Logged By:** GDS **Elevation:** 36 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | | YELLOW-BROWN & GRAY-BROWN SAND (SP)<br>very loose to loose, moist<br>fine to medium grained (dune sand) |
| | CA | | | 2** | FILL | |
| Tx 1410 (720) | CA | 5.3 | 91 | 4** | | |
| | CA | | | 9** | | |
| | CA | | | 16** | | MOTTLED YELLOW-REDDISH BROWN CLAYEY SAND (SC)<br>medium dense, moist<br>with subangular gravel and friable rock fragments<br>with light gray clay seams and lenses<br>with mica (terrace deposits?) |
| | SPT | 16.9 | 116 | 38/8" | | DARK GRAY-BROWN SANDSTONE<br>fractured, low hardness, moderate weathering<br>sheared |

Notes:
1. No free water encountered

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**

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**LOG OF BORING B-22**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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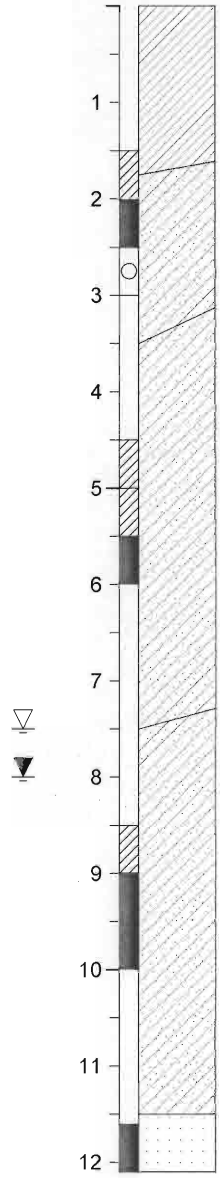
PLATE 30
SHEET 1 of 1

# Log of Boring B-23

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 1/25/11

**Logged By:** GDS **Elevation:** 59 feet ***




| Sampler Type* | Blows/foot | |
|---|---|---|
| | | BLACK SANDY CLAY (CL)<br>soft, moist to wet<br>weak and porous |
| CA | 4** | MOTTLED YELLOW-BROWN & BROWN CLAYEY SAND (SC)<br>very loose, wet<br>mostly fine sand, with occasional gravel |
| | | MOTTLED YELLOW-BROWN AND LIGHT GRAY CLAYEY SAND (SC)<br>medium dense, moist to wet<br>fine to medium grained, with rounded gravels<br>(terrace deposits) |
| CM | 11** | |
| | | DARK YELLOW-BROWN CLAYEY SAND (SC)<br>medium dense, wet<br>dark orange staining, medium to coarse sand<br>(terrace deposits) |
| CM | 13** | |
| SPT | 38/7" | GRAY-BROWN SANDSTONE<br>intense fracturing to crushed, low hardness, moderate weathering |

Notes:
1. Water observed at 7.5 feet during drilling, measured at 8 feet after drilling

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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**LOG OF BORING B-23**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
31
SHEET 1 of 1

# Log of Boring B-24

**Equipment:** 3-inch Hand Auger and Sampling Tools
**Date:** 1/25/11
**Logged By:** GDS **Elevation:** 91 feet ***

| Laboratory Tests | Sampler Type* | Moisture Content (%) | Dry Density (pcf) | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|---|---|---|
| | | | | | 1 | BROWN SAND (SP)<br>very loose, dry<br>fine to medium grained, with some roots<br>dune sand |
| | CA | | | 3** | 2 | |
| | | | | | 3 | YELLOWISH-BROWN SAND (SP)<br>medium dense, moist<br>with clay nodules<br>dune sand |
| | | | | | 4 | |
| Tx 1783 (1152) | CM | 5.0 | 102 | 15** | 5 | |
| | | | | | 6 | DARK REDDISH-BROWN CLAYEY SAND (SC)<br>medium dense, moist<br>mostly fine sand<br>(terrace deposits) |
| | | | | | 7 | |
| | | | | | 8 | |
| | CM | | | 15** | 9 | |
| | | | | | 10 | |
| | | | | | 11 | DARK REDDISH-BROWN CLAYEY SAND (SC)<br>dense, moist |
| | | | | | 12 | |
| | CM | | | 37** | 13 | |

Notes:
1. No free water observed

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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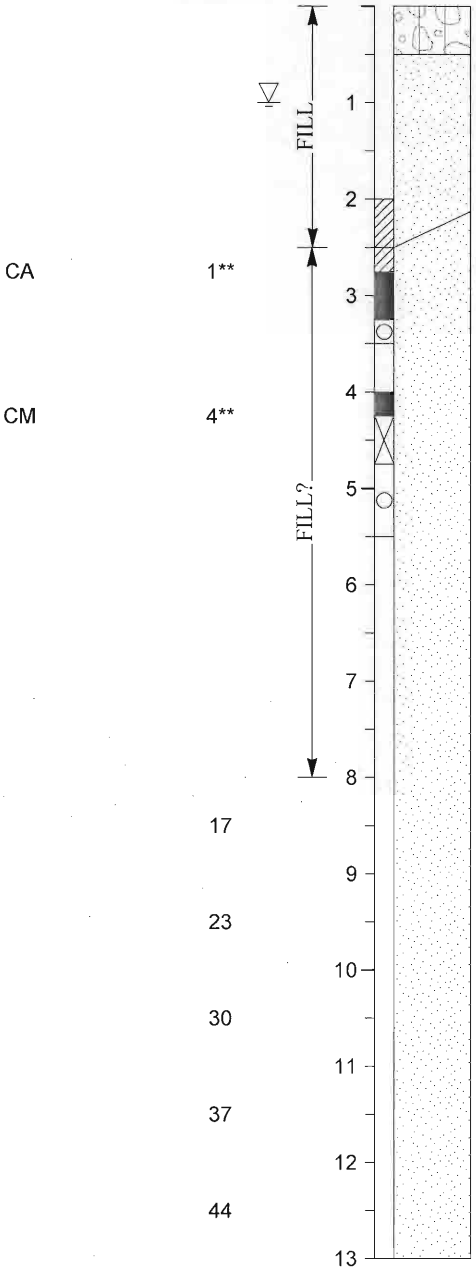
PLATE
32
SHEET 1 of 1

# Log of Boring B-25a

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 1/26/11

**Logged By:** GDS **Elevation:** 5.5 feet ***




SANDY GRAVEL (GM)

GRAY SAND (SP)
very loose, saturated
with coarse rocks

GRAY SAND (SP)
very loose to dense, saturated
with coarse sand

Notes:
1. Water observed at 1 foot after drilling
2. Hole collapsed to 4 feet after drilling to 8 feet
3. Modified SPT (AW rod) used from 8 to 13 feet: 2-inch washer mounted on lower end of sampler rods.

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 2'**

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Bodega Bay
Sonoma County, California

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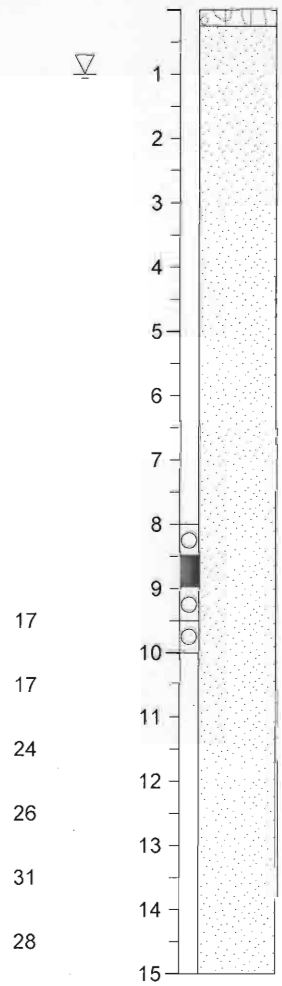
PLATE
33
SHEET 1 of 1

# Log of Boring B-25b

**Equipment:** Light Portable Drill Rig (Little Beaver)

**Date:** 1/26/11

**Logged By:** GDS **Elevation:** 5.5 feet ***




Notes:
1. Water observed at 1 foot during drilling
2. Caving to 4 feet
3. Modified SPT (AW rod) used from 10 to 15 feet: 2-inch washer mounted at lower end of sampling rods

** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**

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**LOG OF BORING B-25b**
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Bodega Bay
Sonoma County, California

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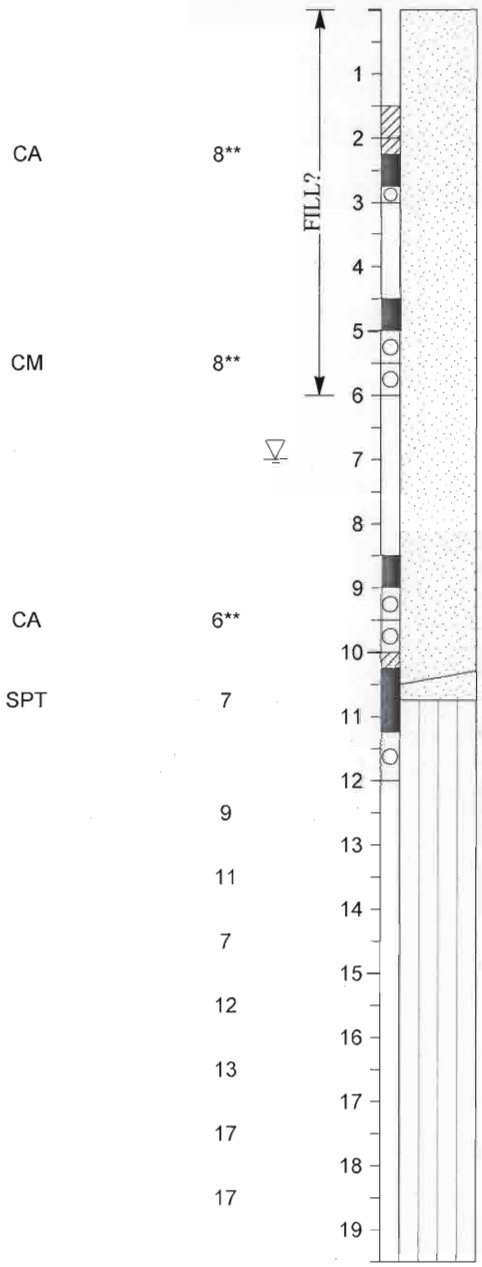
PLATE 34
SHEET 1 of 1

# Log of Boring B-26

**Equipment:** 3-inch Hand Auger and Sampling Tools

**Date:** 1/26/11

**Logged By:** GDS **Elevation:** 18.5 feet ***




DARK GRAY SAND (SP)
loose, moist
fine to medium grained
dune sand

REDDISH-BROWN SAND (SP)
loose, saturated
fine to medium grained

DARK BLUE-GRAY CLAYEY SILT (ML)
medium stiff, saturated
laminae of fine sand and clay

Notes:
1. Water observed at 7 feet during drilling
2. Caving to 5 feet
3. Modified SPT (AW rod) used from 12 to 19.5 feet: 2-inch washer mounted on lower end of sampler rods.

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 3'**


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**LOG OF BORING B-26**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE 35
SHEET 1 of 1

# Log of Boring B-27

**Equipment:** 3-inch Hand Auger and Samplint Tools
**Date:** 1/26/11
**Logged By:** GDS **Elevation:** 11 feet ***

| Sampler Type* | Blows/foot | Depth (ft.) Sample | |
|---|---|---|---|
| | | FILL | BROWN SANDY GRAVEL (GP)<br>dense, dry |
| CA | 10/8"** | 1 | BLUE-GRAY SANDY GRAVEL (GM)<br>medium dense, moist<br>with some clay |

Notes:
1. No free water observed
2. Boring terminated due to possible presence of underground utilities

*CA - California Modified Split Barrel Sampler 3.0-inch O.D.
CM - California Modified Split Barrel Sampler 2.5-inch O.D.
SPT - California Split Barrel Sampler 2.0-inch O.D.
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Area Geologic Map - North, - Central, and - South, See Plates 2A, 2B, and 2C.

**Scale: 1" = 1'**

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**LOG OF BORING B-27**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE 36
SHEET 1 of 1

## UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) ASTM D 2487

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

## KEY TO TEST DATA

Consol - Consolidation
LL - Liquid Limit
PI - Plasticity Index
EI - Expansion Index
SA - Sieve Analysis
■ Sample Retained
▨ Sample Recovered, Not Retained
☒ Bulk Sample
◯ Sample Not Recovered
▽ Groundwater Level Reading

| Shear Strength, psf | Confining Pressure, psf | |
|---|---|---|
| Tx | 320 (2600) | - Unconsolidated Undrained Triaxial |
| TxCU | 320 (2600) | - Consolidated Undrained Triaxial |
| DS | 2750 (2600) | - Consolidated Drained Direct Shear |
| FVS | 470 | - Field Vane Shear |
| UC | 2000 | - Unconfined Compression |
| PP | 2000 | - Field Pocket Penetrometer |
| Sat | | - Sample saturated prior to test |

▼ Second Groundwater Level Reading

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**SOIL CLASSIFICATION CHART & KEY TO TEST DATA**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
37

## RELATIVE DENSITY OF COARSE-GRAINED SOILS

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

## CONSISTENCY OF FINE-GRAINED SOILS

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

## NATURAL MOISTURE CONTENT

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

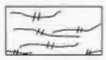
* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

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

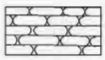
# Generalized Graphic Rock Symbols

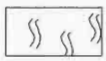

Claystone


Siltstone

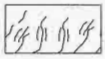

Tuff (Volcanic Ash)

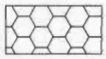

Shale


Chert


Andesite

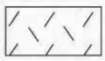

Sandstone


Serpentine


Basalt


Conglomerate


Metamorphic Rock


Granite

# Stratification

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

# Fracturing

| Fracturing Intensity | Thickness of Beds |
|---|---|
| Little | Greater than 4 feet |
| Occasional | 1 foot to 4 feet |
| Moderate | 6 inches to 1 foot |
| Close | 1 inch to 6 inches |
| Intense | 0.5 inches to 1 inch |
| Crushed | less than 0.5 inches |

# Strength

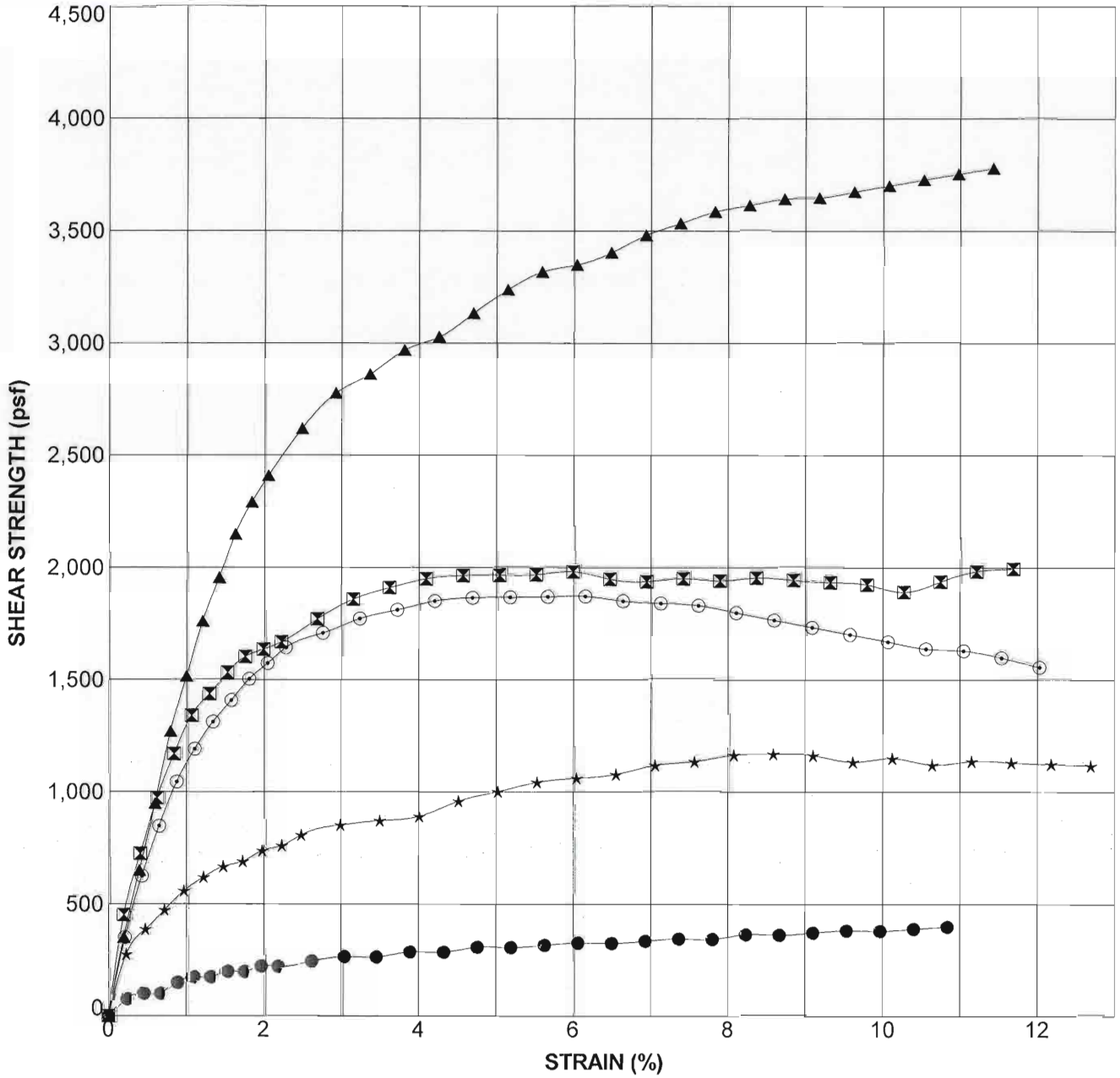
| | |
|---|---|
| Soft | Plastic or very low strength. |
| Friable | Crumbles by hand. |
| Low hardness | Crumbles under light hammer blows. |
| Moderate hardness | Crumbles under a few heavy hammer blows. |
| Hard | Breaks into large pieces under heavy, ringing hammer blows. |
| Very hard | Resists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

# Weathering

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



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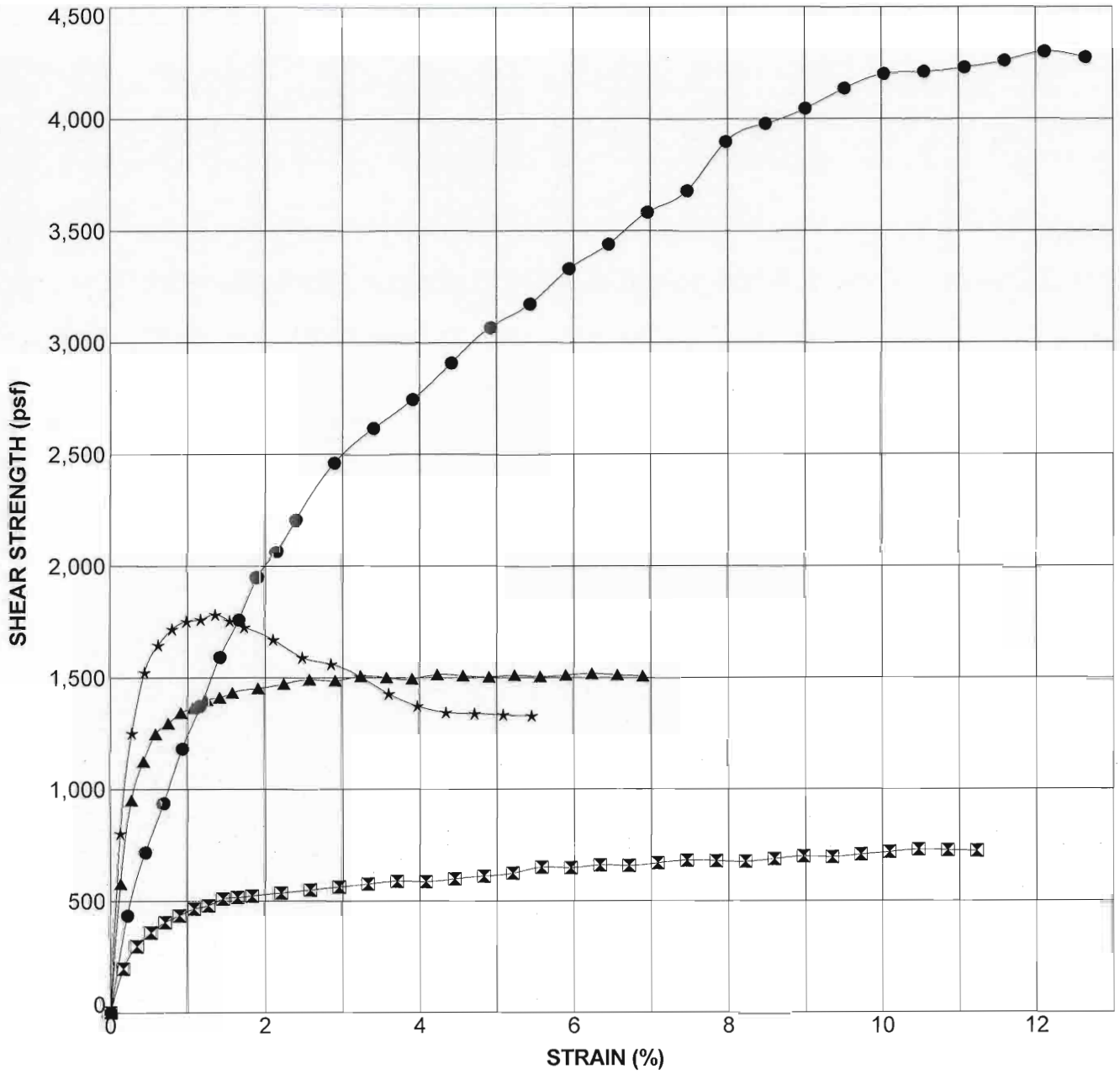

| Sample Source | Classification | Confining Pressure (psf) | Yield Strength (psf) | Strain (%) | Dry Density (pcf) | Moisture Content (%) |
|---|---|---|---|---|---|---|
| ● B- 4 at 6 ft | DARK GRAY SANDSTONE | 720 | 149 | 0.9 | 106 | 19.9 |
| ⊠ B- 5 at 1 ft | DARK GRAY SANDSTONE AND SHALE | 720 | 1669 | 2.2 | 133 | 6.3 |
| ▲ B- 6 at 2.5 ft | DARK GRAY SHALE | 720 | 2778 | 2.9 | 141 | 7.9 |
| ★ B- 9 at 5 ft | DARK GRAY SHALE | 720 | 738 | 2.0 | 134 | 8.5 |
| ⊙ B-11b at 10.5 ft | MOTTLED DARK YELLOW-BROWN SANDSTONE | 1296 | 1643 | 2.3 | 111 | 12.9 |

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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
40




| Sample Source | Classification | Confining Pressure (psf) | Yield Strength (psf) | Strain (%) | Dry Density (pcf) | Moisture Content (%) |
|---|---|---|---|---|---|---|
| ● B-16 at 4 ft | GRAY SANDSTONE | 864 | 2744 | 3.9 | 124 | 14.3 |
| ⧓ B-18 at 5.2 ft | MOTTLED BROWN GRAVELLY SANDY CLAY (CL) | 1008 | 465 | 1.1 | 112 | 8.1 |
| ▲ B-22 at 5 ft | YELLOW-BROWN & GRAY-BROWN SAND (SP) | 720 | 1410 | 1.4 | 91 | 5.3 |
| ★ B-24 at 5 ft | YELLOWISH-BROWN SAND (SP) | 1152 | 1783 | 1.4 | 102 | 5.0 |
| | | | | | | |

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**UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

DRAFT

PLATE
41

**SITE PHOTOGRAPH A** - 3/1/11, looking southeast, approximate tide level 0.0' *




**SITE PHOTOGRAPH B** - 3/1/11, looking north-northwest, approximate tide level 0.0'



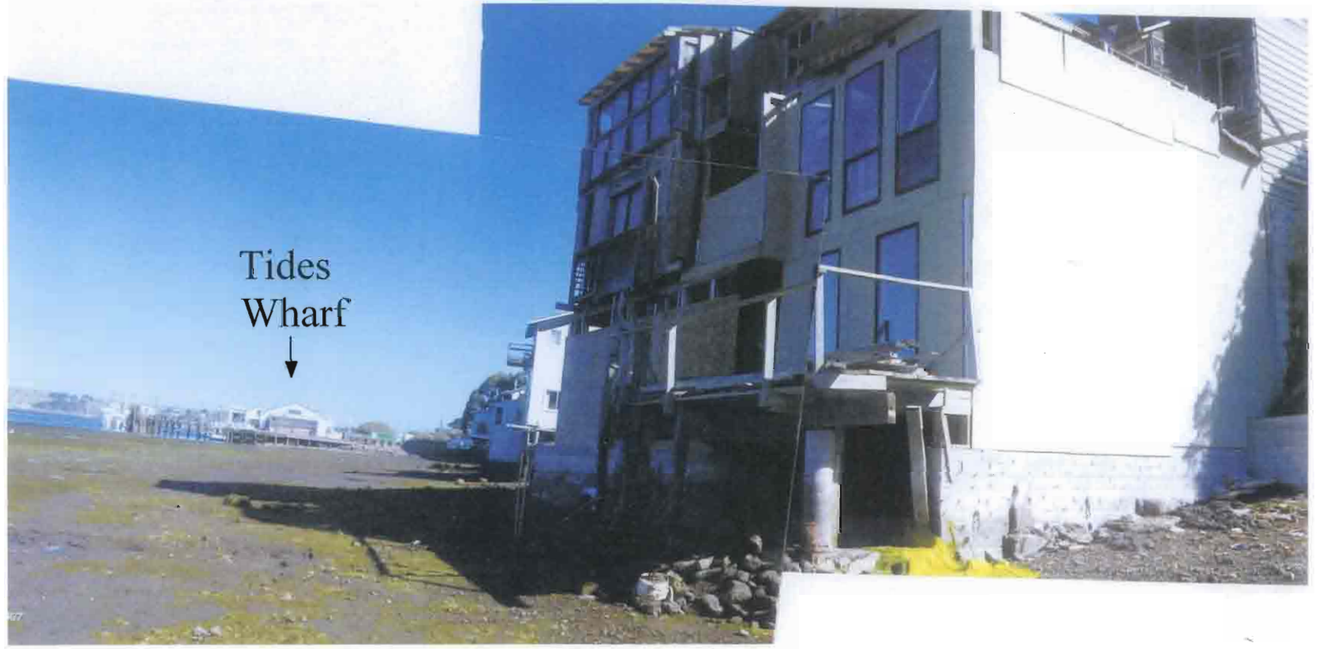

* all tide levels per published tide tables. X - exposed bedrock.

| | | | |
|---|---|---|---|
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**SITE PHOTOGRAPH C** - 7/9/07, looking north-northwest, approximate tide level +6.3'




**SITE PHOTOGRAPH D** - 6/18/07, looking north-northwest, approximate tide level -1.1'




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SITE PHOTOGRAPHS C AND D
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

DRAFT

PLATE
43

**SITE PHOTOGRAPH E**- 03/01/11, looking northwest, approximate tide level 0.0'




**SITE PHOTOGRAPH F** - 12/01/11, looking north, approximate tide level 0.0'



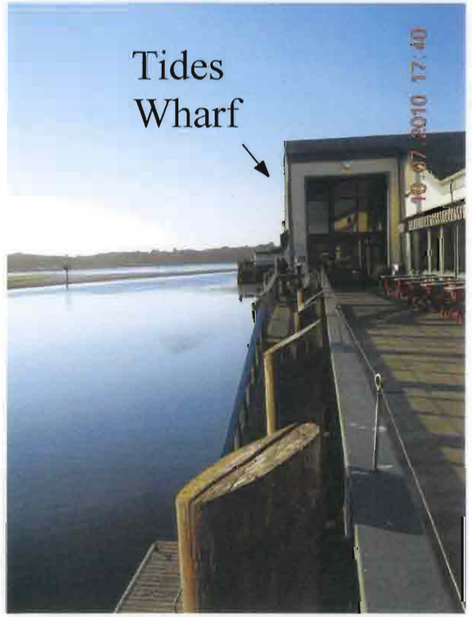

**X** - exposed bedrock.

| | | | |
|---|---|---|---|
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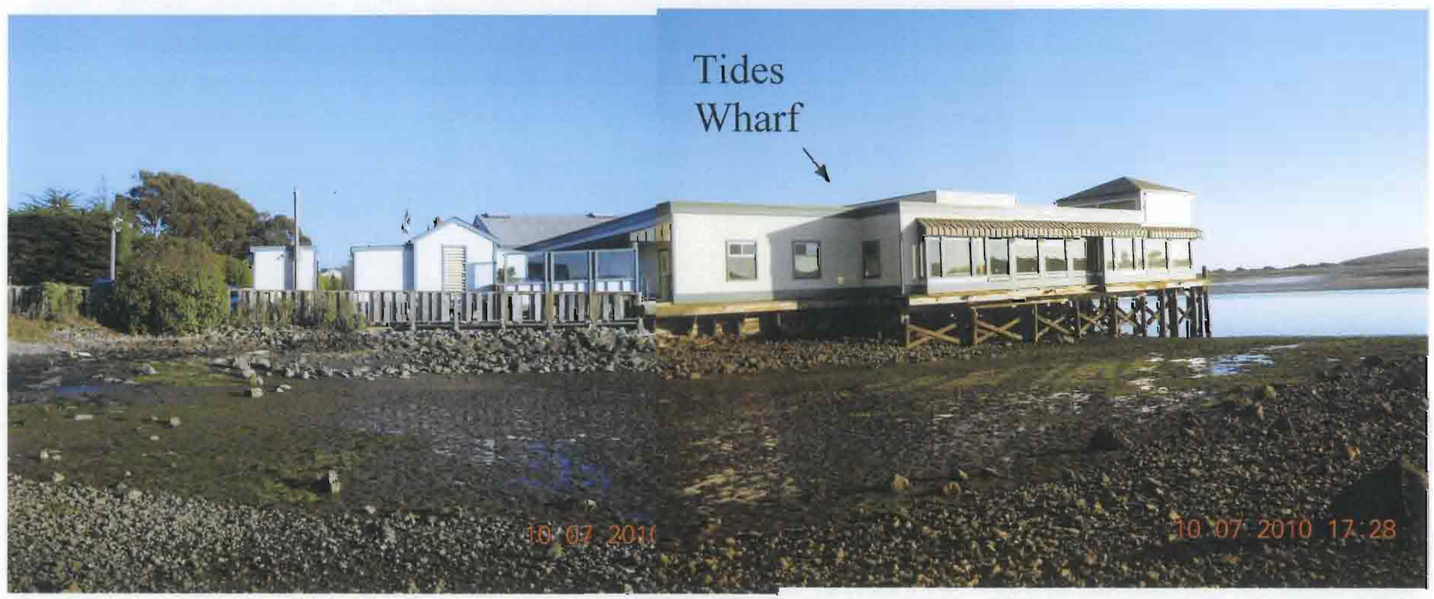
**SITE PHOTOGRAPH G** - 10/17/10, looking south, approximate tide level-0.4'




**SITE PHOTOGRAPH H** - 10/07/10, looking north, approximate tide level -0.4'




**SITE PHOTOGRAPH I** - 10/07/10, looking southwest, approximate tide level -0.4'




| | | | |
|---|---|---|---|
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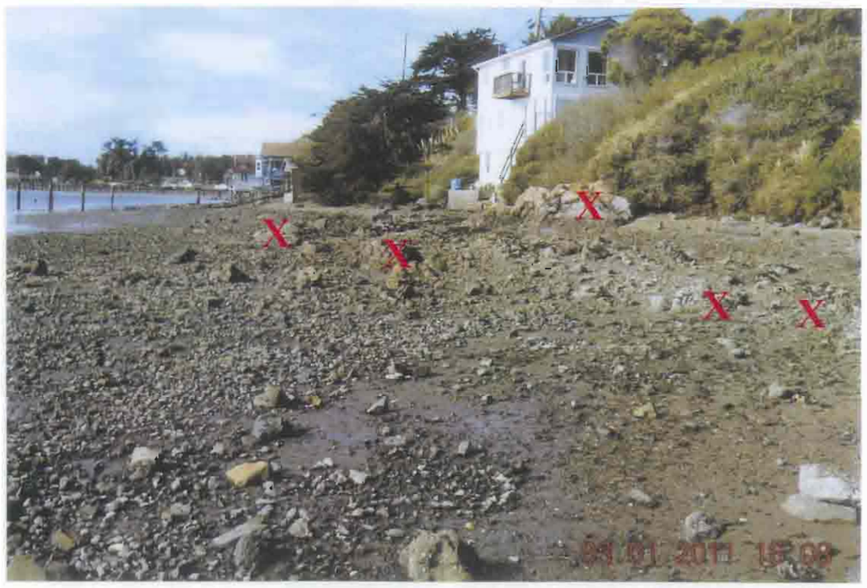
**SITE PHOTOGRAPH J** - 3/1/11, looking south, approximate tide level 0.0'




**SITE PHOTOGRAPH K** - 10/07/10, looking north, approximate tide level -0.4'




**SITE PHOTOGRAPH L** - 3/1/11, looking northwest, approximate tide level 0.0'




**X** - exposed bedrock.

| | | | |
|---|---|---|---|
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**SITE PHOTOGRAPH M** - 03/01/11, looking north, approximate tide level 0.0'




**SITE PHOTOGRAPH N** - 03/01/11, looking north, approximate tide level 0.0'




X - exposed bedrock.

**SITE PHOTOGRAPH O** - 03/01/11, looking north, approximate tide level 0.0'




**SITE PHOTOGRAPH P** - 12/01/10, looking south, approximate tide level +0.1'

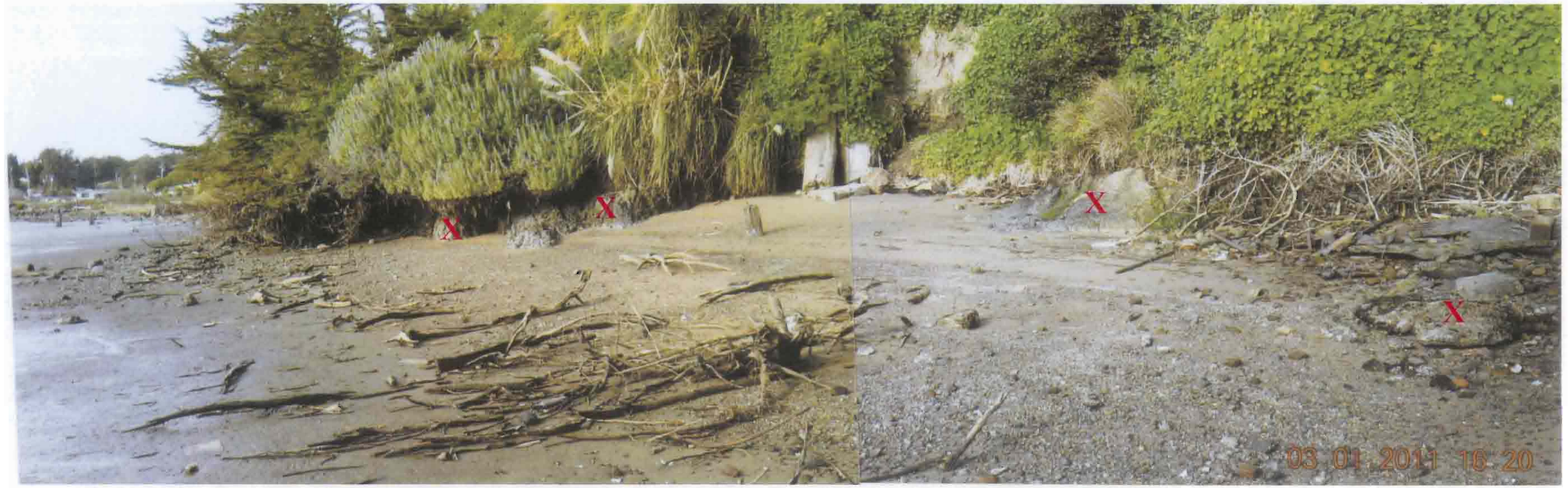



**X** - exposed bedrock.

| | | | |
|---|---|---|---|
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**SITE PHOTOGRAPH Q** - 03/01/11, looking north, approximate tide level 0.0



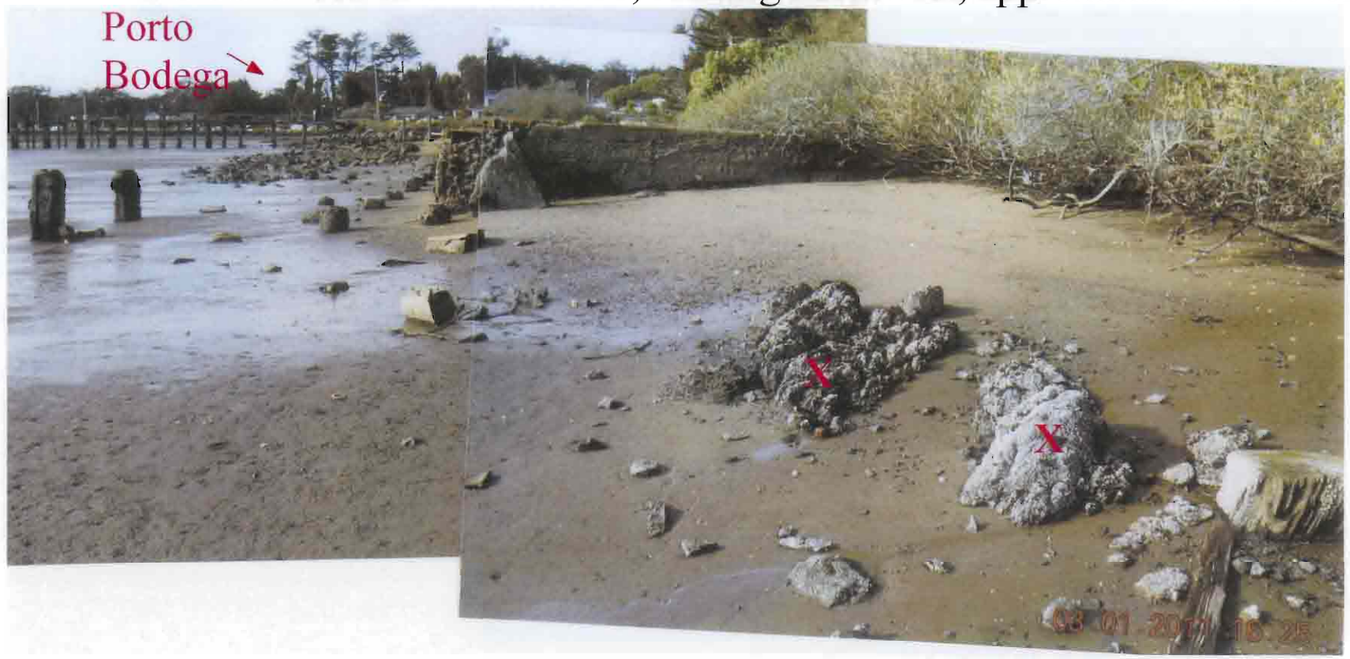

**SITE PHOTOGRAPH R** - 03/01/11, looking north, approximate tide level 0.0'




**X** - exposed bedrock.

| | | | |
|---|---|---|---|
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SITE PHOTOGRAPH S - 03/01/11, looking northwest, approximate tide level 0.0




**SITE PHOTOGRAPH T** - 01/17/11, looking southwest, approximate tide level -0.8'




**X** - exposed bedrock.

**SITE PHOTOGRAPH U** - 11/24/10, looking north




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SITE PHOTOGRAPHS S, T AND U
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

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PLATE
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**LEGEND**

**Approximate location of trenches excavated for previous fault investigations by Erik Olsborg**

**Proposed Bodega Harbor Coastal Trail**

**REFERENCE: Bodega Head, 1974, USGS Special Studies Zones 7.5-minute quadrangle.**

NORTH

APPROXIMATE SCALE (FEET)

0 500 1000 2000

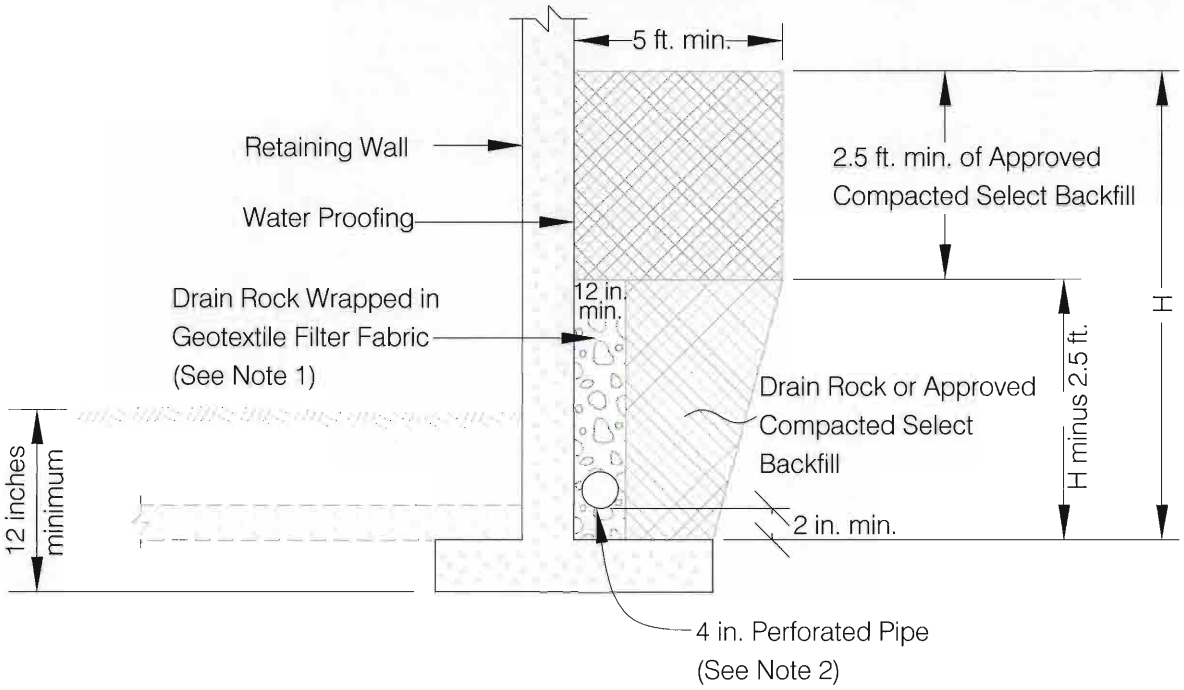
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VICINITY FAULT INVESTIGATION MAP
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
51

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RETAINING WALL DRAINAGE DETAIL
(Not to Scale)

NOTES:

(1) Drain rock should be clean, free-draining material graded in size between the No. 4 and 3/4 or 1-1/2 inch sieves and should be wrapped in a non-woven geotextile filter fabric (Mirafi 140N or equivalent).

(2) Pipe should be SDR 35 or equivalent, placed with perforations down, and sloped at 1% to drain to gravity outlet or sump with automatic pump.

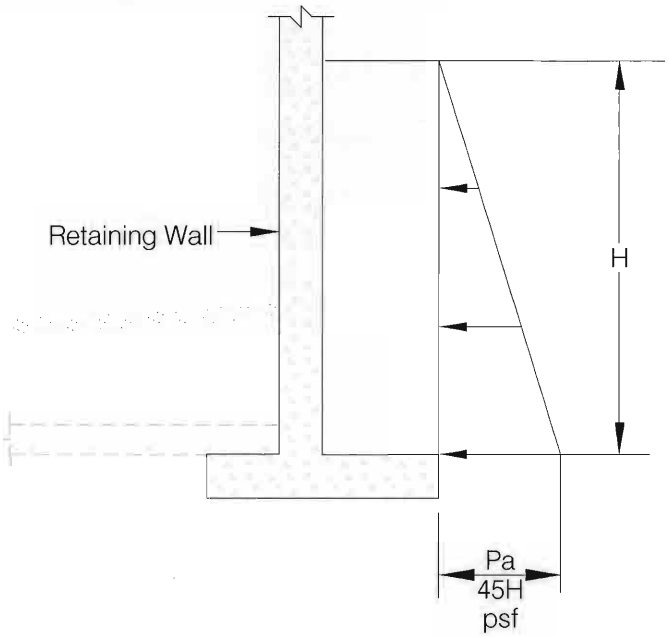
(3) A clean-out pipe with cap should be installed at the up-slope end of perforated pipe, and pipe elbows should be 45 degrees or less (for "snake" access).

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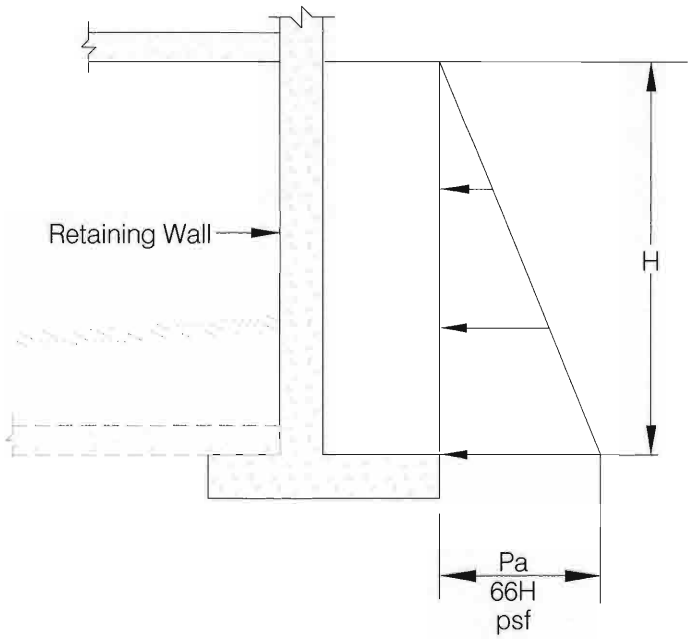
**RETAINING WALL DRAINAGE DETAIL**
BODEGA HARBOR COASTAL TRAIL
Bodega Bay
Sonoma County, California

PLATE
**52**




ACTIVE SOIL PRESSURES DIAGRAM

For walls that are free to rotate (See Note 2)




AT-REST SOIL PRESSURES DIAGRAM

For braced walls of substantial rigidity (See Note 2)

NOTES:

(1) The above are level backfill soil pressures only and do not include lateral loads resulting from other sources such as traffic, floor loads, adjacent foundations or other vertical loads.

(2) If the wall at surface of the backfill cannot yield about 0.1% of its height, at-rest soil pressures should be used.

(3) The above pressures assume a drained condition. See Plate 52 for drainage and backfill details.

(4) The above pressures should be used where backfill slope is flatter than 3 horizontal to 1 vertical (3H:1V). Where backfill slope is between 3H:1V and 1.5H:1V, use active pressure of 55H psf and at-rest pressure of 87H psf, respectively.

(5) For design seismic pressures see the Retaining Walls Section of this report.

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4 copies - Joseph Kase
Sonoma County Regional Parks Department
2300 County Center Drive, #120A
Santa Rosa, California 95403



# Jurisdictional Delineation Report
# Bodega Bay Trail Project – Coastal North Harbor Segment
# Bodega Bay, Sonoma County, California
# January 2020

**Prepared for:**
Sonoma County Regional Parks
2300 County Center Drive, Suite 120A
Santa Rosa, CA 95403

**Prepared by:**
Prunuske Chatham, Inc.
400 Morris Street, Suite G
Sebastopol, CA 95472

PRUNUSKE CHATHAM, INC.

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# 1. Introduction

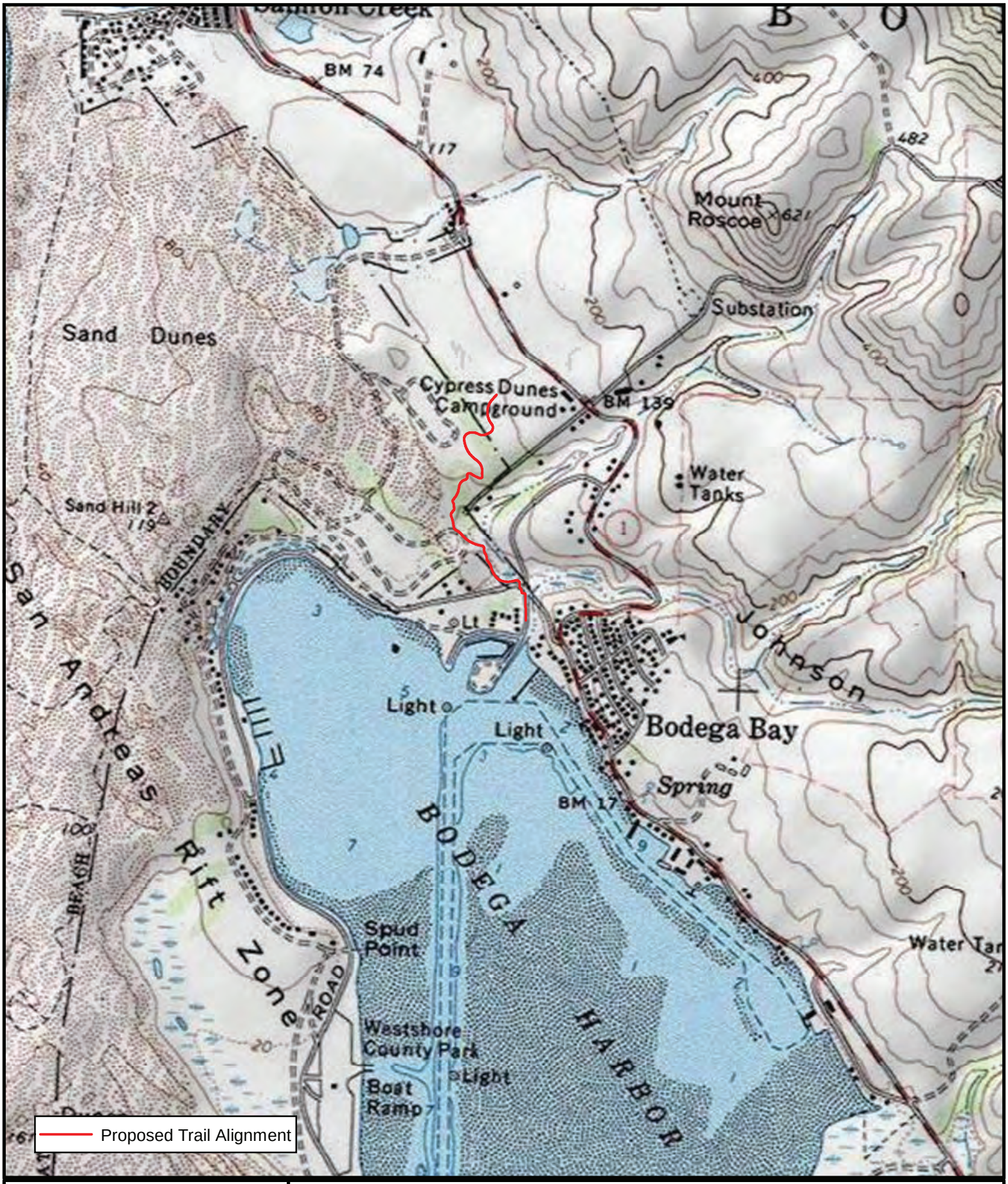
Sonoma County Regional Parks (Regional Parks) is proposing to construct a 3-mile trail along Highway 1 in Bodega Bay that will improve the safety of pedestrians, bicyclists, and motorists. The trail is being developed in four sections. The 1.1-mile segment of the Coastal Prairie Trail was completed and open to the public in 2016. The next priority segment includes the 0.6-mile Coastal North Harbor Trail and then the 0.37-mile trail segment paralleling Smith Brothers Road. The last segment starts at Eastshore Road, continues on County tideland, and connects to Smith Brothers Road and extends for 1 mile.

The Coastal North Harbor Trail is the currently proposed segment (Figure 1). It starts on County-owned parkland adjacent to Highway 1, near the Bodega Bay Community Center. The proposed trail continues southwest, crossing into Sonoma Coast State Park, past an existing amphitheater, and south toward a set of existing campgrounds in the Bodega Dunes Campground. The trail then passes near a private residence at its southern end near Bay Flat Road. The trail then crosses the intersection of Eastshore Road and Bay Flat Road before terminating before Bodega Harbor.

Regional Parks requested that Prunuske Chatham, Inc. (PCI) complete a delineation of U.S. Army Corps of Engineers and California Coastal Commission jurisdictional wetlands and waters within the trail corridor for the Coastal North Harbor Trail segment. This report summarizes PCI's wetlands and waters determination.

# 2. Study Area

The Study Area is located in Bodega Bay, Sonoma County (Figure 2). The site is located in undeveloped coastal scrub, Monterey cypress forest, dunes, and coastal riparian habitat on County and State-owned lands near Bodega Harbor. It is accessed from the parking area behind the Bodega Bay Community Center and near the intersection of Bay Flat Road and Eastshore Road. It is mapped on the Bodega Head 7.5' USGS quadrangle (38.33822°N, -123.05188°W). The Study Area is bordered by the Children's Bell Tower and Coastal Prairie Trail to the north, Bodega Bay RV Park, Ranch Road, Eastshore Road, and riparian habitat to the east, Porto Bodega Marina and Bay Flat Road to the south, and Bodega Dunes Campground and private residences to the west. The Study Area is located along a drainage to Bodega Harbor.



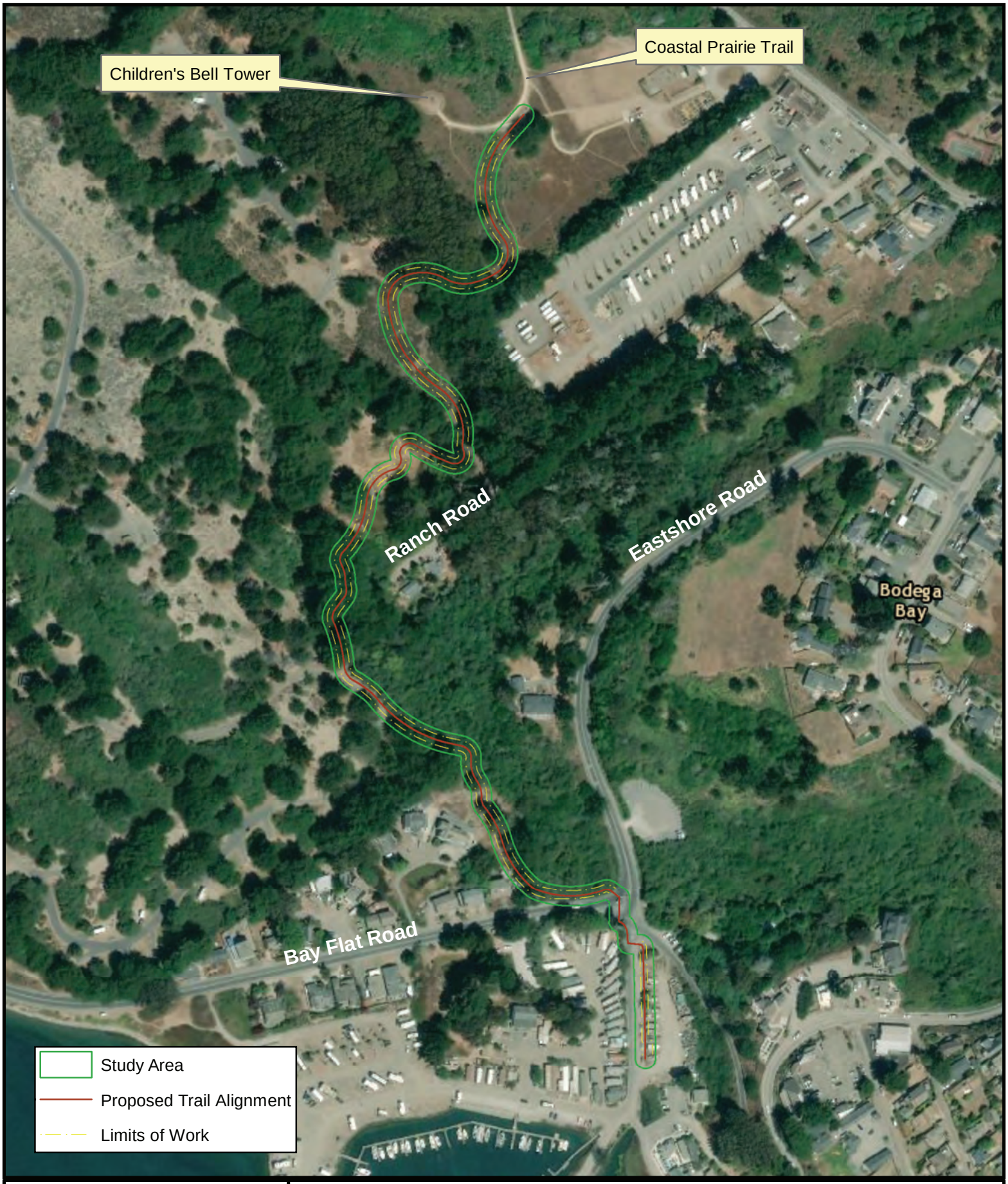

PRUNUSKE CHATHAM, INC.

Figure 1. Project Location
Bodega Bay Trail Project
Coastal North Harbor Segment
Bodega Bay, Sonoma County

0 0.125 0.25 0.5 Miles

January 2020
Aerial: ESRI

N




PRUNUSKE CHATHAM, INC.

Figure 2. Study Area
Bodega Bay Trail Project
Coastal North Harbor Segment
Bodega Bay, Sonoma County

0 75 150 300 450 600 Feet

N

January 2020
Aerial: ESRI
Trail Features: Questa Engineering Corp.

## 3. Field Survey Methods

A preliminary delineation of U.S. Army Corps of Engineers (Corps) and California Coastal Commission (CCC) jurisdictional wetlands and waters within the Study Area was conducted on January 14, 2020. The Study Area includes the proposed trail corridor and a buffer around it (Figure 2). A previous delineation of the project was completed in 2011. However, the project footprint and delineation standards have changed since then, and delineations are also only considered valid for 5 years, so an updated delineation was needed.

*Wetlands*. The delineation followed protocols described in the Corps' *Wetland Delineation Manual* (Corps 1987), Version 2.0 of the *Regional Supplement for the Western Mountains, Valleys, and Coast Region* (Corps 2010), and the California Coastal Commission's *Definition and Delineation of Wetlands in the Coastal Zone* (CCC 2011). Determinations were made at each sample point for both the Corps and CCC jurisdiction. Corps wetland jurisdiction is based on a three-parameter definition; a site must meet criteria for hydrology, hydric soils, and hydrophytic vegetation to be considered a wetland (Corps 1987, 2010). In contrast, only one of those same three parameters must be met for a location to be considered wetland by the CCC (CCC 2011).

Prior to the field investigations, a current aerial photograph, soil map for the area (NRCS 2020), and site plans prepared by Questa Engineering Corp were reviewed. PCI collected formal data at 16 locations in the field based on the presence or absence of wetland characteristics and completed informal assessments of the surrounding areas. At each sample point, vegetation, soils, and hydrology were assessed. A hand-held Trimble TDC 150 GPS unit was used to acquire sub-meter data at each sample point and along wetland feature boundaries. Data was collected on field datasheets. GPS data were downloaded in the office and superimposed onto aerial imagery using ArcGIS software. Representative photos of the wetland features were taken during the delineation and are included at the end of this report. *Table 1, Delineation Plots and Preliminary Determinations*, provides a summary of the diagnostic features present for each wetland sample point and final determinations.

Evaluation of vegetation entailed identifying plant species within an approximately 10' radius surrounding each sample location. All dominant species within each stratum present (i.e., tree, shrub, herb, woody vine) were recorded. A visual estimate of cover was

made for each species, and the wetland indicator status[1] was recorded. Wetland indicator status was based on the National Wetland Plant List website (Corps 2018). Cover values and wetland indicator statuses were then used to calculate dominance and prevalence of hydrophytic vegetation using Corps methods (Corps 1987, 2010).

Soils evaluation entailed digging pits approximately 14" deep by 8" wide at each sample point. The hue, value, and chroma were evaluated using Munsell Soil Color Charts (Macbeth 1992). Soil texture was recorded. Location, type, and color of mottles were also characterized if present. This data was then reviewed to determine whether any hydric soil indicators (such as the presence of a depleted matrix or redox dark surface) were present (Corps 2010, NRCS 2018). At each sample point, hydrology was also assessed, and presence of any indicators of wetland hydrology were noted (Corps 2010).

In addition to sample points, visual observations were made of vegetation composition in surrounding areas to help identify wetland extents and boundaries. Within the wetland and adjacent uplands, test soil pits and visual observations of vegetation confirmed that wetland traits there matched conditions seen in formal wetland sample locations.

*Waters*. Waters were delineated according to the Corps' *A Guide to Ordinary High Water Mark (OHWM) for Non-perennial Streams in the Western Mountains, Valley, and Coast Region of the United States* (Corps 2014). The approximate limits of the Ordinary High Water Mark (OHWM) were evaluated in the field to determine the approximate extent of Corps and CCC jurisdiction where accessible. This included evaluating geomorphic features, such as slopes, substrate, and vegetation composition to determine approximate extent. Representative photos of the waters features were taken during the delineation and are included at the end of this report. *Table 1, Delineation Plots and Preliminary Determinations*, provides a summary of the diagnostic features present for each waters sample point and final determinations.

This report is a preliminary determination of jurisdictional Corps and CCC wetlands and waters with the Study Area and is meant to guide the project design and mitigation planning. It is not considered complete until the delineation report is submitted to the Corps and CCC, and the delineation is confirmed by those agencies.

[1] **Wetland Indicator Status**
OBL = Obligate Wetland Plant (estimated probability of occurring in wetlands >99%)
FACW = Facultative Wetland Plant (estimated probability >67% to 99%)
FAC = Facultative Plant (estimated probability 33% to 67%)
FACU = Facultative Upland Plant (estimated probability 1% to <33%)
UPL = Obligate Upland Plant (estimated probability <1%)
NL = Not Listed (generally indicates upland plant)

## 4. Climate and Precipitation

The Study Area is characterized by cool, wet winters and mild summers with rainfall primarily between October and April. The annual average rainfall for the nearest reported climate station is 37.37 inches (Prism Climate Group 2020). The mean maximum annual air temperate is 68.2°F, and mean minimum annual air temperate is 49.5°F. The warmest temperatures occur between July and September and the coolest temperatures between December and January.

Precipitation data for January 2020 and the 3-month period (October – December 2019) preceding the delineation were evaluated to determine if the site received normal rainfall (Prism Climate Group 2020). Climate records were also evaluated to determine if the Study Area was subject to drought conditions during the previous water year. Drought conditions and low rainfall can influence wetland parameters such as plant growth and hydrology indicators.

- Short-term (1 month): January 2020 was drier than normal, but conditions appeared normal during the delineation. The Study Area received 1.07 inches of rainfall (1/1/2020 – 1/14/2020) during the two weeks preceding the delineation, which represents below-average rainfall for the month of January to date. The 29-year average for rainfall in January is 7.73 inches.

- Mid-term (3 months): Rainfall was within a normal range. Study Area received 10.4 inches of rain from October through December 2019. The average rainfall for this period is 12.74 inches.

| Prior Months | Average Rainfall[1] (in.) | Measured Rainfall[1] (in.) |
|---|---|---|
| December 2019 | 6.54 | 8.98 |
| November 2019 | 4.47 | 1.23 |
| October 2019 | 1.73 | 0.19 |
| **Totals** | 12.74 in. | 10.4 in. |

[1] Data from Prism Climate Group (2020)

- Long-term (1 year): Normal growing conditions were present from early 2019 through December 2019. The Palmer Drought Severity Index was consulted for the period of January 2019 - December 2019 (NOAA 2020). During January 2019, the region was under moderate drought, May was moderately moist, and all other months were within mid-range (average).

## 5. Topography

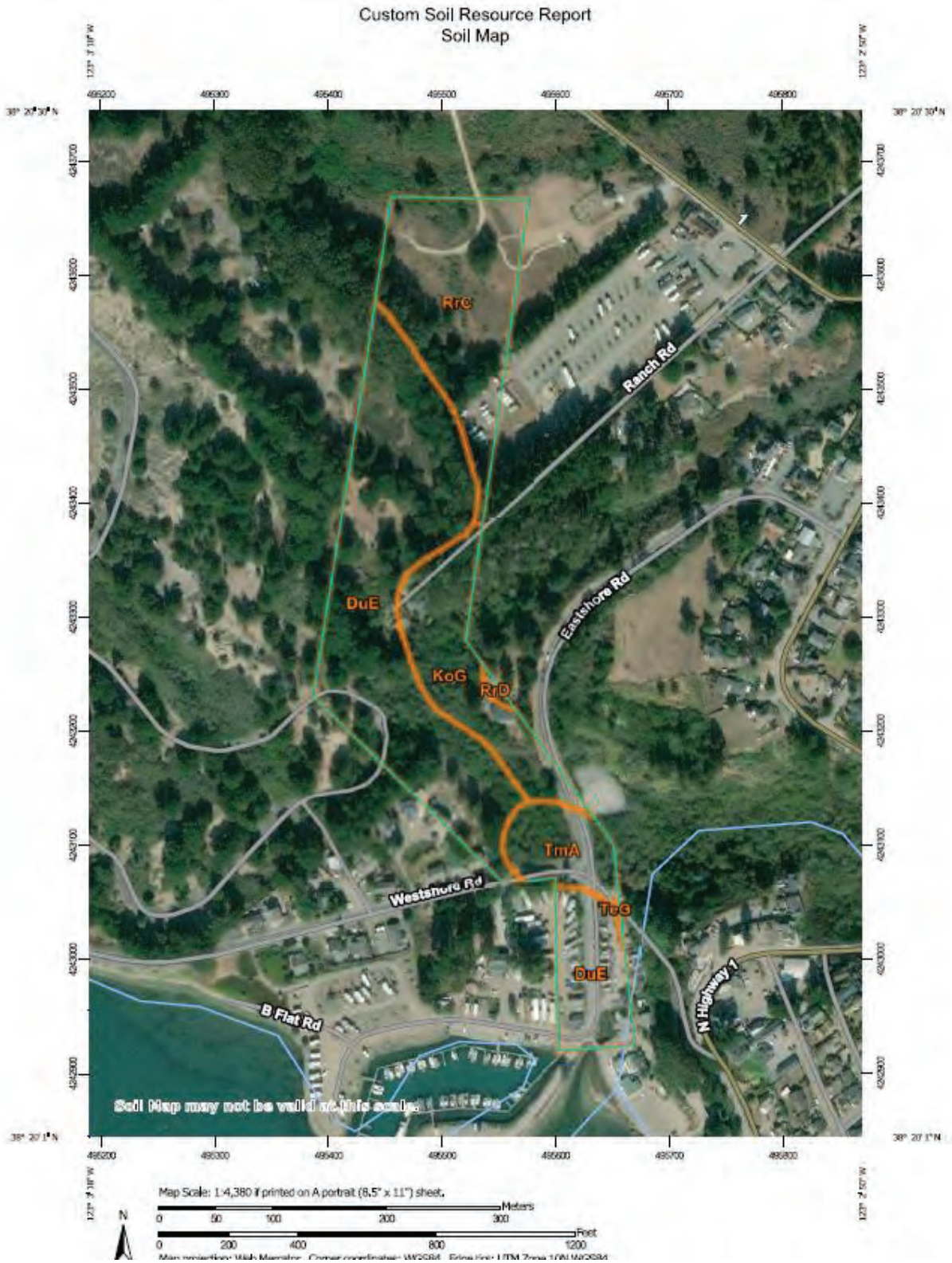
The Study Area begins on a gently sloping coastal terrace, meanders along a steep coastal drainage, and terminates in a flat graded area near Bodega Harbor. Elevation ranges from 102 to 10 feet.

## 6. Hydrology

The primary sources of water flows within the Study Area are direct precipitation, surface runoff from upslope, and possibly groundwater seepage. Drainage patterns flow primarily from the northeast and south down the main drainage. There is a network of smaller channels within the willow thicket adjacent to the Study Area, but they join into one channel at the downstream end of the site. The Study Area drains the coastal hills from Mount Roscoe, north of Bay Flat Road, and drains directly to Bodega Harbor.

## 7. Soils

Soils within the Study Area are mapped as Rohnerville loam, 0-9% slopes (RrC), dune land (DuE), and tidal marsh (TmA) (NRCS 2020). Rohnerville loams occurs at the beginning of the trail near the parking lot and intersection with the Coastal Prairie Trail. This is a moderately well-drained soil found on terraces. The parent material is alluvium derived from sedimentary rock. The soil profile includes loam from 0-16 inches and sandy clay loam and sandy clay from 16 to 60 inches. It is more than 80 inches to a restrictive layer and the runoff class is high. Dune land is found along the majority of the trail alignment, along the drainage and adjacent to the campground. Dune lands are comprised entirely of loose, shifting sand. The corner of Bay Flat Road and Eastshore Road at the lower limits of the trail is mapped as tidal marsh. Historically, this area may have been a tidal flat and frequently inundated.




**NRCS soil map for the Study Area (NRCS 2020).**

## 8. Results

The proposed trail will begin at the end of the Coastal Prairie Trail and Children's Bell Tower and then meander through undeveloped County and State Parks lands before ending near Bay Flat Road and Bodega Harbor. The trail will be constructed in coastal scrub, non-native Monterey cypress and eucalyptus forest, coastal dune, non-native annual grassland, and skirt along the edge of a well-developed riparian thicket and a complex of channels adjacent to the Bodega Dunes Campground. Figure 3a (Northern Segment) and 3b (Southern Segment) include the delineated features within Corps jurisdiction and Figure 4a (Northern Segment) and 4b (Southern Segment) include the CCC jurisdiction. Photographs of representative trail features and select sample points are included below.

The northern end of the proposed trail is located in coastal scrub dominated by coyote brush (*Baccharis pilularis*, NL), common velvetgrass (*Holcus lanatus,* FAC), and California blackberry (*Rubus ursinus*, FACU); Sample Points #1-3. The trail travels to the west and enters a well-developed Monterey cypress (*Hesperocyparis macrocarpa*) grove; (Sample Points #4-5. This area is dominated by a canopy of Monterey cypress (NL) with an understory of coyote brush, California blackberry, toyon (*Frangula californica*, NL), and panic veldtgrass (*Ehrharta erecta*, NL). Dense areas of iceplant (*Carpobrotus* sp., NL) are present in the understory of the Monterey cypress forest. The trail corridor continues through an open coastal dune habitat dominated by mock heather (*Ericameria ericoides*, NL; Sample Point #6) within an understory of annual grasses before crossing through Monterey cypress forest and annual grassland (Sample Point #7).

Beyond the amphitheater in the Bodega Dunes Campground, the trail travels through Monterey cypress-dominated dunes (Sample Point #9) and then begins to skirt along the edge of a riparian thicket and complex of channels. The upper limits of the drainage (Sample Point #8) are dominated by twinberry (*Lonicera involucrata*, FAC) and thimbleberry (*Rubus parviflorus*, FACU). The lower portions of the riparian area are dominated by arroyo willow (*Salix lasiolepis*, FACW) with an understory of slough sedge (*Carex obnupta*, FAC), rush (*Juncus effusus*, FACW), common velvetgrass, and California blackberry (Sample Points #11, 12, 16). The willow-dominated areas beyond the channels meet the one-parameter wetland criteria (Sample Point #11), but are outside of the Corps jurisdiction. See discussion of the drainages below.

The trail continues to border the riparian corridor along the edge of the campground before descending through coastal dune dominated by European beach grass (*Ammophila arenaria*, FACU) and Monterey cypress forest; Sample Point #15. It follows the riparian area again along Bay Flat Road, crosses the street, and terminates near Bodega Harbor on an existing road.

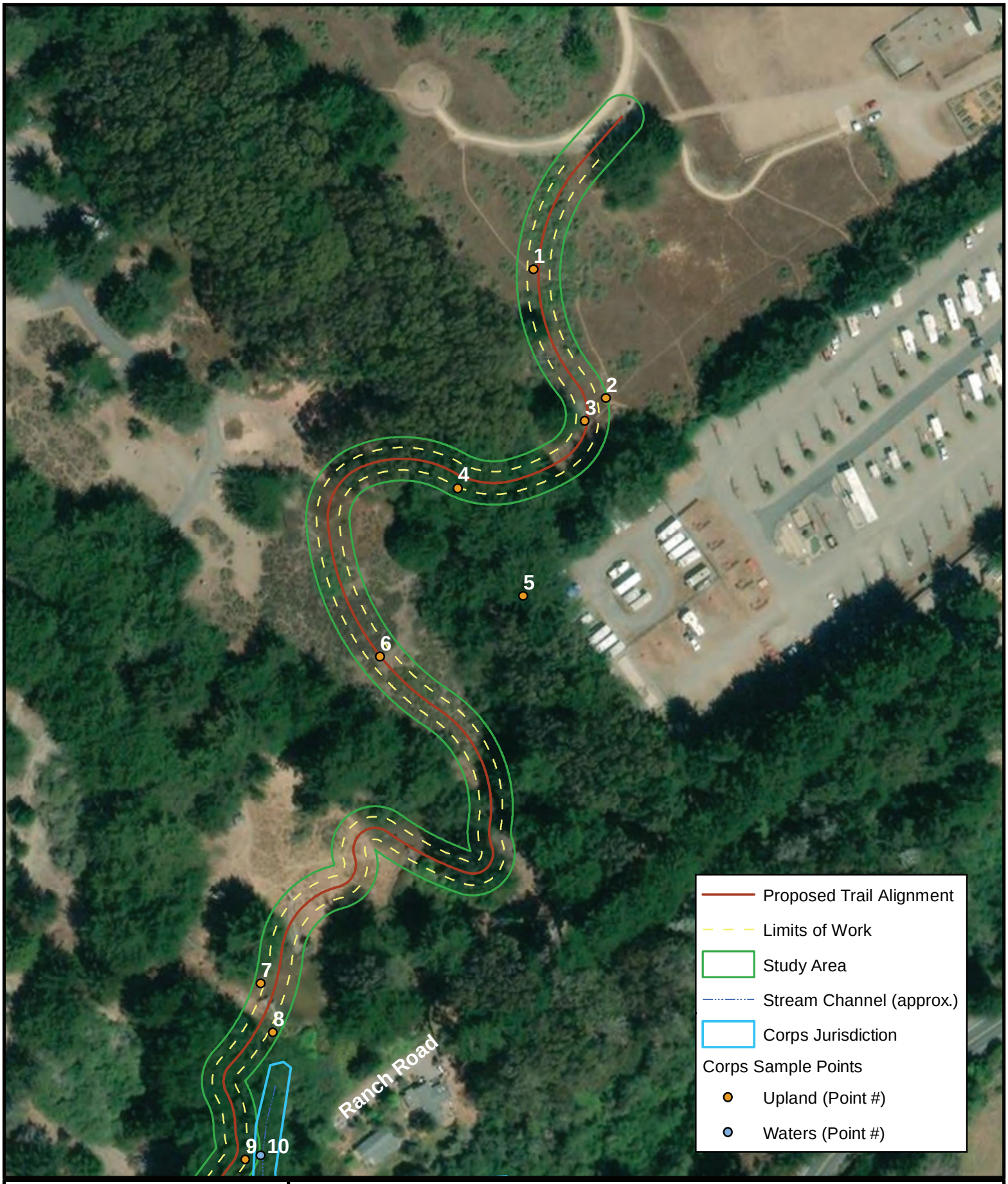
Within the drainage, there are multiple of channels (one larger mapped channel and one smaller tributary). Additional channels may be present, but this area is largely inaccessible due to the topography and density of the vegetation. These channels meet the Corps and CCC definitions for jurisdictional waters and riparian areas, respectively. At the upper limits of the drainage and along the tributary channel at the end of Ranch Road, the channel is 2 feet wide at the OHWM and the water depth was 2-6 inches; Sample Point #10. Along the main channel through the middle of the Study Area reach, the channel is 5 feet wide at the OHWM and the water depth was 6-10 inches; Sample Point #12. At the lower limits of the Study Area, the channel averages 2-3 feet wide at the OHWM with an average water depth of 6 inches; Sample Point #16. The channels were flowing at the time of the delineation.

Soils observed at the sample points included sandy loam, loamy sand, and sand. The sandy loam samples had a matrix color of 10YR3/2. Loamy sand samples had a matrix color of 10YR4/3. Sand sample points were comprised of loose particles. There were no redoximorphic features observed in any of the formal sample points. Soils sample points within the waters were not taken as these areas were fully inundated.

Hydrology indicators were observed at Sample Points #10, 12, and 16. These included inundation and saturated conditions. Redoximorphic features were observed in the floodplain adjacent to the channel at Sample Point #16; however, a formal data point was not collected at this location. All other sample points lacked positive hydrology indicators.

Table 1. Delineation Plots and Preliminary Determinations

| Sample Point | Paired Point | Corps Preliminary Determination | CCC Preliminary Determination | Hydrophytic Vegetation? | Hydric Soils? | Hydrology? |
|---|---|---|---|---|---|---|
| 1 | - | Upland | Upland | No | No | No |
| 2 | - | Upland | Upland | No | No | No |
| 3 | - | Upland | Upland | No | No | No |
| 4 | - | Upland | Upland | No | No | No |
| 5 | - | Upland | Upland | No | No | No |
| 6 | - | Upland | Upland | No | No | No |
| 7 | - | Upland | Upland | No | No | No |
| 8 | - | Upland | Upland | No | No | No |
| 9 | 10 | Upland | Upland | No | No | No |
| 10 | 9 | Waters | Wetland/Waters | No | Yes | Yes |
| 11 | 12, 13 | Upland | Wetland | Yes | No | No |
| 12 | 11, 13 | Waters | Wetland/Waters | Yes | Yes | Yes |
| 13 | 11, 12 | Upland | Upland | No | No | No |
| 14 | - | Upland | Upland | No | No | No |
| 15 | 16 | Upland | Upland | No | No | No |
| 16 | 15 | Waters | Wetland/Waters | No | Yes | Yes |



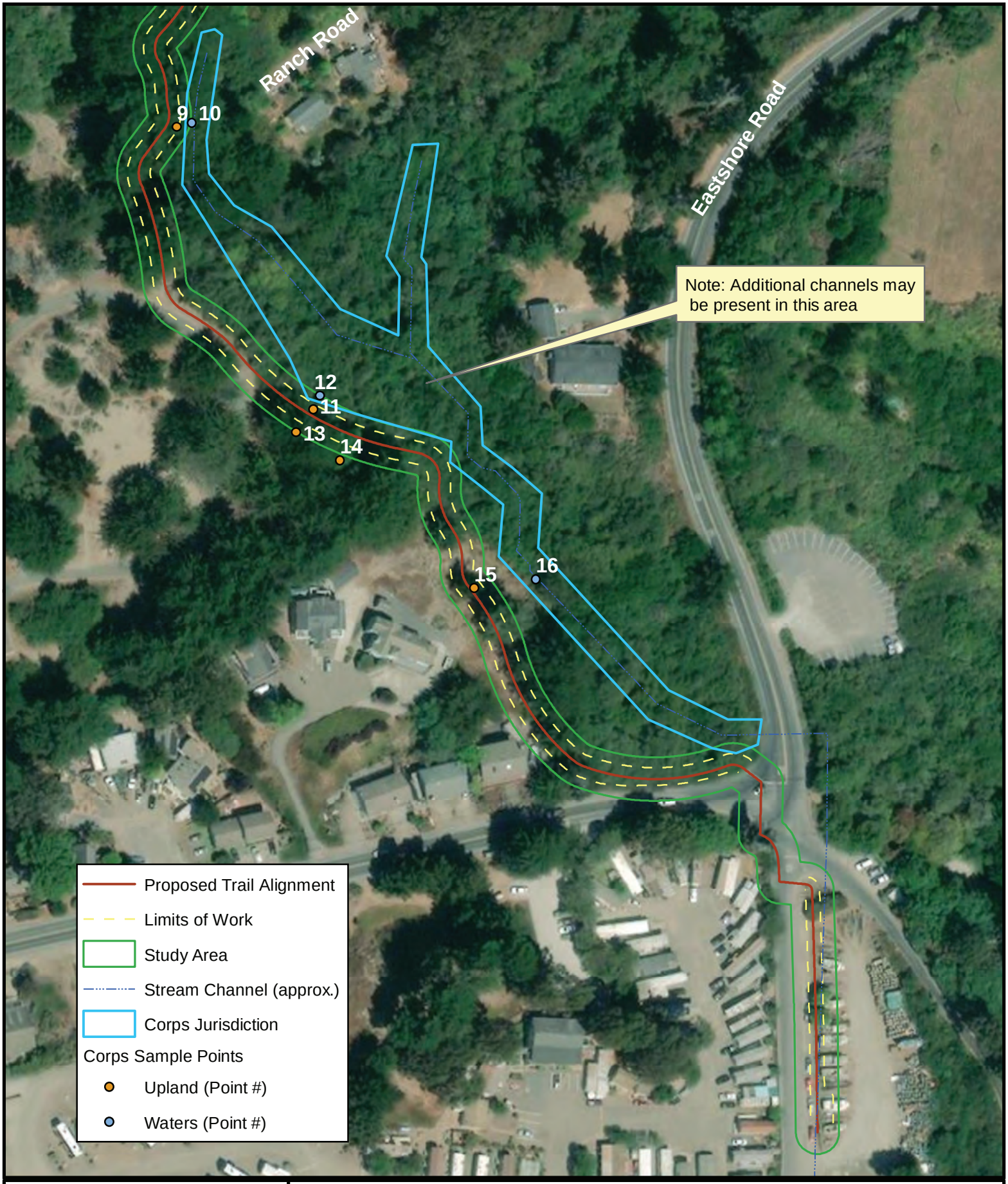

PRUNUSKE CHATHAM, INC.

Figure 3a. U.S. Army Corps of Engineers Jurisdictional Delineation
Coastal North Harbor Segment - Northern Segment

Field Work: PCI January 2020
Aerial: ESRI
Trail Features: Questa Engineering Corp.

N

0 40 80 160 240 Feet



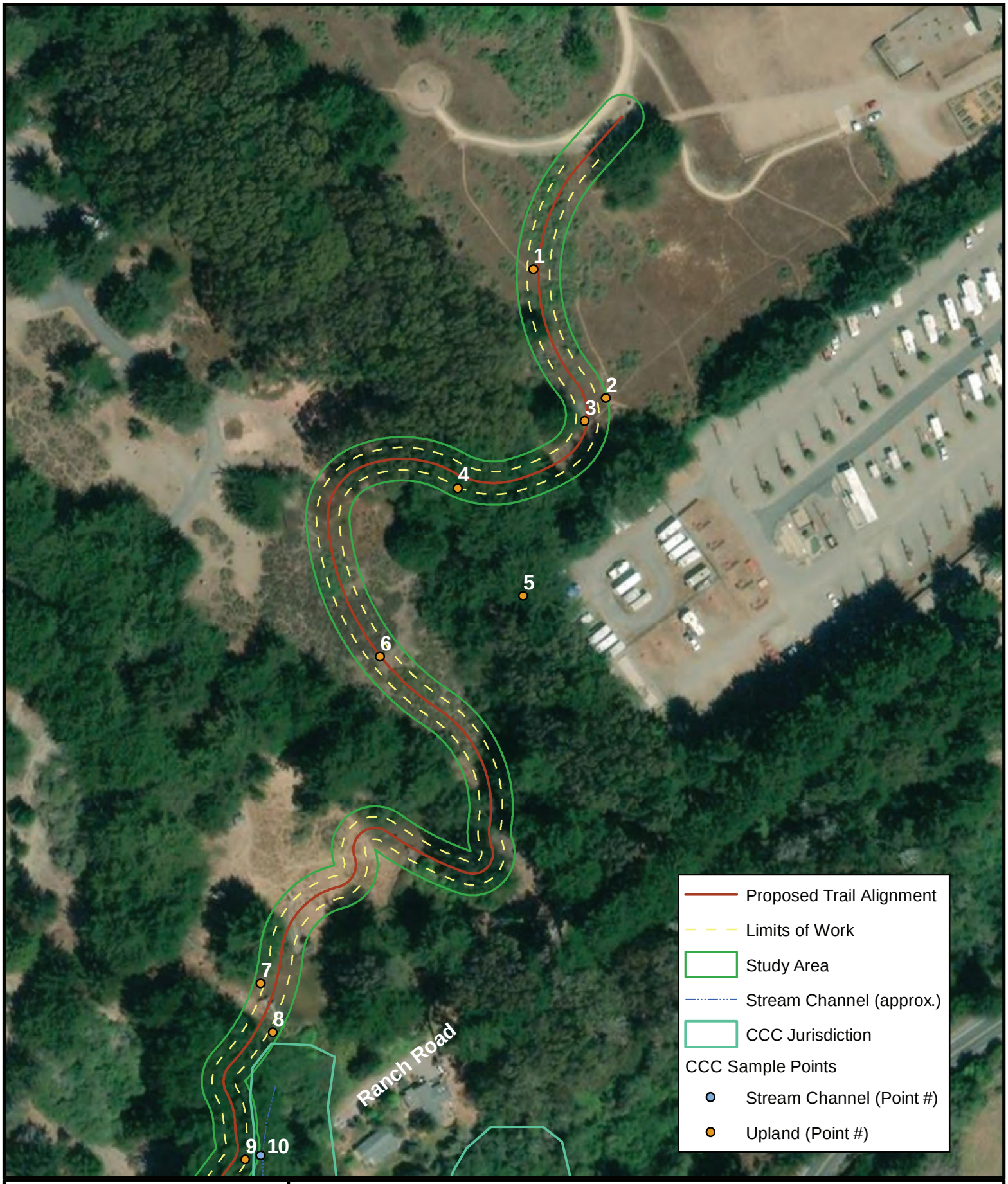

PRUNUSKE CHATHAM, INC.

Figure 3b. U.S. Army Corps of Engineers Jurisdictional Delineation
Coastal North Harbor Segment - Southern Segment

Field Work: PCI January 2020
Aerial: ESRI
Trail Features: Questa Engineering Corp.

N

0 40 80 160 240 Feet



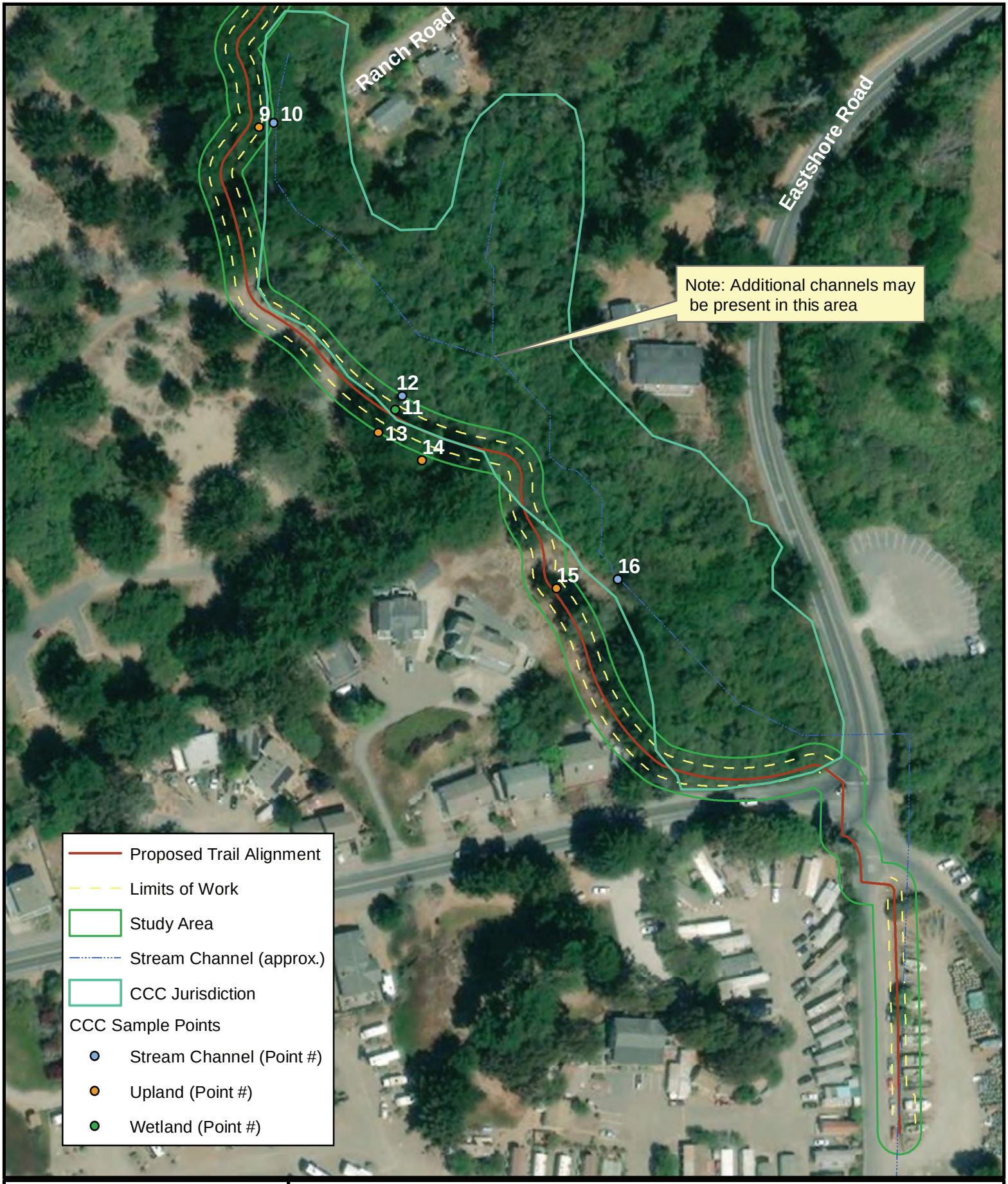

PRUNUSKE CHATHAM, INC.

Figure 4a. California Coastal Commission Jurisdictional Delineation
Coastal North Harbor Segment - Northern Segment

Field Work: PCI January 2020
Aerial: ESRI
Trail Features: Questa Engineering Corp.

N

0 40 80 160 240 Feet




PRUNUSKE CHATHAM, INC.

Figure 4b. California Coastal Commission Jurisdictional Delineation
Coastal North Harbor Segment - Southern Segment

Field Work: PCI January 2020
Aerial: ESRI
Trail Features: Questa Engineering Corp.

N

0 40 80 160 240 Feet

# 9. References

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## 10. Study Area Photographs – January 14, 2020





Trail entrance near Coastal Prairie Trail (top) and Sample Point #1 in coastal scrub (bottom).





Sample point #2 (top) and trail alignment near Sample Point #3 before entering forested area (bottom).





Trail alignment near Sample Point #6 in mock heather-dominated dune (top) and grassland near amphitheater, immediately north of Sample Point #7 (bottom).





Trail alignment through cypress grove (top) and Sample Point #10 with channel (bottom).





Trail alignment along edge of road through campground (top) and Sample Point # 13 and trail area adjacent to campground site # 86 (bottom).





Sample Point #11 in willow thicket at edge of trail alignment (top) and #12, with channel (bottom).





Trail alignment through dune and Sample Point #15 (top) and Sample Point #16 with channel bottom).





Trail alignment along Bay Flat Road (top) and terminating near Bodega Harbor (bottom).

# 11. **Wetland Delineation Data Forms**

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 1

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes _____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes _____ | No ✓ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: _____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | _____ = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: _____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | _____ = Total Cover | | |
| **Herb Stratum** (Plot size: _____) | | | |
| 1. Holcus lanatus | 90 | Y | FAC |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 90 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: _____) | | | |
| 1. Rubus ursinus | 15 | Y | FACU |
| 2. | | | |
| | 15 = Total Cover | | |

% Bare Ground in Herb Stratum _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes _____ No ✓

Remarks:

## SOIL

Sampling Point: 1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 95 | - | | | | sandy loam | rock fragments, 5% |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 2

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes _____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes _____ | No ✓ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: _____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | _____ = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: _____) | | | |
| 1. Baccharis pilularis | 30 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 30 = Total Cover | | |
| **Herb Stratum** (Plot size: _____) | | | |
| 1. Holcus lanatus | 15 | N | FAC |
| 2. Juncus effusus | 80 | Y | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 95 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: _____) | | | |
| 1. Rubus ursinus | 10 | Y | FACU |
| 2. | | | |
| | 10 = Total Cover | | |

% Bare Ground in Herb Stratum 5

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes _____ No ✓

Remarks:

## SOIL

Sampling Point: 2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 95 | - | | | | sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 3

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

## VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 10 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 10 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Baccharis pilularis | 50 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 50 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Holcus lanatus | 80 | Y | FAC |
| 2. Geranium dissectum | 1 | N | NL |
| 3. Cirsium vulgare | 1 | N | FACU |
| 4. Elymus glaucus | 10 | N | FACU |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 92 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 10 | Y | FACU |
| 2. | | | |
| | 10 = Total Cover | | |

% Bare Ground in Herb Stratum 8

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 3

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 100 | - | | | | sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 4

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 70 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 70 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Frangula californica | 10 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 10 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Ehrharta erecta | 70 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 70 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 1 | N | FACU |
| 2. Hedera helix | 5 | Y | FACU |
| | 6 = Total Cover | | |

% Bare Ground in Herb Stratum 30

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 4

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Redox Features Type[1] | Redox Features Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 100 | - | | | | sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 5

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 30 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 30 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Ehrharta erecta | 5 | N | NL |
| 2. Zantedeschia aethiopica | 20 | Y | OBL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 25 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 40 | Y | FACU |
| 2. | | | |
| | 40 = Total Cover | | |

% Bare Ground in Herb Stratum 15

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 5

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 80 | - | | | | sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 6

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

## VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Ericameria ericoides | 40 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Briza major | 20 | Y | NL |
| 2. annual grass | 25 | Y | NL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 45 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | = Total Cover | | |

% Bare Ground in Herb Stratum 5

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 6

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | - | 100 | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 7

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Carpobrotus sp. | 50 | Y | NL |
| 2. annual grass | 25 | Y | NL |
| 3. Oxalis pes-caprae | 20 | Y | NL |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 95 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | = Total Cover | | |

% Bare Ground in Herb Stratum 5

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 7

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Redox Features Type[1] | Redox Features Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/2 | 80 | - | | | | loamy sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 8

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** **Yes** ____ **No** ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | ____ = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Lonicera involucrata | 70 | Y | FAC |
| 2. Rubus parviflorus | 20 | Y | FACU |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 90 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | ____ = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

% Bare Ground in Herb Stratum 5

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** **Yes** ____ **No** ✓

Remarks:

Edge of riparian corridor

## SOIL

Sampling Point: 8

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR3/1 | 90 | - | | | | sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 9

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 40 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 40 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Ehrharta erecta | 30 | Y | NL |
| 2. Oxalis pes-caprae | 20 | Y | NL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 50 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

% Bare Ground in Herb Stratum 15

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 9

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Redox Features Type[1] | Redox Features Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | - | 100 | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 10

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ✓ No ____ |
| Hydric Soil Present? | Yes ✓ | No ____ | |
| Wetland Hydrology Present? | Yes ✓ | No ____ | |

Remarks:

Channel with flowing water

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 70 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 70 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Corylus cornuta | 10 | Y | FACU |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 10 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Polystichum munitum | 10 | Y | FACU |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 10 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus armeniacus | 60 | Y | FAC |
| 2. Hedera helix | 10 | N | FACU |
| | 70 = Total Cover | | |

% Bare Ground in Herb Stratum ____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 10

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

No sample taken, inundated channel, hydric soils assumed

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes ✓ No ___ Depth (inches): 2-6"

Water Table Present? Yes ✓ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): ___

**Wetland Hydrology Present?** **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Channel, water flowing through site, channel width 2', depth of channel 1', water depth 2-6"

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 11

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No ____ | **Is the Sampled Area within a Wetland?** Yes ✓ No ____ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

CCC wetland

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Salix lasiolepis | 50 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Holcus lanatus | 30 | Y | FAC |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 30 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 5 | Y | FACU |
| 2. | | | |
| | 5 = Total Cover | | |

% Bare Ground in Herb Stratum 20

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ✓ No ____

Remarks:

## SOIL

Sampling Point: 11

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR4/3 | 90 | - | | | | loamy sand | rock fragments, 10% |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 12

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ✓ | No ____ | **Is the Sampled Area within a Wetland?** Yes ✓ No ____ |
| Hydric Soil Present? | Yes ✓ | No ____ | |
| Wetland Hydrology Present? | Yes ✓ | No ____ | |

Remarks:

Channel with flowing water and adjacent riparian vegetation

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Salix lasiolepis | 50 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Carex obnupta | 25 | Y | FAC |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 25 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 10 | Y | FACU |
| 2. | | | |
| | 10 = Total Cover | | |

% Bare Ground in Herb Stratum 30

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ✓ No ____

Remarks:

## SOIL

Sampling Point: 12

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

No sample taken, inundated channel, hydric soils assumed

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes ✓ No ___ Depth (inches): 6"

Water Table Present? Yes ✓ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): ___

**Wetland Hydrology Present?** **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Channel, water flowing through site, channel width 5', depth of channel 6-10"

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 13

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 50 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 50 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | ____ = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Annual grasses | 30 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 30 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

% Bare Ground in Herb Stratum 25

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 13

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | | | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 14

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes _____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes _____ No ✓ |
| Hydric Soil Present? | Yes _____ | No ✓ | |
| Wetland Hydrology Present? | Yes _____ | No ✓ | |

Remarks:

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: _____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 50 | Y | NL |
| 2. Arbutus menziesii | 30 | Y | NL |
| 3. | | | |
| 4. | | | |
| | 80 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: _____) | | | |
| 1. Salix lasiolepis | 70 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 70 = Total Cover | | |
| **Herb Stratum** (Plot size: _____) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | _____ = Total Cover | | |
| **Woody Vine Stratum** (Plot size: _____) | | | |
| 1. | | | |
| 2. | | | |
| | _____ = Total Cover | | |

% Bare Ground in Herb Stratum 25

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes _____ No ✓

Remarks:

## SOIL

Sampling Point: 14

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | - | | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 15

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ____ No ✓ |
| Hydric Soil Present? | Yes ____ | No ✓ | |
| Wetland Hydrology Present? | Yes ____ | No ✓ | |

Remarks:

## VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 10 | Y | NL |
| 2. Pinus radiata | 10 | Y | NL |
| 3. | | | |
| 4. | | | |
| | 20 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Baccharis pilularis | 15 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 15 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Ammophila arenaria | 25 | Y | FACU |
| 2. Briza major | 25 | Y | NL |
| 3. Carpobrotus sp. | 10 | N | NL |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 60 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. | | | |
| 2. | | | |
| | ____ = Total Cover | | |

% Bare Ground in Herb Stratum 10

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 15

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | - | | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes _____ No ✓**

Remarks:

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

**Wetland Hydrology Present? Yes _____ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

## WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Sonoma Coast - Harbor Trail City/County: Bodega Bay, Sonoma County Sampling Date: 1/14/2020

Applicant/Owner: Sonoma County Regional Parks State: CA Sampling Point: 16

Investigator(s): Jennifer Michaud and Joan Schwan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Northwest Forests and Coast Lat: 38.33822N Long: 123.05188W Datum: NAD 1983

Soil Map Unit Name: Rohnerville loam or dune land NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No ✓ | **Is the Sampled Area within a Wetland?** Yes ✓ No ____ |
| Hydric Soil Present? | Yes ✓ | No ____ | |
| Wetland Hydrology Present? | Yes ✓ | No ____ | |

Remarks:

Channel with flowing water, with adjacent riparian vegetation

### VEGETATION – Use scientific names of plants.

| Tree Stratum (Plot size: ____) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. Hesperocyparis macrocarpa | 20 | Y | NL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | 20 = Total Cover | | |
| **Sapling/Shrub Stratum** (Plot size: ____) | | | |
| 1. Salix lasiolepis | 10 | N | FACW |
| 2. Baccharis pilularis | 15 | Y | NL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | 25 = Total Cover | | |
| **Herb Stratum** (Plot size: ____) | | | |
| 1. Polystichum munitum | 15 | Y | FACU |
| 2. Juncus effusus | 5 | N | FACW |
| 3. Holcus lanatus | 5 | N | FAC |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 25 = Total Cover | | |
| **Woody Vine Stratum** (Plot size: ____) | | | |
| 1. Rubus ursinus | 40 | Y | FACU |
| 2. | | | |
| | 40 = Total Cover | | |

% Bare Ground in Herb Stratum 5

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by: |
|---|---|
| OBL species ____ | x 1 = ____ |
| FACW species ____ | x 2 = ____ |
| FAC species ____ | x 3 = ____ |
| FACU species ____ | x 4 = ____ |
| UPL species ____ | x 5 = ____ |
| Column Totals: ____ (A) | ____ (B) |

Prevalence Index = B/A = ____

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes ____ No ✓

Remarks:

## SOIL

Sampling Point: 16

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ✓ **No** ___

Remarks:

No sample taken, inundated channel, hydric soils assumed

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes ✓ No ___ Depth (inches): 6"

Water Table Present? Yes ✓ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): ___

**Wetland Hydrology Present?** **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Channel, water flowing through site, channel width 2-3', depth of channel 6"