California North Coast Offshore Wind Studies

Existing Conditions and Potential Environmental Effects

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Executive Summary

In support for the North Coast Offshore Wind Feasibility Project, funded by the California Ocean Protection Council (OPC), this document provides an inventory of existing conditions and evaluates the potential effects of the project scenarios developed by Humboldt State University (HSU) and Mott MacDonald. These project scenarios (also referred to as the proposed action) represent different combinations of project scales and locations, as presented briefly below. The goal of this document is to inform the evaluation of project scenario feasibility and support future regulatory and permitting efforts.

The North Coast Offshore Wind Feasibility Project assesses two offshore wind farm locations with multiple build-out scenarios that differ in project size and the associated number of 12 MW turbines. The offshore wind farm locations consist of offshore Humboldt Bay (HB), which coincides with the Bureau of Ocean Energy Management's Northern California Call Area, and the hypothetical Cape Mendocino area (CM). For HB, there are three project size scenarios: 50 MW (four turbines), 150 MW (12 turbines), and 1800 MW (153 turbines). At CM, there are two project size scenarios (150 MW and 1800 MW). Both locations would require the installation and operation of an export cable to convey the electricity to the shore cable landfall at the South Spit of Humboldt Bay. The segment of export cable between the South Spit cable landfall and the Humboldt Bay Substation would be installed using horizontal directional drilling under the bay. All of the project scenarios would involve infrastructure improvements to the Humboldt Bay port. These improvements would include upgrades to Redwood Marine Terminal 1 and adjacent lands to support project construction and maintenance; potential changes to the timing and frequency of dredging within Humboldt Bay, and the potential addition of areas to be dredged in the bay. Power generated by the offshore wind farms will likely need to be distributed out of the area by overland transmission line route upgrades from the Humboldt Bay Substation to the east or south, or by a subsea cable route that extends south from the offshore wind farms to the San Francisco Bay area.

All of the project scenarios (proposed action) would entail construction, operations and maintenance, and decommissioning that would result in effects on the marine and terrestrial environments. The potential short-term effects on the marine environment that would be associated with construction include: (1) disturbance of benthic habitat; (2) changes in water quality from sedimentation or contaminants; (3) increase in ambient acoustic levels underwater; (4) increase in the risk for vessel collisions with wildlife; and (5) wildlife disturbance from the use of artificial lighting (e.g., on decks or underwater). The potential longer-term effects associated with operations and maintenance include: (1) operational noise of turbines and maintenance vessels; (2) seabird and bat collision/avoidance with rotating turbine blades; (3) marine mammal interactions with underwater structure (e.g., cetacean collision or entanglement with lost fishing gear); (4) habitat changes associated with structure in the water column and on the seafloor; (5) perching and haul-out effects; and (6) electromagnetic field transmissions from the interarray cables, offshore substation, and export cable (see table below). The potential effects on the terrestrial environment associated with the transmission line upgrades include: (1) disturbance of threatened or endangered wildlife species from the noise associated with horizontal directional

drilling and transmission line improvements; (2) removal of threatened or endangered plant species or sensitive natural communities during ground-disturbing activities; (3) loss of wildlife habitat (vegetation clearing); (3) hydrological interruption or the placement of fill in jurisdictional water bodies; (4) increased long-term risk of bird collision with transmission lines improvements; and (5) the introduction and spread of terrestrial invasive plant species (see table below).

The following are the key findings of this study.

- The potential effects of onshore and offshore construction will mostly be short-term and localized with opportunities for mitigation; however, major changes to existing habitat in Humboldt Bay (e.g., larger docks, dredging to increase channel size/depth beyond current channel configuration) will be a challenge to permit.
- The potential effects associated with the offshore project operations and maintenance will likely be an ongoing, long-term concern, primarily due to greater uncertainties about interactions with seabirds and marine mammals that may require extensive monitoring and adaptive management; these potential effects are scaled to project size and scenario.
- The long, linear improvements to existing overland transmission lines will also result in long-term effects on multiple terrestrial and freshwater biota and habitats, including those subject to state and federal regulations.

Permitting challenges are scaled to project size/scenario due to greater environmental uncertainties and potential risks: larger scale projects will not only affect a larger offshore footprint, but will include long terrestrial transmission line improvements that potentially affect a large number of threatened or endangered species and natural communities (e.g., wetlands and other waters). In addition, there are differences in the applicable regulatory agencies between the east and south transmission routes[1].

Potential environmental effects associated with the installation and operation of a subsea transmission cable to the south and from Cape Mendocino to Humboldt Bay are not well understood when compared to the terrestrial transmission line improvements, and will require more extensive surveys to narrow down the cable route and improve understanding of environmental risks and permitting challenges. The routes for the export cables and the subsea transmission cable should avoid marine geological features (e.g., submarine canyons, faults), protected marine areas (e.g., Marine Protected Areas), and (where feasible) rocky or hard substrates, to minimize effects.

[1] The east route intersects with the jurisdictions of the North Coast and Central Valley Regional Water Quality Control Boards (RWQCBs) and two U.S. Army Corps of Engineers (USACE) Districts: San Francisco and Sacramento. The south route occurs within the jurisdictions of the North Coast RWQCB and the San Francisco USACE District.

Summary of Offshore Wind Alternative Build-Out Scenario Stressors and their Relative Potential Risks to the Marine, Humboldt Bay, and Terrestrial Environment

Stressor	Small Build-Out Scenario -50 MW	Medium Build-Out Scenario -150 MW	Commercial Build-Out Scenario -1800 MW
Marine Environment			
Rotating Blades (seabird and bat collision)	Low	Medium	High
Mooring and Interarray Cables (cetacean collision or entanglement)	Low	Low	High
Acoustic (marine mammal behavior)	Low	Low	High
Habitat Change (benthic and pelagic invertebrates, fish)	Low	Medium	High
EMF (fish and invertebrate behavior)	Low	Low	Medium
Water Quality (contaminants, increased turbidity from sediments)	Low	Low	Medium
Humboldt Bay			
Dock Improvements (eelgrass, fish, marine mammals)	Low	Low	Medium
Dredging (habitat, acoustic, water quality)	Low	Low	Medium
Vessels (acoustic, collision, nonnative aquatic species, bird disturbance and displacement)	Low	Low	Medium
Terrestrial Environment			
Acoustic (behavior)	Low	Low	Medium
Ground Disturbance (sensitive habitats, listed plant and wildlife species, wildlife habitat)	Low	Low	Medium
Vegetation Clearing (sensitive habitats, wildlife habitat)	Low	Low	Medium
Hydrology and Water Quality (wetlands, riverine, and lacustrine water bodies)	Low	Low	Medium
Transmission Lines and Towers (bird collision, electrocution)	Low	Low	Medium
Invasive Plants	Low	Low	Medium

Notes: Relative Risk: Low Medium High

The potential effects, and their relative risks to the affected environment from stressors associated with the build-out scenarios were categorized as low, medium, and high. Stressors are considered to have a low risk if their potential effects are relatively well understood and/or they appear to present a low risk for harm to the affected environment (e.g., if only a small spatial scale or temporal scale of effect). If the potential environmental effects from stressors are not well understood (i.e., a higher level of uncertainty) and additional studies are required to improve understanding, the stressors are considered to have a medium risk. Stressors were classified as high risk if their potential effects are known to pose substantial risks to the affected environment (e.g., potential to have a negative effect over a longer term and spatial scale) and will require the implementation of avoidance, minimization, and/or mitigation measures.

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**Images on cover page represent species that are likely to occur in the action area*

Section 1.0 Introduction

This document provides support for the North Coast Offshore Wind Feasibility Project funded by the California Ocean Protection Council (OPC). The project scenarios and project descriptions were developed by Humboldt State University (HSU) and Mott MacDonald. The North Coast Offshore Wind Feasibility Project evaluates different project scales and locations, as described in detail in Severy and Garcia (2020). In summary, there are two offshore areas, the Northern California Humboldt Bay Call Area (HB) and the hypothetical Cape Mendocino area (CM) (Figure 1). Within each of these areas, there are different build-out scenarios (number of turbines): for HB, there are 3 different project size scenarios (50 MW, 150 MW and 1800 MW), and for CM there are 2 different project size scenarios (150 MW and 1800 MW). Both locations require export cables to bring power to the shore cable landfall at the South Spit of Humboldt Bay where it will be horizontally directionally drilled under the bay to the Humboldt Bay Substation. Humboldt Bay Port infrastructure improvements are described in detail in Porter and Phillips (2020). In summary, port infrastructure improvements will include upgrades to Redwood Marine Terminal 1 and adjacent lands to support project construction and maintenance, and potential changes to the timing and frequency of dredging within Humboldt Bay, and potential new dredged areas. For only the 1800 MW scale scenarios, power from the project would need to be distributed out of the area by overland transmission line route upgrades from the Humboldt Bay Substation to the east and south or by a subsea cable route option south from the offshore locations to the San Francisco Bay area (Figure 1).

The purpose of this document is to characterize the existing biotic conditions in the action area, which is defined as the project footprint and adjacent areas that may be affected by project activities, such as infrastructure improvements and upgrades, project construction, and project operations and maintenance. This document describes the habitats and species that are known to occur or likely to occur in the action area and provides an inventory of existing environmental conditions and evaluates the potential effects of project activities. The goal of this document is to inform the evaluation of project scenario feasibility and support future regulatory and permitting efforts.

This document is organized into the terrestrial and marine project components. The marine project components include the offshore areas where wind turbines would be deployed, the subsea cable routes from the deployment areas to shore, shoreline cable landing, and Humboldt Bay where infrastructure improvement activities would occur to provide marine terminal support. Species and habitat information was obtained from online resources including the National Marine Fisheries Service (NMFS) Essential Fish Habitat (EFH) Mapper, otherwise species information was obtained from the available literature. The terrestrial project components primarily consisted of two existing onshore transmission routes; the selected line would need upgrading to support a large-scale offshore wind project scenario. To evaluate potentially affected species and habitats in the terrestrial portion of the action area, several available spatial databases were queried. Species information was obtained from the California Natural Diversity Database (CNDDB), which was queried using a 500-feet-wide buffer zone from the cable landfall locations and 5 miles from the overland transmission routes.

The National Wetlands Inventory (NWI) was queried using a 250-feet-wide buffer zone from the cable landfall locations and overland transmission routes. Stream crossing data for the overland transmission routes were obtained from the National Hydrography Dataset (NHD).

A brief overview of the applicable statutory and regulatory requirements is provided, as well as strategies for addressing regulatory decision-making.

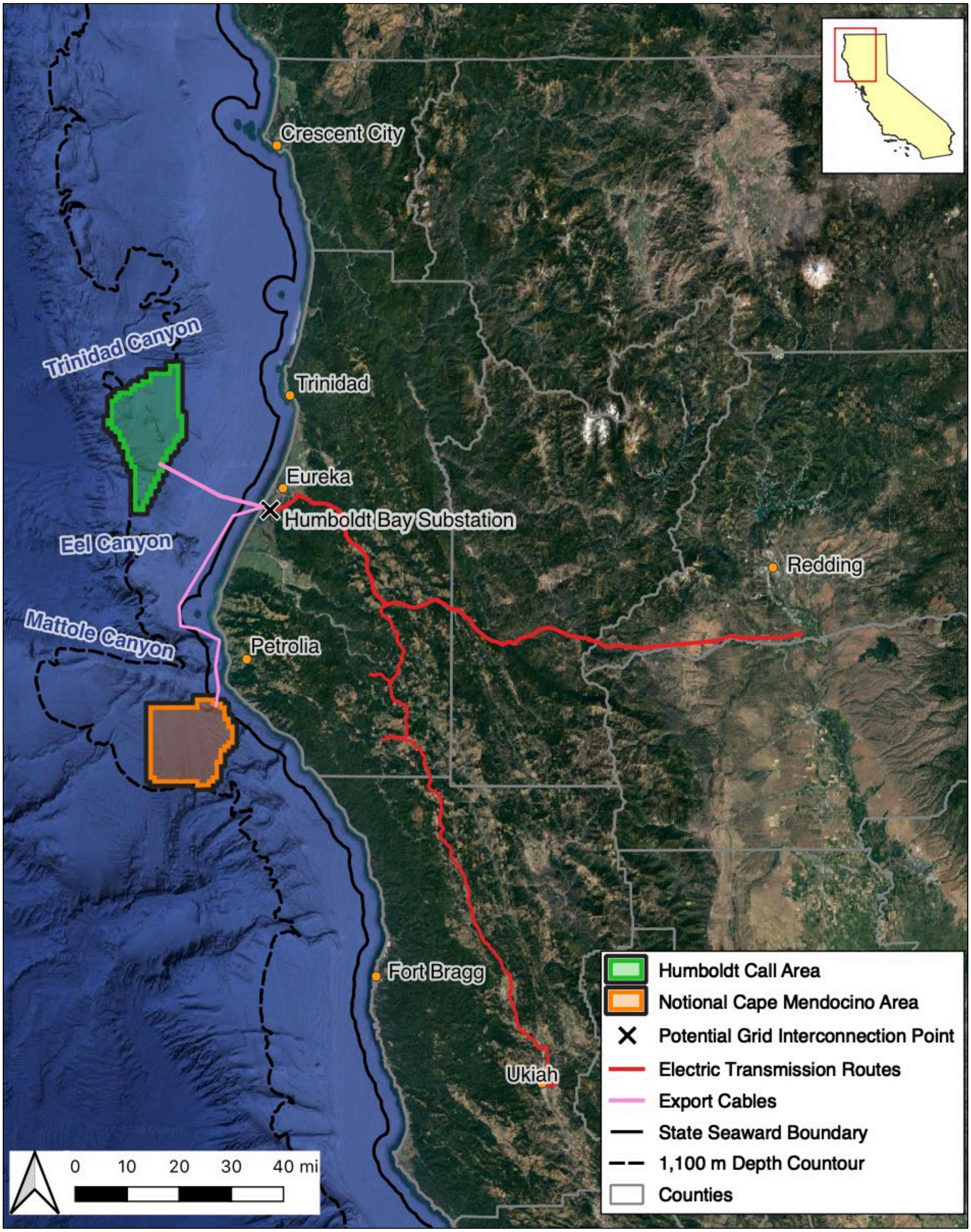

Figure 1. North Coast Offshore Wind Feasibility Project Action Area for Environmental Consideration

Section 2.0 Existing Conditions and Effects Analysis

This section provides an inventory of existing conditions in the action area, which consists of the Northern California Humboldt Bay Call Area (HB), Hypothetical Cape Mendocino Area (CM), subsea cable routes from HB and CM to shore, cable landfall and interconnection locations, harbor infrastructure improvements, and the overland transmission routes (Figure 1). The potential environmental effects of the proposed action and the statutory and regulatory requirements are also described in this section. The physical environment, biological environment, and potential environmental effects are discussed separately for the marine and terrestrial components of the action area.

2.1 Physical Environment

2.1.1 Marine

The marine physical environment encompasses the HB and CM, which include the proposed wind farm sites; the subsea cable routes; and Humboldt Bay, which contains the South Spit and Fields Landing cable landfall locations and locations for harbor infrastructure improvements. This section discusses the regional marine conditions (e.g., coastal winds, currents) and geology of the HB and CM; it also describes the physical setting information for Humboldt Bay, including geology and the influences of anthropogenic activities on the bay.

2.1.1.1 Marine Conditions

The marine conditions in the HB and CM include water depth, seafloor characteristics, winds, upwelling, wave action, oceanic circulation (i.e., currents), and water temperature.

The northern boundary of the HB is located 19.9 miles (mi) (32 kilometers [km]) west of Trinidad Head, and the southern boundary is approximately 21.3 mi (34.3 km) to the shore at the South Spit of Humboldt Bay (Severy and Garcia 2020). The CM is located south of Cape Mendocino, the westernmost point of California, and it is only 5.6 mi (9 km) from shore because of the narrowing of the continental shelf near the cape (reference to HSU project description). Although the HB and CM differ in their proximity to shore, they both have a maximum depth of approximately 3,609 feet (ft) (1,100 meters [m]) offshore. The minimum depths of the HB and CM at their eastern boundaries are approximately 1,640 ft (500 m) and 328 ft (100 m), respectively. Although data for substrate types and benthic invertebrates are not available for most of the HB, the area inshore of the 1,640-ft (500-m) contour between the northern and southern boundaries includes rocky reef areas. Most of the seafloor inshore of the HB also lacks sufficient geotechnical information. At the time of preparation of this document, there were no data available for the seafloor in the CM.

The wind velocities above the ocean surface along the eastern boundary of the Pacific Ocean from the Channel Islands north to the Oregon border can range from 1.6 to 31.2 ft/second (s) (0.5 to 9.5 m/s) at a reference height of 328 ft (100 m) above sea level (Musial et al. 2016). Summer (May through August) wind patterns are from the north/northwest; as measured from the NOAA weather buoy 46022 located 17 nautical miles WNW of Eureka between 1997 and 2008, the monthly average peak wind speeds ranged from 10.5 to 14 knots (19.4 to 25.9 km/hr) and the maximum monthly peak winds ranged from 38.3 to 45.1 knots (70.9 to 83.5 km/hr) (National Data Buoy Center 2019). These winds affect ocean circulation by moving surface waters away from the coastline and are the primary drivers of upwelling. Upwelling is the flow of deep, colder waters to the surface to replace warmer surface waters that have been advected offshore, and contributes nutrient-rich surface waters that support biological productivity (Checkley and Barth 2009) to the HB and CM. The region has annual average wave heights of 6 to 8 ft (1.8 to 2.4 m) with average periods of 11 s, and winter swells can be as high as 26 ft (7.9 m) with a period of 21 s (CDIP 2019).

The primary oceanic circulation pattern that influences regional marine conditions is the California Current System (CCS). The CCS is a surface current approximately 621 mi (1,000 km) wide and 1,640 ft (500 m) deep with a top speed of 0.33 ft/s (10 centimeters [cm]/s) (Marchesiello et al. 2003). The CCS has a slow across-shore flow southward along the Pacific coast towards the equator in the spring and summer; in the winter, the flow is northward from the Davidson Current (Marchesiello et al. 2003). In general, the northeast Pacific region has both low water temperatures and low salinity because it is closely regulated by the CCS; the salinity increases with depth (Marchesiello et al. 2003). The range for mean sea-surface temperatures for the region is 52–55°F. The CCS is affected by variability in wind velocities, and large-scale patterns of climate variability such as the North Pacific Gyre Oscillation, Pacific Decadal Oscillation (PDO), and El Niño Southern Oscillation (ENSO) also determine the CCS response to changes in wind on a local scale (Chhak and Di Lorenzo 2007; Bjorkstedt et al. 2017). The PDO can change the depth of the upwelling cell pattern (depending on whether it is in a cool or warm phase), which can substantially affect the nutrient availability at the surface and the biological responses (Chhak and Di Lorenzo 2007) in the region. The ENSO also influences upwelling and surface nutrient availability.

2.1.1.2 Marine Geology

The regional geology is relatively complex, and this section provides information pertinent to the HB and CM. Geological information relevant to Humboldt Bay is discussed in a separate section below.

The HB is on a relatively wide portion of the continental shelf and extends inward from the shelf's outer edge. The width of the shelf is approximately 15.5 mi (25 km) wide between Trinidad Head and south to Cape Mendocino (Nitrrouer et al. 2007). This section of the shelf is referred to as the Eel Shelf and is approximately 43.5 mi (70 km) long; the Eel River supplies approximately 90% of the sediment to the shelf during winter storms (Fan et al. 2004). Sediment is also deposited on the shelf when the river floods; seasonal floods that are relatively minor typically deposit 0.39–2 in (1–5 cm), but major flood events can result in the addition of 2–3.9 in (5–10 cm) (Bentley and Nitrrouer 2003). The deposited material is characterized by a silty sediment base underlying a clay rich sediment; bioturbation (i.e., reworking of sediments by organisms) of shallow layers produces a coarse-grained sedimentary fabric (Bentley and Nitrrouer 2003). The sediment from the Eel River also accumulates at the entrance to Humboldt Bay, which is discussed below.

The HB is on the Gorda Plate north of the Mendocino Triple Junction (MTJ), which is the intersection of the Gorda Plate, Pacific Plate, and the North American Plate off Cape Mendocino; the cape is the location of the highest concentration of earthquake events in the continental United States (Humboldt County 2017). The convergence of the Gorda and the North American Plates results in movement of approximately 1.2 in (3 cm) per year in a west-northwest/east-southeast alignment (Nitrrouer et al. 2007). The MTJ location is also where the Juan de Fuca Slab, Mendocino Transform Fault, and the San Andreas Fault meet, and represents a transitional area between two major tectonic regimes: the northern Cascadia Subduction Zone and the San Andreas Fault system (McCrory 2000).

As a result of regional seismic activity, the HB has adjacent submarine canyons: Trinidad Canyon is approximately 5.9 mi (9.15 km) to the north, and Eel River Canyon is roughly 4.5 mi (7.3 km) to the south. These canyons are formed in the shelf break between the continental shelf and continental slope, and function as conduits for the movement of large amounts of terrestrial sediment across the continental shelf to the seafloor. Eel River Canyon, which is west of the mouth of the Eel River, incises the shelf break at a depth of 490 ft (150 m) (Nitrrouer et al. 2007). The CM, which is just south of the Mendocino Transform Fault on the Pacific Plate, has four canyons nearby. Mendocino Canyon is located approximately 2.5 mi (4 km) offshore of Cape Mendocino. Mattole Canyon is roughly 4.8 mi (7.7 km) north of the CM and is approximately 1 mi (1.6 km) wide; it initiates on the continental shelf about 1.5 mi (2.4 km) offshore and continues to depths greater than 3,609 ft (1,100 m). Spanish Canyon and Delgada Canyon are approximately 0.5 mi (0.7 km) and 6.5 mi (10.5 km) south of the CM's inshore boundary, respectively.

2.1.1.3 Humboldt Bay

Humboldt Bay is located along the northern California coast and at the northern end of the Coast Range. The topography of the bay area is relatively flat and characterized by bay waters, tidal flats, and slightly elevated flat to gently rolling terraces. The Coast Range comprises mainly the Franciscan complex inland, sand, and other alluvial deposits located closer to the coast. Marine deposits, range in altitude between sea level and 400 ft (122 m) and extend in a 3.5-mi (5.6-km) wide band from Crannell to the Mad River, just north of the city of Arcata. The bay is semi-enclosed and approximately 14 mi (22.5 km) long and 4.5 mi (7.2 km) wide at its widest point; the surface area is 38.8 mi^2 (62.4 km^2) at mean high tide and 17.4 mi^2 (28.0 km^2) at mean low tide. Arcata and the city of Eureka are alongside the bay, which includes three subbasins: South Bay, Arcata Bay, and Entrance Bay. The entrance to the ocean is approximately in the middle of Humboldt Bay, which has a 359 mi^2 (578 km^2) drainage area from watersheds of the Coast Range (Barnhart et al. 1992). The sediments in Humboldt Bay vary, but they correlate to the bay floor types: mudflats, tidal channels, salt marshes which are located primarily by the tidal elevations, and currents, which leave coarser sediments in the channels and finer sediments in the mudflats (Barnhart et al. 1992). As discussed above, the nearby Eel River is also a source of sediment.

After the bay was discovered in 1806 and settled in the 1850s, its entrance was stabilized by the construction of two jetties (north and south); in efforts to make passage safer for mariners and shipping commerce, Congress authorized dredging of the navigation channel in 1881 (Barnhart et al. 1992). Sediment management to maintain safe access to the bay entails regular dredging and is overseen by the Humboldt Bay Harbor, Recreation and

Conservation District (Harbor District), which receives financial and technical assistance from the U.S. Army Corps of Engineers (USACE) (Harbor District 2019). The bay entrance is dredged to 48 ft (14.6 m) and the shipping channel is dredged to 38 ft (11.6 m). The dredged sediment is conveyed to the Humboldt Open Ocean Disposal Site (HOODS), which is north of Humboldt Bay and just offshore of the 3-nautical mile line and state waters. The HOODS, which was established in 1995 by the U.S. Environmental Protection Agency (EPA), is reaching capacity and environmental analyses are being conducted in the surrounding area to determine if expansion is feasible.

Humboldt Bay's north and south jetties are the terminus to both the North Spit and the South Spit, respectively. North Spit is located along Arcata Bay, and the South Spit is located along the South Bay; both areas have maximum elevations of approximately 25 ft (7.6 m). The North and South Spits were developed during the last period of sea level rise and formed the bar-built estuary in combination with wave action (Barnhart et al. 1992). Most of the Humboldt Bay area, including the North and South Spits, has been characterized as a high-risk tsunami zone because of its relatively low elevation, historical record of tsunamis, seismic activity, and lack of multiple evacuation routes (Graehl and Dengler 2008; Redwood Coast Tsunami Working Group 2012).

The transition from natural to artificial shoreline within the bay primarily occurred between 1870 and 1946, and included the installation of docks and marinas, establishment of boat building and repair facilities, addition of railroad infrastructure, and conversion of wetlands to grazing lands (Barnhart et al. 1992; Laird et al. 2013). The shoreline within Humboldt Bay has increased by 42 mi (68 km) since 1970 as a result of the installation of docks, two marinas, dikes, agriculture, the railroad grade, Pacific Gas & Electric power plant at Fields Landing, waste water treatment ponds, dense residential areas, aquaculture, and a boardwalk (Laird et al. 2013). Present-day Humboldt Bay retains multiple docks and marinas for recreational, commercial, and marine services. Redwood Marine Terminal 1 was the wharf and wooden dock for the former lumber company town of Samoa, and now it continues to function as a "working dock" for the commercial fishermen of the Bay. This rehabilitated site has become part of the working waterfront of Humboldt Bay with infrastructure improvements including dock, storage, high voltage power, and a 2-ton crane (Harbor District 2019).

2.1.2 Terrestrial

The overland transmission routes both include the North Coast and North Coast Range subregions of the California Floristic Province; the eastern route also enters the Klamath Ranges subregion (Baldwin et al. 2012). The overland east transmission route (hereafter, east route) traverses Humboldt, Trinity, and Shasta Counties, and the overland south route (hereafter, south route) crosses portions of Humboldt and Mendocino Counties. Both routes begin in Eureka, where the average annual precipitation is 41.8 in (106.1 cm) and the average annual temperature range is 47.0–59.6°F (PRISM Climate Group 2019). Because the east route extends inland, the regional climate is generally warmer and receives less precipitation than the south route, which follows the North Coast Ranges. At the eastern terminus of the east route at Cottonwood in Shasta County, the average annual precipitation is 29.4 in (74.7 cm) and the average annual temperature range is 48.8–75.2°F (PRISM Climate Group 2019). The south route ends at Ukiah in Mendocino County, where the average annual precipitation is 45.8 in (116.3 cm) and the average annual temperature range is 44.6–71.4°F (PRISM Climate

Group 2019). Soil survey mapping data from the Natural Resource Conservation Service indicate that the east route crosses approximately 224 soil map units in five soil survey areas, and the south route crosses roughly 194 soil map units in four soil survey areas (NRCS 2019).

2.2 Biological Environment

2.2.1 Marine Ecosystems

2.2.1.1 Affected Environment

Sensitive Habitats

Sensitive habitats have been identified within and/or adjacent to the HB, CM, and Humboldt Bay (Figure 2). The HB contains rocky reef areas that have been designated by the Pacific Fishery Management Council (PFMC) as Habitat Areas of Particular Concern (HAPC) within EFH under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Rocky reefs also occur approximately 3.9 mi (6.31 km) north of the CM. There are five Marine Protected Areas (MPAs) in the region: Samoa State Marine Conservation Area (Samoa SMCA), South Humboldt Bay State Marine Recreational Management Area (South Humboldt Bay SMRMA), South Cape Mendocino State Marine Reserve (South Cape Mendocino SMR), Sea Lion Gulch SMR, and Big Flat SMCA (Figure 2).

Samoa SMCA is north of Humboldt Bay from 3 nautical miles to the shore and parallels the Mad River Slough. Recreational and commercial fishing for salmon (*Oncorhynchus* spp.), surf smelt (*Hypomesus pretiosus*), and Dungeness crab (*Metacarcinus magister*) are permitted in this MPA, which has soft bottom habitat from 0–328 ft (0–100 m) (CDFW 2016). South Humboldt Bay SMRMA is in the southwestern corner of Humboldt Bay near Table Bluff, and it serves to protect eelgrass and mudflat habitats used by leopard sharks (*Triakis semifasciata*) and rays (e.g., bat ray [*Myliobatis californica*]) in the coastal marsh and channel areas (CDFW 2012). Waterfowl hunting and non-consumptive recreational activities are allowed in the South Humboldt Bay SMRMA. The South Cape Mendocino SMR, where no take or consumptive uses are permitted, contains hard substrate from 98–328 ft (30–100 m), and soft bottom habitat from 0–98 ft (0–30 m) (CDFW 2012). Sea Lion Gulch SMR is approximately 0.25 mi (0.4 km) east of the CM and Big Flat SMCA is roughly 1.6 mi (2.56 km) east of the CM.

Humboldt Bay National Wildlife Refuge was established in 1971 to protect and enhance habitats for the diverse assemblage of birds, fish, mammals, invertebrates, amphibians, and plants that occur in the bay. The refuge is the largest component of the Humboldt National Wildlife Refuge Complex, and supports mudflats, salt marsh, brackish marsh, estuarine eelgrass meadows, seasonally flooded freshwater wetlands, riparian wetlands, streams, coastal dunes, and forest. More than 316 bird species use these habitats, and the refuge is an important stopover point for migratory birds that travel the Pacific Flyway. The refuge also supports habitat for over 40 mammal species and approximately 100 species of marine invertebrates and fish. (USFWS 2019a).

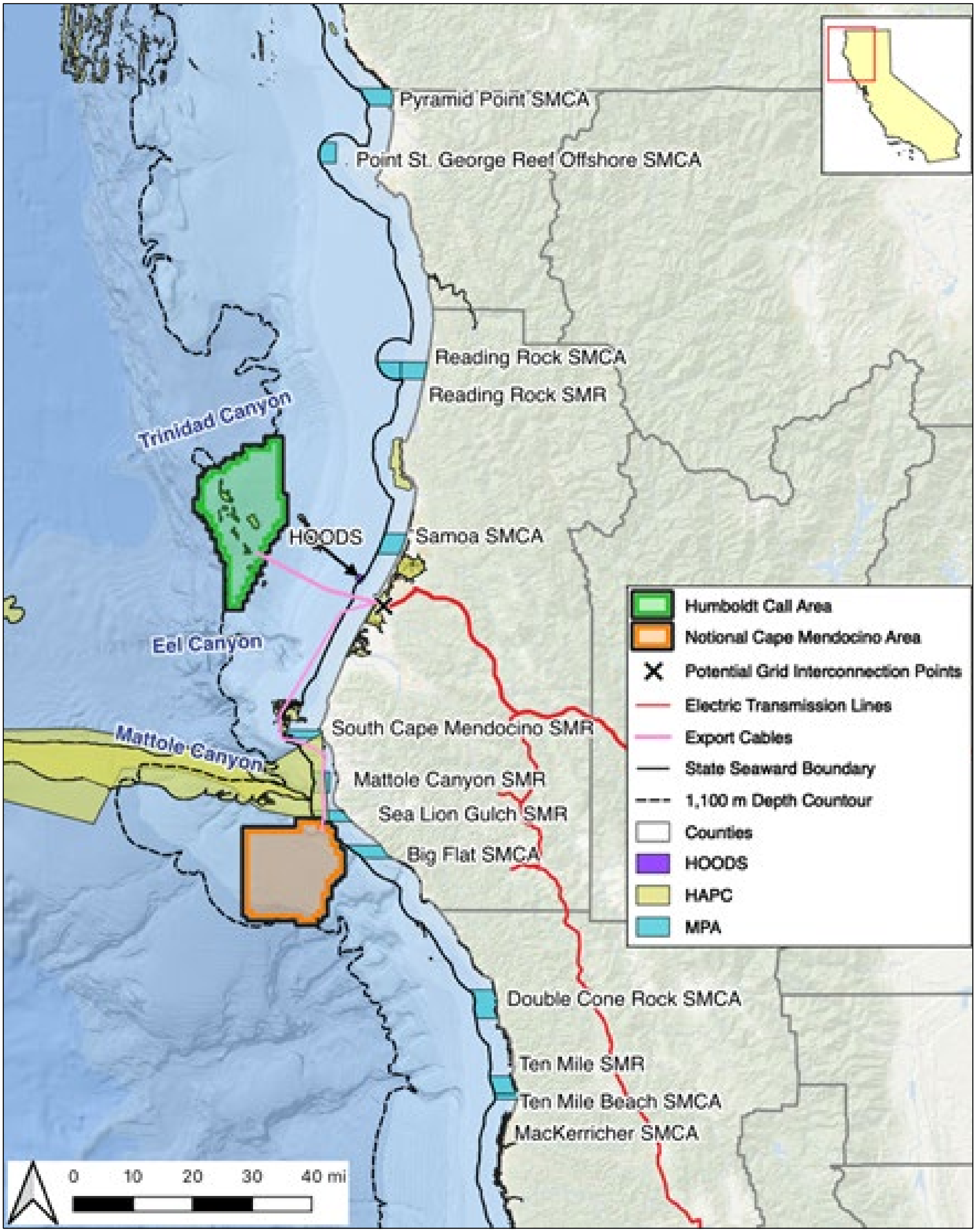

Figure 2. Marine Sensitive Habitats, Including Habitat Areas of Particular Concern (HAPC) and California Designated Marine Protected Areas (MPA), and the Humboldt Open Ocean Disposal Site (HOODS)

Benthic Invertebrates

The action area contains intertidal and subtidal marine habitats. The intertidal zone is primarily exposed sandy beach, with the exception of the two rock and concrete jetties at the entrance to Humboldt Bay. The soft-bottom subtidal zone lies seaward of the intertidal zone and extends across the continental shelf. Within the continental shelf area and seaward of the surf zone (the zone of breaking waves) lies the inner shelf, where waves frequently agitate the substrate. Along the northern California coastline, the inner shelf extends to water depths of approximately 197 ft (60 m) due to the frequent occurrence of large waves (Crockett and Nittrouer 2004).

Pequegnat et al. (1990) examined benthic invertebrate distribution and abundance patterns associated with changes in substrate characteristics along a transect extending from the mouth of Humboldt Bay and across the inner shelf at depths from 59–239 ft (18–73 m). The researchers identified three assemblages of benthic invertebrates:

- A nearshore assemblage associated with sandy sediments, low amounts of organic debris, and high wave action.
- A mid-depth assemblage associated with fine sand, the presence of terrestrial organic debris, and reduced wave action on the substrate.
- An offshore assemblage associated with silty sand or sandy silt sediments, increased amounts of organic material, and negligible wave action on the benthos.

These faunal assemblages correspond to three major sedimentary facies (i.e., bodies of sediment that are recognizably distinct from adjacent sediments) found on the Eel River continental shelf (Borgeld et al. 1999):

- Inner nearshore sands, in water depths less than approximately 115 ft (35 m).
- Outer nearshore sands, in water depths between 115 ft (35 m) and approximately 164 ft (50 m).
- Mud-sand transition zone, in water depths from about 164–246 ft (50–75 m).

Several biological surveys in the vicinity of the proposed project site have included benthic invertebrate sampling. The most comprehensive studies to date have been related to dredged material disposal or wastewater effluent discharge in the nearshore area. These studies include:

- Humboldt Bay Wastewater Authority survey for a proposed (but never built) ocean outfall for treated municipal wastewater (ERC 1976).
- Ocean Monitoring Project from 1987 to 1994 for two pulp mills that were discharging effluent into the nearshore waters off the Samoa Peninsula (Pequegnat et al. 1995).

- Ocean Baseline Survey for the USACE as part of the designation of the HOODS (Pequegnat et al. 1990).

More recently, Henkel et al. (2014) used box cores to characterize benthic substrates and organisms in the Pacific Northwest, including 20 sites offshore of Eureka between 164–426 ft (50–130 m), and the results were compared to EPA surveys taken in 2003.

The Intertidal Zone

On the sandy beach bordering the seaward side of the Samoa Peninsula, the intertidal fauna has been sampled several times; numbers of invertebrate species ranged from 9 to 20, using varying numbers of transects, sampling periods, and sampling techniques (ERC 1976; Gail Newton and Associates 1988; Pacific Affiliates 2006, 2007; Nielsen et al. 2017). Although sample sizes and methodology differed among the surveys, crustaceans were consistently present in 1988, 2006, 2007, 2014, and 2015. Species composition of the beach fauna was dominated by motile, burrowing crustaceans, able to swim and rapidly burrow in response to substrate disturbance by wave action. Crustacean species characteristic of the sandy beach along the Samoa Peninsula include gammarid amphipod "beach hoppers" (*Megalorchestia* spp.), an isopod (*Excirolana liguifrons*), a mysid (*Archaeomysis grebnitzkii*), and the mole crab (*Emerita analoga*), which is sometimes used as bait by fishermen.

The Subtidal Zone

Benthic Infauna—Benthic infauna in the subtidal zone is characterized by polychaetes, amphipods, gastropods, bivalves, ophiuroids, and nemertians (ERC 1976, Henkel et al. 2014). In general, a decrease of bivalves and increase of polychaetes occurs at deeper stations with more silt/clay fraction (Henkel et al. 2014).

Epibenthic Invertebrates—On the continental shelf off the Humboldt County coast, a taxonomically diverse assemblage of invertebrate animals occupies the benthic zone, on or near the substratum and just above it in the water column. This assemblage is relevant because it occurs at the project site (e.g., subsea cable route), supports a major commercial fishery, and is prey for a variety of marine organisms. Prior studies in the area suggest that abundance is low, but high diversity with decapod crustaceans as the most important group numerically and by weight (Pequegnat et al. 1990). In particular, Dungeness crab and caridean shrimp (*Crangon stylirostris*, *Crangon nigricauda*, and *Crangon franciscorum*) dominate summertime trawls, with mysids (*Neomysis kadiakensis* and *Neomysis ravii*) and the euphausid (*Thysanoessa spinifera*) dominating in the winter (Pequegnat et al. 1990, 1995). Some benthic invertebrates (e.g., Dungeness crab) appear to move offshore in the winter and onshore in the summer (Pequegnat et al. 1990). This observation is corroborated by anecdotal accounts of local commercial crab fishers.

Dungeness crab is considered the most important species in the action area because of its abundance and biomass in habitat along the inshore portion of the undersea cable route (Pequegnat et al. 1990), as well as its importance to local commercial and recreational fisheries (Hankin and Warner 2001; Dewees et al. 2004).

Dungeness crab is found most commonly on sand or mud bottoms from the intertidal zone to 98 ft (30 m) depth, but off Humboldt Bay are largely inshore of 180 ft (55 m) in August and at greater depths in March (Pauley et al. 1989; Hankin and Warner 2001). Their larvae are planktonic, molting into juveniles that are found in estuaries such as Humboldt Bay and in shallow, coastal waters (Gunderson et al. 1990). Crabs feed opportunistically; clams, fish, amphipods, and isopods are all common prey (Pauley et al. 1989; Hankin and Warner 2001).

Several nearshore and estuarine species of caridean shrimp (*Crangon* spp.) are present in the action area, and primarily occupy burrows in soft sediments. Off Humboldt Bay, *Crangon* species are often one of the most numerically abundant invertebrates (Pequegnat et al. 1990, 1995). Species vary in their use of estuarine versus coastal habitat; for example, *Crangon nigromaculata* is comparatively coastal while *Crangon fransciscorum* is common in estuaries (Reilly et al. 2001). These shrimp are opportunistic feeders, but benthic infauna such as amphipods and bivalves are likely important prey items. Caridean shrimp are important food items for a wide variety of organisms, including commercially important and protected fishes (Dumbauld et al. 2008; Yang et al. 2006), and may play an important ecological role in bioturbation (Widdicombe and Austen 2003).

Mysids are a group of crustaceans commonly known as opossum shrimp, and in past surveys off Humboldt Bay were one of the most numerically abundant invertebrate species (Pequegnat et al. 1990, 1995). Most species are filter-feeders and many form large, dense aggregations or schools just above the substratum (Brusca and Brusca 1990). Mysids are thought to be an important prey item for gray whales (*Eschrichtius robustus*) (Darling et al. 1998).

Fish

Fish groupings or assemblages can be ecologically classified by their habitats; cluster analysis indicates three main habitat types (shallow, deep, and pelagic) that support different fish species compositions (Allen and Pondella II 2006a). Furthermore, these three groupings can be further broken into different specific habitat types supporting different subgroupings of fish, such as shallow water bay/embayment, surfzone, rocky reef habitats, and deeper water habitats including deep reef, outer shelf, and continental slopes. (Allen and Pondella II 2006a). We describe examples of these different habitat types in the action area that support different assemblages or groupings of fish.

Surf-Zone Fishes—Species of the surfperch family (Embiotocidae) occur in inshore coastal waters of the temperate eastern North Pacific (Fritzsche and Collier 2001; Allen et al. 2006; Nielsen et al. 2017). Surfperches (*Amphistichus* spp.) occur in shallow waters inshore of the action area and support local commercial and recreational fisheries, in particular the redtail surfperch (*Amphistichus rhodaterus*) (CDFG 2009). Surf smelt, night smelt (*Spirinchus starksi*), and topsmelt (*Atherinops affinis*) also occur in the surf zone and support local commercial and recreational fisheries (Allen and Pondella II 2006b; Nielsen et al. 2017).

Elasmobranchii (Sharks, Skates, and Rays)—The Elasmobranchii ("elasmobranchs") are a subclass of cartilaginous fishes including sharks, skates, and rays (Nelson 1984). They are diverse and ecologically significant members of the marine community that occupy the action area and nearby habitats. Of the species commonly found in the action area and in comparable habitat, most prey on benthic invertebrates and fishes, but larger, more open water sharks are frequent visitors or transients, feeding on pelagic organisms. Marine mammals are also important prey for great white sharks (*Carcharodon carcharias*) (Klimley et al. 2001). Some species such as the big skate (*Raja binoculata*) are likely present year-round, and others (e.g., soupfin shark [*Galeorhinus zyopterus*]) are transients that migrate through the area (Ebert 2001) or are only occasionally present.

The sensory biology of elasmobranchs is likely the topic of greatest relevance to ocean renewable energy development (Nelson 2008). Elasmobranchs possess electroreceptive sense organs of high sensitivity (Ampullae of Lorenzini) for prey detection, mate detection, and possibly orientation and navigation (Bodznick et al. 2003). According to Bullock et al. (1982), "...nearly all non-teleost groups have this sensory modality," including lampreys, ratfish, and sturgeons. Some skates (Rajidae and Torpedinidae) also possess electric discharge organs for communication (Bratton and Ayers 1987; Evans and Claiborne 2005), predation, or defense (Nelson 1984; Helfman et al. 1997). Some elasmobranchs are also sensitive to magnetic stimuli and use these signals for navigation (Walker et al. 2003).

Information on the ranges, depth distributions, and life history of the elasmobranchs common in waters off Humboldt Bay is generally available. There have been detailed studies of the biology and ecology of the great white shark (e.g., Klimley and Ainley 1998; Klimley et al. 2001, 2002; Bonfil et al. 2005; Weng et al. 2007; Jorgensen et al. 2009), leopard shark (e.g., Au and Smith 1997; Ackerman et al. 2000; Carlisle et al. 2007), and bat ray, albeit to a lesser extent (e.g., Martin and Cailliet 1988a, 1988b; Gray et al. 1997, Klimley et al. 2005). However, specific studies on these species' movement patterns in the vicinity of the action area do not exist. Longnose skate (*Raja rhina*) are landed by commercial fisheries in Eureka (see Table 9 in CDFW 2019a), most likely bycatch from deep trawl fisheries, and are likely to occur in the HB and CM, as well as along the subsea cable routes.

Elasmobranchs support commercial and recreational fisheries in northern California waters (Leet et al. 2001), but the relevance of these fisheries to the action area is marginal. Species fished include leopard sharks and sevengill sharks (*Notorynchus maculatus*) in Humboldt Bay, and offshore salmon sharks (*Lamna ditropis*) or thresher sharks (*Alopias* spp.).

Demersal Fishes—Demersal fishes are associated with the bottom and typically exhibit morphological adaptations for living in direct contact with the substrate; their eyes are oriented upwards and their fins are arranged for locomotion along or just off the bottom. Flatfish such as Dover sole (*Microstomas pacificus*), starry flounder (*Platichthys stellatus*), and big skates have flattened bodies. Other demersal species are less flat (e.g., lingcod [*Ophiodon elongatus*] or thornyheads [*Sebastolobus* spp.]) or are adapted to burrowing into the substrate (e.g., hagfish [*Eptatretus* spp.] or cusk eels [*Chilara* spp.]). Demersal fishes are associated with all substrate types; however, the discussion below focuses on species that occur in the soft or unconsolidated substrates found in the action area (flatfishes) and/or are associated with reefs and high-relief habitats (rockfishes [*Sebastes* spp.], lingcod, kelp greenling [*Hexagrammos decagrammus*], and cabezon [*Scorpaenichthys marmoratus*]).

Because bottom substrate in the action area is dominated by soft substrates (e.g., mud, fine sand, sand), flatfishes are expected to be the most common groundfish[2] present. Most fishes, including demersal forms, exhibit a planktonic larval form, but some species develop more directly (i.e., juveniles emerge from eggs or the female's body). The implications for understanding the effects of offshore wind development on demersal fish fauna partially depend on the affected life history stages. Some species may complete an entire life cycle at depths and habitats comparable to the action area. Others may recruit to coastal soft bottoms as juveniles, then move into deeper waters as adults that release planktonic eggs, with the larvae moving into nursery habitats as they develop. The regional biology and ecology of demersal species is generally well known (Miller and Geibel 1973; Allen 1982; Lea et al. 1999; Leet et al. 2001; Allen et al. 2004, 2006) but local ecological patterns are less understood. Additional sources of information include fisheries data held by California Department of Fish and Wildlife (CDFW), NMFS, and the Pacific States Marine Fisheries Commission (PSMFC).

Flatfishes—The following flatfishes are most likely to be in the project vicinity, including the undersea cable route, from Humboldt Bay, to inshore to offshore where the wind turbines would be deployed, and are in order from shallow water embayment to deep slope habitats (Pequegnat et al. 1990, 1995; Allen et al. 2006).

- California halibut (*Paralichthys californicus*), predominantly in Humboldt Bay, recreationally important
- Speckled sanddab (*Citharichthys stigmaeus*), in Humboldt Bay and nearshore
- Sand sole (*Psettichthys melanostictus*)
- Starry flounder, considered a moderately important commercial species (Haugen and Thomas 2001)
- English sole (*Parophrys vetulus*), considered a commercially important species captured by bottom trawl
- Pacific sanddab (*Citharichthys sordidas*), known to be common and abundant
- Petrale sole (*Eopsetta jordani*), considered a commercially important species captured by bottom trawl
- Rex sole (*Glyptocephalus zachirus*), considered a commercially important species captured by bottom trawl
- Dover sole, considered a commercially important species captured by bottom trawl
- Arrowtooth flounder (*Atheresthes stomias*), considered a commercially important species captured by bottom trawl

Nearly all of these species have been recorded in commercial landings for Eureka in 2018 (CDFW 2019a). Flatfish such as rex sole, Dover sole, and arrowtooth flounder occur more commonly in deeper water (e.g., in the HB and CM) (Allen 2006); however, rex sole, Dover sole, butter sole (*Isopsetta isolepis*), English sole, Pacific

[2] Groundfish" is a management term that, as defined by the Pacific Fishery Management Council (PFMC 2019), describes a group of fish species of commercial importance and made up of rockfish, flatfish, roundfish, sharks, and skates.

sanddab, sand sole, and starry flounder have been captured in trawl surveys near the inshore portion of the export cable route (Pequegnat et al. 1990, 1995; Allen 2006).

In general, the abundance and composition of flatfishes changes with depth along the coast offshore of Humboldt Bay (Pequegnat et al. 1990) and are therefore affected by different components of the project: most of the species are affected primarily by the export cable. A transition in flatfish species composition occurs at approximately 131 ft (40 m) depth. At shallower depths than this threshold, English sole, sand sole, and starry flounder were the most abundant flatfishes, but at greater depths Pacific sanddab, rex sole, slender sole, and Dover sole were collected (albeit in very low numbers) (Pequegnat et al. 1990). Most of these flatfish species tend to spawn in the winter, with juveniles settling to demersal habitats in the summer (Brodeur et al. 2004).

Rockfishes (Lingcod, Kelp Greenling, Cabezon, and Sablefish)—Members of the rockfish genus *Sebastes* are ovoviviparous, and their young are hatched internally (Ashcraft and Heisdorf 2001). Brown rockfish (*Sebastes auriculatus*) reproduce in the open ocean where the young of the year migrate into bays and estuaries; this attribute is unique among the rockfishes (Ashcraft and Heisdorf 2001). Canary rockfish (*Sebastes pinniger*) females are fertilized in December and the young remain inside the females until they are born in March; from April through June, the juveniles reside in the pelagic zone approximately 100 ft (30.5 m) from the surface, and subsequently retreat to benthic habitats (Williams and Adams 2001). Kelp greenling, which have reproductive habits that are similar to lingcod, are batch spawners that mature by their fourth year and lay egg clusters on the seafloor (Howard and Silberberg 2001). Lingcod mature later in the northern part of their range and migrate to nearshore for spawning; they lay their egg masses in nests on rocky substrate (Adams and Starr 2001).

Although the typical habitat for many of these species is rocky substrate with some relief, some species will use (sometimes extensively) sand bottom habitats. For example, lingcod make extensive use of both types of habitat (Love et al. 1991; Lea et al. 1999; Allen 2006). In general, rockfishes are most likely to occur in the action area during the early phases of their life history (pelagic larval through pre-settlement); however, some species will settle on soft substrates, including: rougheye rockfish (*Sebastes aleutianus*), darkblotched rockfish (*Sebastes crameri*), splitnose rockfish (*Sebastes diploproa*), widow rockfish (*Sebastes entomelas*), shortbelly rockfish (*Sebastes jordani*), black rockfish (*Sebastes melanops*), vermillion rockfish (*Sebastes miniatus*), bocaccio rockfish (*Sebastes paucispinis*), canary rockfish, and stripetail rockfish (*Sebastes saxicola*) (Love et al. 1991).

Many rockfishes exhibit strong site fidelity (Lea et al. 1999; Love et al. 1991, 2002); however, some species—and individuals—make extensive movements of over 1.7 mi (2.7 km) (Lea et al. 1999; Love et al. 2002; Starr et al. 2002; Jorgensen et al. 2006; Lowe and Bray 2006; Lowe et al. 2009; Marliave and Challenger 2009). Sub-adult and adult lingcod are frequently found on soft bottoms as well as rocky reefs (Miller and Geibel 1973). Kelp greenling and cabezon are typically referred to as reef-associated species; however, Eureka-area commercial crab fishers find these as bycatch in their traps in sandy habitat at 66–262 ft (20–80 m) with some frequency[3]. Cabezon have been captured in trawl surveys off Humboldt Bay (Pequegnat et al. 1995). Brodeur et al. (2004)

[3] Novak, A., Commercial Fisherman. Eureka, California, and M. Zamboni, Commercial Fisherman. Trinidad, California. March 10, 2009—communication with P. Nelson of H. T. Harvey & Associates, regarding bycatch.

found that yellowtail rockfish (*Sebastes flavidus*) were an indicator species associated with salmonids in June nekton trawls collected offshore where they had the highest counts within the total catch.

Nearshore, shallow water species such as kelp greenling; black, brown, yellow, darkblotched, and canary rockfish; lingcod, and cabezon are present in the nearshore area from San Diego to Alaska. These species are more common north of Morro Bay in shallows from 10–60 ft (3–18 m); larger fish inhabit depths from 80–100 ft (24–30 m) (Howard and Silberberg 2001). Cabezon occur along the west coast of North America in shallows up to 250 ft (76 m) deep with hard bottoms (Wilson-Vanderberg and Hardy 2001).

Reilly (2001a) noted that black rockfish frequently school in rocky reefs with shallow depths of 120–240 ft (37–73 m); their numbers are characteristically high in the nearshore area. Pequegnat et al. (1990) recorded larger numbers and the highest biomass of black rockfish in March on transects offshore Humboldt Bay that were taken by trawls at a depth of 52 ft (16 m), which infers a wider depth range for the species.

Blue rockfish (*Sebastes mystinus*) larvae remain at the surface until they are young of the year (YOY); they subsequently cluster inshore in rocky areas with kelp canopy cover before recruiting into rocky reefs with depth ranges from 100–300 ft (30–91 m) (Reilly 2001b). Brown rockfish occur along the west coast of North America in the nearshore sand-to-rock interface, residing in bays and subtidal areas that are commonly between 175–400 ft (53–122 m) deep; they aggregate near kelp beds in the shallower areas and keep close to the rocky bottom in deep areas (Ashcraft and Heisdorf 2001).

Canary rockfish also occur along the west coast of North America; they have been caught en masse to depths of 500 ft (152 m), but have also been documented at depths greater than 1,000 ft (305 m) (Williams and Adams 2001).

Lingcod are only found along the west coast of North America; they are most commonly associated with rocky areas in nearshore waters at depths from 30–330 ft (9–101 m) but have also been recorded in substrate from depths of 10–1,300 ft (3–396 m) (Adams and Starr 2001).

Mid- to deep-shelf species include bocaccio rockfish and quillback rockfish (*Sebastes maliger*), which occur in waters south of Cape Mendocino (MacCall 2007). They are federally listed as overfished and this designation is supported by Schroeder and Love’s (2002) research near a de facto marine protected area offshore of Santa Monica at “Platform Gail” in 755 ft (230 m) depth; catch densities measured 408 times greater for boccacio rockfish compared to other rockfish species and the highest catch densities were recorded offshore (i.e., where access was relatively more difficult for fishers). Quillback rockfish are present from the surface to a depth of 900 ft (274 m) (Osorio and Klingbeil 2001).

Likely to occur within the wind farm footprint are the deepest dwelling rockfish are splitnose rockfish (*Sebastes diploproa*), longspine thornyhead (*Sebastolobus altivelis*), and shortspine thornyhead (*Sebastobolus alascanus*), which are captured by bottom trawl and contribute to local commercial landings in Eureka (CDFW 2019a). Sablefish

(*Anoplopoma fimbria*) are also likely to occur in deeper waters of the call area and are a commercially important species landed in Eureka (CDFW 2019a); they are caught by trawling, longline fishing, and pot/trap methods.

Other Demersal Species Considered—Two additional commercial fisheries landed in Eureka warrant consideration (CDFW 2019a): Pacific hagfish (*Eptatretus stoutii*) and pink shrimp (*Pandalus jordani*). Pacific hagfish are captured by trapping, and are likely to occur in deeper soft bottom habitats; Barss (1993) reported that the species was usually caught in muddy substrates at approximate depths of 361–600 ft (110–183 m). Pink shrimp are captured by trawling, and tend to be further inshore on soft bottom habitats at depths of less than 1,181 ft (360 m) (Frimodig et al. 2007).

Essential Fish Habitat

The Magnuson-Stevens Act requires direct action to stop or reverse the continued loss of fish habitats. The act requires cooperation between NMFS, the regional fishery management councils, fishing participants, federal and state agencies, and others in achieving the EFH goals of habitat protection, conservation, and enhancement. EFH identifies waters and substrates required by fish for spawning, breeding, feeding, and growth to maturity. EFH waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish. For Pacific coast species, EFH is described under four fishery management plans (FMPs) covering groundfish, coastal pelagic species, highly migratory species, and Pacific coast salmon (as detailed in the following sections). The species with EFH in the HB or CM and along the undersea cable routes, and the likelihood of their occurrence in the action area are provided below (Table 1).

Pacific Groundfish—Pacific groundfish represent a large number of resident species along the U.S. West Coast. The northern California coast provides groundfish habitat from the nearshore mean higher high water or the upstream extent of salt water intrusion, to deepwater areas seaward to the boundary of the U.S. Exclusive Economic Zone (EEZ) (PFMC 2006). In 1998, the PFMC made more than 400 EFH designations for 82 groundfish species (PFMC 2006). The PFMC further defined important habitat by species and life stage.

Highly Migratory Species—Highly migratory species are pelagic fish species such as tunas, marlins, and sharks that occur worldwide and are highly mobile. They can be found in both the EEZ region out to 230 mi (370 km) from shore and the high seas (PFMC 2007). Pelagic fish off the northern California coast with EFH in the action area include the common thresher shark (*Alopias vulpinus*) and bigeye thresher shark (*Alopias superciliosus*). Reproduction of common thresher shark occurs considerably farther south of the site, pups are known to come into shallow waters and bays, and adults are generally found farther offshore in 1,197–1,798 ft (365–548 m) depths (PFMC 2007). Similarly, adult bigeye thresher shark are found in deeper waters off northern California (PFMC 2007). Three other species with EFH in the HB are albacore tuna (*Thunnus alalunga*), northern bluefin tuna (*Thunnus orientalis*), and broadbill swordfish (*Xiphias gladius*) (NMFS 2009a). Adult albacore tuna and juvenile northern bluefin tuna generally occur beyond the 100-fathom (fm) (183 m) isobaths, which makes them likely to occur within the HB and CM (PFMC 2007). Likewise, juvenile and adult broadbill swordfish tend to be offshore of the 1,000-fm (1,830-m) isobath, and are therefore potentially likely in the most offshore and deepest parts of both the HB and CM (PFMC 2007).

Coastal Pelagic Species—Coastal pelagic species live in the water column, and are generally found anywhere from the surface to 3,281 ft (1,000 m) deep. Coastal pelagic species that may occur in offshore waters along the northern California coast, and in action area, include six species/species groups that are actively managed: northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), California market squid (*Loligo opalescens*), and krill (PFMC 2008a). The geographic ranges of these species vary seasonally in response to changes in sea surface temperatures (PFMC 2008b). They prefer sea surface temperatures between 50–78°F that usually occur above the thermocline. Sardine and mackerels can be seasonally more abundant in the northern California region during the summer months and El Niño warm water years (PFMC 2008a). Mackerel spawn from Eureka to Cabo San Lucas, Mexico, peaking between April and July when enough plankton, euphausids, squid, or small fish are available and the environmental conditions are favorable (PFMC 1998). The EFH for these species is marine and estuarine waters along the coast of northern California and offshore to the EEZ boundary line. Pacific mackerel, jack mackerel, and northern anchovy have been documented in or near the action area. Harvest of all species of krill is prohibited in the West Coast EEZ and is intended to ensure fisheries will not develop that could put at risk krill stocks and the other living marine resources that depend on krill (PFMC 2019).

Pacific Coast Salmon—EFH for Chinook and coho salmon includes rivers and coastal streams from central California to Alaska and oceanic waters along the United States and Canadian coasts and seaward to the north central Pacific Ocean and the high seas (PFMC 2000). The marine environment covers an extensive area and has not been well sampled. Therefore, EFH for salmon in the ocean cannot be precisely defined. Salmon EFH occurs within the aquatic habitats of the terrestrial portion of the action area, and coho and Chinook salmon are likely to occur in many streams and tributaries. Adult and juvenile coho and Chinook salmon forage in nearshore and offshore areas, often near shelf habitat where upwelling creates the proper temperatures and conditions for food resource production (PFMC 2000). Chinook and coho salmon are most concentrated inshore of 37 mi (60 km) along the continental shelf of Washington, Oregon, and California while Chinook salmon have been recorded from high-seas fisheries and tagging studies that also show their presence outside the continental shelf (PFMC 2014).

Table 1. Species with Essential Fish Habitat (EFH) in the Action Area (including Undersea Cable Route)

Common Name	Species Name	Occurrence	Source
Groundfish Species			
Rockfish			
Aurora rockfish	*Sebastes aurora*	L (>262 ft [80 m] depth)	1, 2
Bank rockfish	*Sebastes rufus*	L	1, 2
Black rockfish	*Sebastes melanops*	L, C	1, 2, 3, 4, 9, 12
Blackgill rockfish	*Sebastes melanostomus*	L (>410 ft [125 m] depth)	1, 2
Black and yellow rockfish	*Sebastes chrysomelas*	U (hard bottom)	1, 2
Blue rockfish	*Sebastes mystinus*	L	1, 2, 6, 13
Bocaccio	*Sebastes paucispinis*	L	1, 2, 6
Bronze-spotted rockfish	*Sebastes gilli*	L (>246 ft [75 m] depth)	1, 2
Brown rockfish	*Sebastes auriculatus*	L	2, 6, 14
Calico rockfish	*Sebastes dalli*	U (dist. south of area)	1, 2
California scorpionfish	*Sebastes guttata*	U (dist. south of area)	1, 2
Canary rockfish	*Sebastes pinniger*	L	1, 2, 15
Chilipepper rockfish	*Sebastes goodei*	L	1, 2
China rockfish	*Sebastes nebulosus*	L	1, 2, 6
Copper rockfish	*Sebastes caurinus*	L	1, 2, 6
Cowcod	*Sebastes levis*	L	1, 2
Darkblotched rockfish	*Sebastes crameri*	L	1, 2
Dusky rockfish	*Sebastes variabilis*	U (dist. north of area)	2
Dark rockfish	*Sebastes ciliatus*	U (dist. north of area)	2
Flag rockfish	*Sebastes rubrivinctus*	L	1, 2
Gopher rockfish	*Sebastes carnatus*	L	1, 2
Grass rockfish	*Sebastes rastrelliger*	L	1, 2
Greenblotched rockfish	*Sebastes rosenblatti*	U (>180 ft [55 m] depth, dist. south of area)	1, 2
Greenspotted rockfish	*Sebastes chlorostictus*	L	1, 2
Greenstriped rockfish	*Sebastes elongatus*	U (>164 ft [50 m] depth)	2
Harlequin rockfish	*Sebastes variegatus*	U (dist. north of area)	1, 2
Honeycomb rockfish	*Sebastes umbrosus*	U (dist. south of area)	1, 2
Kelp rockfish	*Sebastes atrovirens*	U (dist. south of area)	1, 2
Longspine thornyhead	*Sebastolobus altivelis*	U (>1,312 ft [400 m] depth)	1, 2
Mexican rockfish	*Sebastes macdonaldi*	U (dist. south of area)	1, 2
Olive rockfish	*Sebastes serranoides*	L	1, 2
Pacific Ocean perch	*Sebastes alutus*	L	1, 2
Pink rockfish	*Sebastes eos*	L	1, 2
Quillback rockfish	*Sebastes maliger*	L	1, 2, 6
Redbanded rockfish	*Sebastes babcocki*	L (>492 ft [150 m] depth)	1, 2
Redstripe rockfish	*Sebastes proriger*	L (>492 ft [150 m] depth)	1, 2
Rosethorn rockfish	*Sebastes helvomaculatus*	L (>328 ft [100 m] depth)	1, 2

Common Name	Species Name	Occurrence	Source
Rosy rockfish	*Sebastes rosaceus*	L	1, 2
Rougheye rockfish	*Sebastes aleutianus*	L	1, 2
Sharpchin rockfish	*Sebastes zacentrus*	L (>328 ft [100 m] depth)	1, 2
Shortbelly rockfish	*Sebastes jordani*	L	1, 2
Shortraker rockfish	*Sebastes borealis*	U (dist. north of area)	1, 2
Shortspine thornyhead	*Sebastolobus alascanus*	L (>328 ft [100 m] depth)	1, 2
Silvergray rockfish	*Sebastes brevispinis*	L (>328 ft [100 m] depth)	1, 2
Speckled rockfish	*Sebastes ovalis*	L	1, 2
Splitnose rockfish	*Sebastes diploproa*	L (>262 ft [80 m] depth)	1, 2
Squarespot rockfish	*Sebastes hopkinsi*	L	1, 2
Starry rockfish	*Sebastes constellatus*	U (dist. south of area)	1, 2
Stripetail rockfish	*Sebastes saxicola*	L	1, 2
Tiger rockfish	*Sebastes nigrocinctus*	L	1, 2
Treefish	*Sebastes serriceps*	U (dist. south of area)	1, 2
Vermillion rockfish	*Sebastes miniatus*	L	1, 2
Widow rockfish	*Sebastes entomelas*	L	1, 2
Yelloweye rockfish	*Sebastes ruberrimus*	L	1, 2
Yellowmouth rockfish	*Sebastes reedi*	L (>328 ft [100 m] depth)	1, 2
Yellowtail rockfish	*Sebastes flavidus*	L	1, 2, 6, 16
Roundfish			
Cabezon	*Scorpaenichthys marmoratus*	L, C	1, 2, 4, 17
Kelp greenling	*Hexagrammos decagrammus*	L	1, 2, 18
Lingcod	*Ophiodon elongatus*	L, C	1, 2, 4, 19, 20, 23
Pacific cod	*Gadus macrocephalus*	L	1, 2
Pacific flatnose	*Antimora microlepis*	L (>574 ft [175 m] depth)	1, 2
Pacific grenadier	*Coryphaenoides acrolepis*	L (>508 ft [155 m] depth)	1, 2
Pacific hake	*Merluccius productus*	L	1, 2
Sablefish	*Anoplopoma fimbria*	L (>656 ft [200 m] depth)	1, 2
Flatfish			
Arrowtooth flounder	*Atheresthes stomias*	L	1, 2
Butter sole	*Isopsetta isolepis*	L, C	1, 2, 3, 4
Curlfin sole	*Pleuronichthys decurrens*	L	1, 2
Dover sole	*Microstomus pacificus*	L, C	1, 2, 3
English sole	*Parophrys vetulus*	L, C	1, 2, 3, 4, 23
Flathead sole	*Hippoglossoides elassodon*	L	1, 2
Petrale sole	*Eopsetta jordani*	L	1, 2
Pacific sanddab	*Citharichthys sordidus*	L, C	1, 2, 3, 4, 23
Rex sole	*Glyptocephalus zachirus*	L, C	1, 2, 3
Rock sole	*Pleuronectes bilineatus*	L	1, 2
Sand sole	*Psettichthys melanostictus*	L, C	1, 2, 3, 4
Starry flounder	*Platichthys stellatus*	L, C	1, 2, 3, 4, 23

Common Name	Species Name	Occurrence	Source
Sharks, Skates, and Chimaeras			
Big skate	*Raja binoculata*	L, C	1, 2, 4, 5, 9
California skate	*Raja inornata*	L	1, 2
Longnose skate	*Raja rhina*	L, C, offshore (call area)	1, 2, 4
Leopard shark	*Triakis semifasciata*	L	1, 2, 5, 6, 9
Ratfish	*Hydrolagus colliei*	L, offshore (call area)	1, 2
Soupfin shark	*Galeorhinus galeus*	L	1, 2, 6, 10, 11
Spiny dogfish	*Squalus acanthias*	L	1, 2, 4, 5, 6
Highly Migratory Species			
Common thresher shark	*Alopias vulpinus*	L	7, 8, 21
Bigeye thresher shark	*Alopias superciliosus*	L	8, 21
Albacore	*Thunnus alalunga*	L, seasonal, offshore (call area)	7, 21
Bluefin tuna	*Thunnus orientalis*	U, offshore (call area)	21
Swordfish	*Xiphias gladius*	U, offshore (call area)	7, 21
Coastal Pelagic Species			
Pacific mackerel	*Scomber japonicus*	L, C	4, 7, 8, 22
Pacific sardine	*Sardinops sagax*	L	7, 8, 22
Jack mackerel	*Trachurus symmetricus*	L, C	4, 7, 8, 22
Northern anchovy	*Engraulis mordax*	L, C	4, 7, 8, 22
Market squid	*Logilo opalescens*	L	7, 8, 22
Pacific Salmon			
Coho salmon	*Oncorhynchus kisutch*	L	7, 8
Chinook salmon	*Oncorhynchus tshawytscha*	L	7, 8

Note: L=likely; U=unlikely; C=reported from surveys in HB and CM; ft=feet; m=meters

Source:

[1] PFMC 2010
[2] PFMC 2006
[3] Pequegnat et al. 1990
[4] Pequegnat et al. 1995
[5] Fritzsche and Cavanagh 1995
[6] Love 1996
[7] NMFS 2009a
[8] NMFS 2009b
[9] Allen 2006
[10] Miller and Lea 1976
[11] Ebert 2001
[12] Reilly 2001a
[13] Reilly 2001b
[14] Ashcraft and Heisdorf 2001
[15] Williams and Adams 2001
[16] Brodeur et al. 2004
[17] Wilson-Vandenberg and Hardy 2001
[18] Howard and Silberberg 2001
[19] Adams and Starr 2001
[20] Lea et al. 1999
[21] PFMC 2007
[22] PFMC 1998
[23] Lockheed Center for Marine Research 1979

Sea Turtles

Four listed sea turtle species may occur off the west coast of North America: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and olive ridley (*Lepidochelys olivacea*). These species are rarely observed off northern California; no leatherback sea turtles were detected during aerial line-transect surveys for marine mammals and sea turtles conducted from 1990–2003 (Benson et al. 2007) and no leatherback turtles were identified inshore of 6,562-ft (2,000-m) isobaths off northern California based on telemetry (Benson et al. 2011).

Loggerhead Sea Turtle—The loggerhead sea turtle was federally listed as threatened in 1978 (NMFS and USFWS 1978). Critical habitat has not been designated for the species in the North Pacific (NMFS 2014), and in the eastern North Pacific Ocean, they occur primarily in waters south of San Diego, California. Nesting for populations in the Pacific Ocean occurs on beaches along the western Pacific; there are no known nesting sites on the U.S. West Coast (NMFS 2014). Unlike the leatherback sea turtle, the loggerhead sea turtle requires warmer waters and rarely occurs off the northern California coast. Therefore, occurrences of the loggerhead sea turtle are highly unlikely in the action area.

Green Sea Turtle—The green sea turtle was federally listed as endangered in 1978 for breeding colony populations in Florida and on the Pacific coast of Mexico; all other populations were listed as threatened (NMFS and USFWS 1978). Critical habitat for the species has only been designated in the Atlantic Ocean (NMFS 1998). Green sea turtles are herbivorous, and they feed near shore on sea grasses and algae. They are rarely seen along the U.S. West Coast (including northern California), and there are no known nesting locations along the U.S. West Coast (Seminoff et al. 2015). They tend to occur in coastal waters south of San Diego, California. No recent sightings of green sea turtles along the northern California coast were reported in the latest 5-year review of the species (Seminoff et al. 2015). Therefore, occurrences of the green sea turtle are highly unlikely in the action area.

Leatherback Sea Turtle—The leatherback sea turtle was federally listed as endangered in 1970 (USFWS 1970). Critical habitat has been designated in the Pacific Ocean, however, critical habitat was not designated off Humboldt County (NMFS 2012). They are the most pelagic of the four sea turtle species that may occur along the California coast. In the fall of 1990 to 2003, aerial line-transect surveys for marine mammals and sea turtles were conducted in waters less than 302 ft (92 m) depth, and within 21 mi (34 km) of the central and northern California shore, from Point Conception to the Oregon border (Benson et al. 2007). Two to 28 leatherback sea turtles per year were reported, for a total of 100 individuals during the 13-year survey period. The lowest densities were in south-central California and the northern coast (including Humboldt County), and the highest was along the central coast. None of the individuals reported from the northern coast were north of Cape Mendocino in Mendocino County. However, tagged leatherback sea turtles have been observed offshore of the northern California coast (Benson et al. 2011; TOPP 2019). In addition, recreational and commercial fishermen have reported sightings in the area and several sightings off Humboldt County, including Shelter Cove and Humboldt Bay, were reported in the 1970s. Of all four of the sea turtle species, the leatherback sea turtle is most likely to occur in the region. However, given their rarity in the area according to surveys and their tendency to occur in pelagic waters, they are still unlikely to occur in action area.

Olive Ridley Sea Turtle—The olive ridley sea turtle was federally listed as endangered in 1978 for breeding colonies on the Pacific coast of Mexico; all other populations were listed as threatened (NMFS and USFWS 1978). Critical habitat has not been designated for this species (NMFS and USFWS 2014). Unlike the leatherback turtle, the olive ridley sea turtle requires warmer waters, although they have been reported as far north as Alaska (NMFS and USFWS 2014). In the eastern Pacific Ocean, olive ridley sea turtles generally occur from southern California to northern Chile. The species is rare off the northern California coast, and occurrences of the olive ridley sea turtle are highly unlikely in the action area.

Marine Mammals

The action area contains or has the potential to contain marine mammals such as pinnipeds (seals and sea lions), mustelids (sea otters), and cetaceans (whales and dolphins) (Tables 2 and 3).

Pinnipeds—Pinnipeds are a diverse suborder; some species live near the coast and haul out frequently (e.g., harbor seals [*Phoca vitulina richardsi*] and California sea lions [*Zalophus californianus*]), while other species occur in waters off the continental shelf when away from breeding colonies (e.g., northern fur seal [*Callorhinus ursinus*] and northern elephant seal [*Mirounga angustirostris*]). They prey on a variety of fish and cephalopods, including salmonids (*Oncorhynchus* spp.), Pacific sardines (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), Pacific mackerel (*Scomber japonicus*), Pacific hake (*Merluccius productus*), Pacific herring (*Clupea pallasii*), Pacific whiting (*Merluccius productus*), rockfish (*Sebastes* spp.), market squid (*Loligo opalescens*), octopus (order Octopoda), shellfish, and shrimp (Antonelis and Fiscus 1980; Lowry et al. 1991; Lowry and Carretta 1999; Weise 2000; Lowry and Forney 2005). The species of pinnipeds likely to occur regularly in the action area include the harbor seal, Steller sea lion (*Eumetopias jubatas*), California sea lion, and northern elephant seal. Species of pinnipeds likely to occur only rarely or infrequently in the action area include the northern fur seal and Guadalupe fur seal (*Arctocephalus townsendi*).

***Northern Elephant Seal*—**Northern elephant seals breed in large colonies, many of which have historically been on islands between mid-Baja California and the Farallon Islands (Antonelis and Fiscus 1980). More recently, the growing population has extended breeding colonies to mainland beaches near island colonies (Le Boeuf and Panken 1977) and new colonies have formed on mainland beaches in central California north to Humboldt County (Lowry et al. 1996; Forman et al. 2018). Male elephant seals regularly pass through the northern California area between foraging grounds off Canada and Alaska and breeding colonies in central and southern California. Female elephant seals, however, typically occur several thousand miles offshore at these latitudes. Females and subadults forage in deep oceanic water, likely on scattering layer prey species, whereas males forage along the continental margin on benthic prey (Le Boeuf et al. 2000a). Elephant seals are likely to occur in the action area.

***Harbor Seal*—**Harbor seals are widely distributed throughout the northern Atlantic and Pacific Oceans along coastal waters, river mouths, and bays (Burns 2008; Lowry et al. 2008). The harbor seals in the action area region represent the eastern North Pacific (ENP) Ocean subspecies, and aside from occasional dispersing individuals, are part of the California population. Harbor seals breed along the Humboldt County coast and inhabit the area year-round (Sullivan 1980). Humboldt Bay is the largest pupping and haul-out area in the action area; other haul-out sites are located in Trinidad Bay and at the mouths of the Mad and Eel Rivers (Loughlin 1974; Sullivan 1979, 1980). Harbor seal abundance in the action area, and site fidelity to haul-out sites, peaks in summer during pupping and molting, and declines in winter when individuals disperse to seek areas of high prey abundance (Sullivan 1980; Herder 1986; Goley and Harvey 2010).

Table 2. Pinniped and Mustelid Species that Could Occur in the Action Area or be Affected by the Proposed Action

Common Name	Scientific Name	Status	Project in Critical Habitat?	Occurrence	Temporal Distribution	Habitat
Marine Mammals—Pinnipeds						
Northern elephant seal	*Mirounga angustirostris*		N	L	Year-round	Offshore (call area), slope, shelf, coastal, beach
Harbor seal	*Phoca vitulina richardsi*		N	L	Year-round	Coastal, pupping and haul-out
Steller sea lion	*Eumetopias jubatus*	FT	N	L	Year-round, adult, juvenile	Coastal, continental shelf and slope
California sea lion	*Zalophus californianus*		N	L	Year-round, adult, juvenile	Coastal, continental shelf and slope
Northern fur seal	*Callorhinus ursinus*		N	U		Oceanic, continental slope
Guadalupe fur seal	*Arctocephalus townsendi*	FT, ST	N	U	Summer, seasonal low numbers	Oceanic, continental slope
Marine Mammals—Mustelids						
Southern sea otter	*Enhydra lutris nereis*	FT	N	U	N/A	Nearshore
Northern sea otter	*Enhydra lutris kenyoni*		N	U	N/A	Nearshore

Notes: FT = federally listed as threatened; ST = state-listed as threatened; L = likely to occur in action area; U = unlikely to occur in action area or be affected by proposed action

Steller Sea Lion—The Steller sea lion was federally listed as threatened in 1990 (NMFS 1990). In 1997, the eastern population (i.e., east of 144° W longitude) was listed as threatened, and the western population (i.e., west of 144° W longitude) was listed as endangered (NMFS 1997). Critical habitat was designated in 1993, and includes Sugarloaf Island, Cape Mendocino, Southeast Farallon Island, and Año Nuevo Island in California (NMFS 1993a). Steller sea lions do not dive deeply and they forage over the continental shelf at night, usually within 12 miles of the colony (Loughlin 2008). Individuals rarely come ashore on the mainland, but haul out on islands and offshore rocks and even remain at sea during stormy weather (Kenyon and Rice 1961). Steller sea lions breed along the Humboldt County coast and their presence in the marine and coastal portions of the action area varies throughout the year. Two of the three largest breeding colonies in the region are on Sugarloaf Island off Cape Mendocino and on St. George Reef off Crescent City.

Table 3. Cetaceans that Could Occur in the Action Area or be Affected by the Proposed Action

Common Name	Scientific Name	Status	Habitat	Food	Temporal Distribution
Blue whale	*Balaenoptera musculus*	FE	Offshore (call area), shelf break, inshore occasionally	Mostly krill	Spring to fall, ephemeral
Fin whale	*Balaenoptera physalus*	FE	Cont. slope, nearshore occasionally	Schooling fish, krill	Spring to fall
Sei whale	*Balaenoptera borealis*	FE	Shelf and slope	Copepods, krill, fish	Rare
Bryde's whale	*Balaenoptera edeni*		Tropical offshore	Krill, fish	Rare
Humpback whale	*Megaptera novaeangliae*	FE	Nearshore, cont. shelf	Krill, fish	Spring to fall
Gray whale	*Eschrichtius robustus*	BIA (migration)	Nearshore, cont. shelf	Benthic, epibenthic, pelagic and surface inverts	Year-round
Minke whale	*Balaenoptera acutorostrata*		Nearshore, cont. shelf, offshore (call area)	Krill, fish	Occasional
North Pacific right whale	*Eubalaena japonica*	FE	Shelf and slope	Copepods, krill	Rare
Sperm whale	*Physeter macrocephalus*	FE	Cont. slope, offshore (call area)	Squid, fish	Year-round
Killer whale - southern resident	*Orcinus orca*	FE	Shelf	Salmon	Rare, winter
Killer whale - Bigg's (transient)	*Orcinus orca*		Offshore (call area), slope, shelf, nearshore	Marine mammals, birds	Year-round
Killer whale - offshore	*Orcinus orca*		Offshore (call area), slope, shelf	Sharks, fish	Rare
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*		Outer shelf and slope, occasionally inshore	Fish	Year-round
Risso's dolphin	*Grampus griseus*		Shelf, offshore (call area)	Fish, squid	Year-round
Northern right whale dolphin	*Lissodelphis borealis*		Cont. slope, shelf	Fish, squid	Year-round
Harbor porpoise	*Phocoena phocoena*		Nearshore, shelf	Fish	Year-round
Dall's porpoise	*Phocoenoides dalli*		Outer shelf, offshore (call area)	Fish, squid	Year-round

Common Name	Scientific Name	Status	Habitat	Food	Temporal Distribution
Bottlenose dolphin	*Tursiops truncatus*		Shelf, nearshore	Fish	Uncommon
Short-beaked common dolphin	*Delphinus delphis*		Off shelf	Squid, fish	Rare
Long-beaked common dolphin	*Delphinus capensis*		Off shelf	Squid, fish	Rare
Striped dolphin	*Stenella coeruleoalba*		Off shelf	Squid, fish	Rare but strandings in the area
Short-finned pilot whale	*Globicephala macrorhynchus*		Off shelf	Squid, fish	Rare
Pygmy sperm whale	*Kogia breviceps*		Off shelf	Squid, fish	Rare
Dwarf sperm whale	*Kogia sima*		Off shelf	Squid, fish	Rare
False killer whale	*Pseudorca crassidens*		Off shelf	Squid, fish	Rare
Baird's beaked whale	*Berardius bairdii*		Off shelf	Squid, fish	Rare
Cuvier's beaked whale	*Ziphius cavirostris*		Off shelf	Squid, fish	Rare
Blainville's beaked whale	*Mesoplodon densirostris*		Off shelf	Squid, fish	Rare
Perrin's beaked whale	*Mesoplodon perrini*		Off shelf	Squid, fish	Rare
Gingko-toothed beaked whale	*Mesoplodon gingkodens*		Off shelf	Squid, fish	Rare
Hubbs' beaked whale	*Mesoplodon carlhubbsi*		Off shelf	Squid, fish	Rare
Stejneger's beaked whale	*Mesoplodon stejnegeri*		Off shelf	Squid, fish	Rare
Pygmy beaked whale	*Mesoplodon peruvianus*		Off shelf	Squid, fish	Rare

Notes: cont. = continental; FE = federally Endangered; BIA = Biologically Important Area (Calambokidis et al. 2015)

California Sea Lion—California sea lions are restricted to middle latitudes of the ENP Ocean. Commercial harvest reduced the U.S. population (from Canada to Mexico) to about 1,500 by the 1920s (Zavala-Gonzalez and Mellink 2000); however, protection under the 1972 Marine Mammal Protection Act (MMPA) has allowed the species to recover and the U.S. population was estimated at 257,606 individuals along the U.S. West Coast in 2014 (Carretta et al. 2019a). California sea lions typically feed over the continental shelf within the 1,650-ft (500-m) isobath (Costa et al. 2007), although they have been observed traveling much farther offshore in response to anomalous oceanographic conditions (e.g., El Niño). California sea lions do not breed along the Humboldt County coast; however, non-breeding or migrating individuals occur in the action area. Two seasonal peaks of California sea lions are observed in the action area: one during the fall northward migration and one during spring (mid-April) as they return to breeding colonies in the south (Griswold Jr. 1985; Lowry and Forney 2005; Sullivan 1980). Therefore, this species is likely to occur in the action area, particularly in spring and fall.

Northern Fur Seal**—**Historically, the northern fur seal was exclusively a high Arctic island breeder (Gentry 1998), and females and juvenile males left rookeries to migrate to middle latitudes as far as central California. There are two breeding colonies off California; one is on San Miguel Island in southern California, and the other is on the Farallon Islands off central California (Carretta et al. 2017a). These two colonies were estimated to contain 14,050 individuals in 2013 (Carretta et al. 2017a). Northern fur seals are pelagic and occur primarily outside the action area, foraging in waters off the continental shelf in northern and central California when not at their summer breeding grounds. Off the California coast, they forage over the continental shelf break, with highest densities at 50–75 mi (80–121 km) offshore; they are rarely seen onshore or nearshore. Therefore, the northern fur seal is likely to occur only rarely in the action area.

Guadalupe Fur Seal**—**This species was federally listed as endangered in 1967 and then re-listed as threatened in 1985 (NMFS 1985). No critical habitat has been designated in the U.S., but Mexico has declared its major breeding ground, Isla Guadalupe, as a sanctuary (NMFS 1985). Guadalupe fur seal was listed as threatened by the California Department of Fish and Game in 1971 (CDFW 2019b), and is also designated as a fully protected species. Breeding occurs almost exclusively at Guadalupe Island, Mexico, although a small population occurs at San Miguel Island in southern California (Melin and DeLong 1999). The species is non-migratory and occurs in the subtropical waters of southern California and Mexico. Individuals have been observed stranded, entangled, or sick as far north as Sonoma County, often in association with El Niño events (Hanni et al. 1997). Although some Guadalupe fur seals may infrequently use northern California offshore waters, this species is likely to occur only rarely in the action area.

Mustelids—Three mustelids may occur in the northern California area: the southern sea otter (*Enhydra lutris nereis*), the northern sea otter (*Enhydra lutris kenyoni*), and the marine-adapted river otter (*Lontra canadensis*).[4] A population of marine-adapted river otters has been well-documented at Trinidad Head, and there are examples of river otters living marine lives in southeast Alaska. Because marine-adapted river otters are coastal and do not range far from shore, they are unlikely to occur in the action area and be in contact with the floating platforms. Therefore, they are not discussed separately below.

Southern Sea Otter**—**Southern sea otter was federally listed as threatened in 1977 (USFWS 1977). No critical habitat has been designated for the species. Southern sea otter is also designated as a fully protected species by CDFW. The northern California coast historically was home to southern sea otters, but they were extirpated from the region by Russian hunters for their fur in the 1700s and 1800s. The current population size is estimated at 2,800 individuals (Carretta et al. 2009). The range of the southern sea otter extends from just south of San Francisco Bay to just south of Point Conception, Santa Barbara County (Carretta et al. 2009), therefore the

[4] Jacobsen, J., Cetacean and Seabird Biologist. H. T. Harvey & Associates. September 5, 2019—communication with Dr. Sharon Kramer of H. T. Harvey & Associates, regarding observations of sea otters in Humboldt County.

species is not expected to occur along the Humboldt County coast. It is highly unlikely that southern sea otters will be present in the action area.

Northern Sea Otter**—**The northern sea otter historically ranged throughout the North Pacific Ocean from Asia to the Aleutian Islands, and was reported as far north as the Pribilof Islands and in the eastern Pacific Ocean from the Alaska Peninsula south along the coast to Oregon; it is not federally listed as endangered or threatened (USFWS 2018a). The distribution of the majority of the Washington sea otter population encompasses the area from Pillar Point in the Strait of Juan de Fuca, west to Cape Flattery, and as far south as Point Grenville on the outer Olympic Peninsula coast; however, scattered individuals (usually one or two at a time) occur outside of this range (USFWS 2018a). There are occasional sightings of northern sea otters in Humboldt County[2], but they are very rare and this species is unlikely to be in the action area.

Cetaceans—A variety of toothed whales (odontocetes) and baleen whales (mysticetes) frequent the continental shelf waters off the Humboldt County coast. The most common species that occurs year-round in this area is the harbor porpoise (*Phocoena phocoena*), an odontocete that inhabits nearshore sandy bottom habitats. Other cetaceans likely to occur in the action area are the gray whale, humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), blue whale (*Balaenoptera musculus*), and the transient ecotype of the killer whale (*Orcinus orca*). The Dall's porpoise (*Phocoenoides dalli*), Risso's dolphin (*Grampus griseus*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) are also likely to occur in the action area, but mostly inhabit offshore waters. The fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), and northern right whale dolphin (*Lissodelphis borealis*) are rarer but likely to occur in the action area due to their offshore distribution; they occasionally frequent continental shelf break waters in the region. The remaining species are unlikely to occur in the action area because of their offshore distribution beyond the continental slope, low numbers, and sporadic occurrences reported in the region. All cetaceans have highly developed acoustic abilities; they are capable of detecting sounds and producing communication signals over long distances.

Aerial and ship-based line-transect surveys have been conducted for many years and provide the best distribution data and population estimates (Carretta et al. 2009), although most of the survey efforts occurred farther offshore than the action area. Photographic identification surveys have been conducted on gray whales, humpback whales, blue whales, fin whales, and killer whales, thus providing another method for estimating population density and understanding movements of individuals (Bigg et al. 1990; Calambokidis and Barlow 2004; Calambokidis 2007; Calambokidis et al. 2008). More recently (2011–2012), low-elevation aerial ship-based surveys were conducted from shore to the 6,562-ft (2,000-m) isobath between Fort Bragg, California, and Grays Harbor, Washington, to provide information on the distribution and abundance of marine birds and mammals (Adams et al. 2014), and biologically important areas (BIAs) have been identified for blue whales, gray whales, and humpback whales (Calambokidis et al. 2015).

Gray Whale**—**This species was listed as endangered in 1970 (CDFW 2019b). The ENP population was delisted from endangered in 1994, but the western North Pacific (WNP) population is still listed as endangered (CDFW 2019b). The entire ENP population of gray whales migrates past Humboldt County twice a year and the action area includes migration BIAs; the HMCA is within the gray whale feeding BIA (Calambokidis et al. 2015). The southbound migration begins as early as October and peaks in January, and the northern migration is from March to May (Sullivan et al. 1983; Rugh et al. 2005; Goley and Harvey 2010; Calambokidis et al. 2015). Given that a significant portion of calves are born north of Monterey Bay, it is plausible that a few calves would be born in nearshore waters along Humboldt County. More recently, some gray whales have been observed to remain throughout the summer between northern California and Vancouver Island instead of returning to Alaska. This "Pacific Coast Feeding Group" (PCFG) numbers about 200 whales, many of whom return to these areas between years (Calambokidis et al. 2002). Humboldt County is within the southern end of the PCFG (Calambokidis et al. 2002). In 1998 and 1999, 28 individuals of the PCFG were photo-identified; three individuals were sighted in both years (Toropova 2003). The highest number of sightings occurred at Patrick's Point and at the mouth of the Klamath River from early June to mid-October. Gray whales were the second-most numerically abundant cetacean species recorded from nearshore surveys (0.25–3.11 mi [.4–5 km] from shore) conducted from 1989 to 2009 from the Oregon/California border to Shelter Cove, California (USFS 2010). Therefore, gray whales are likely to occur in the action area, particularly during their migrations and inshore of the wind turbine deployment area.

Humpback Whale**—**The species was federally listed as endangered in 1970 (CDFW 2019b). Critical habitat has been proposed for the species in the action area (NMFS 2019a). Feeding area BIAs have been developed, however, none are in the action area (Calambokidis et al. 2015). Humpback whales forage singly or as coordinated groups that maintain long-term associations; sometimes they make bubble nets by releasing air from blowholes in order to corral fish into denser schools (Hain et al. 1982; D'Vincent et al. 1985; Sharpe and Dill 1997; Sharpe 2001). They also emit a stereotyped vocalization when bubble-net feeding on herring (*Clupea* spp.), which may serve to herd the fish or coordinate movements of individuals in the group (D'Vincent et al. 1985; Sharpe 2001). The California/Oregon/Washington (COW) population migrates south to the coast of Mexico and Central America to breed (Calambokidis et al. 2000, 2001, 2008; Urban et al. 2000). Humpback whale migration is not as synchronized as that of gray whales, and a continuous exchange of individuals is observed at breeding areas[5]. Off northern California, humpbacks are likely to be present year-round, although in low numbers during the winter (Adams et al. 2014). Humpback whales off northern California can form competitive groups that are large, and travel and behave very differently than individual humpback whales[3]. Humpbacks were the most common marine mammal species reported from 30 surveys conducted in fall 1991–2007; 94 were sighted, which represented 44% of all sightings (Calambokidis 2009), and were the most common whale observed in U.S. West Coast low-elevation aerial surveys (Adams et al. 2014). Therefore, humpback whales may occur in the action area year-round, but are likely to be more common from spring to fall and less frequent in winter.

Minke Whale**—**Minke whales in U.S. waters are divided into an Alaskan population and the COW population (Carretta et al. 2009). They are sighted throughout the year off California (Forney et al. 1995; Barlow and Forney 2007). The best estimate for the COW population size is 636 individuals from transect surveys in summer and

[5] Jacobsen, J. Cetacean and Seabird Biologist. H. T. Harvey & Associates. September 7, 2019—communication with Dr. Sharon Kramer of H. T. Harvey & Associates regarding humpback whale feeding and breeding behavior and migration.

autumn 2008 and 2014 (Carretta et al. 2017b). Minke whales have been found stranded on beaches in Humboldt County and one was sighted 7.5 mi (12 km) offshore (Sullivan and Houck 1979). No minke whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Minke whales may make occasional excursions to the action area.

***Blue Whale*—**Blue whale populations were greatly reduced by commercial whaling in the early 1900s, and the species was federally listed as endangered in 1970 (CDFW 2019b). Two blue whale populations are recognized in the North Pacific Ocean; one occurs in the ENP and the other is in the WNP (Carretta et al. 2009, 2019b). The seasonal migration of the ENP population has been confirmed by long-term acoustic monitoring (Burtenshaw et al. 2004) and by movements of photo-identified individuals between southern California and the Gulf of Alaska (Calambokidis 2009). Blue whales travel northward as summer progresses in response to northward progressing spring transition, and subsequent increases in primary productivity (Burtenshaw et al. 2004; Calambokidis 2009). Feeding BIAs have been identified for blue whale, but the action area is not within any BIAs (Calambokidis et al. 2015). Blue whales identified in the area off northern California are re-sighted most frequently off Point St. George (Calambokidis et al. 2004; Calambokidis 2007). They are most commonly sighted along the continental shelf break but also occur farther inshore, in transit or feeding on surface swarms of krill. Satellite-tagged blue whales provided information on "core areas of use", indicating a high area of overlap for individuals at the western part of the Channel Islands, and near the Gulf of the Farallones, and the northern part of Cape Mendocino (Irvine et al. 2014). Irvine et al. (2014) found that although the satellite tracks were widely distributed, these whales tended to occupy the area off northern California during the latter part of the feeding season in late October–November. Therefore, blue whales are known to occur in the action area primarily in late summer and fall (Irvine et al. 2014).

***Harbor Porpoise*—**Harbor porpoises from Humboldt County are included in the northern California/southern Oregon population that extends from Point Arena to Lincoln City, Oregon (Carretta et al. 2009, 2019c). This species was the most common cetacean observed in low-elevation aerial surveys along the U.S. West Coast, and was mostly observed inshore (up to 32 ft [100 m] depths) (Adams et al. 2014). Harbor porpoise feeds primarily on fish, from small-schooling to bottom-dwelling species in waters less than 650 ft (200 m) deep (Recchia and Read 1989; Westgate et al. 1995; Bjorge and Tolley 2008). They may also feed at night in outer continental shelf environments on vertically migrating fish and squid. Along the U.S. West Coast, harbor porpoises do not migrate seasonally (Barlow 1988) and they have been observed throughout the year within the action area at the entrance to and within Humboldt Bay, usually as single individuals but sometimes in groups, with a maximum size of 12 animals (Goetz 1983). Abundance peaks between May and October, and porpoises are most plentiful in Humboldt Bay during the flooding tide. Therefore, this species occurs year-round in the action area and is likely to be more common from late spring to early fall.

***Dall's Porpoise*—**Dall's porpoise is endemic to the North Pacific Ocean and its COW population has been sighted over, along, and beyond the continental shelf (Carretta et al. 2009), as well as in nearshore environments; it feeds on small fish and cephalopods (Houck and Jefferson 1999). Sullivan and Houck (1979) reported 21 sightings at 1–88 mi (1.6–141 km) from shore off northern California from 1965 to 1978, and 34 Dall's porpoises were observed in low-elevation aerial surveys, mostly at depths of 656–6,562 ft (200–2,000 m) (Adams et al. 2014). The species distribution is highly variable and is likely affected by oceanographic conditions (Forney and Barlow 1998); although there appears to be a seasonal north-south movement, individuals are seen off northern California throughout the year (Carretta et al. 2009). Therefore, this species is likely to occur in the action area.

Pacific White-Sided Dolphin**—**Pacific white-sided dolphins occur across the North Pacific Ocean both in the open ocean and along the outer continental shelf (Black 2008) where they consume fish and squid (Walker et al. 1986). Walker et al. (1986) found that although the Pacific white-sided dolphins that occur off northern and southern California are similar in appearance, there are differences in their skeletal morphology that suggest there are two forms with a zone of overlap in the south. The northern form is genetically distinct from the southern form (Lux et al. 1997) and likely can be distinguished by their echolocation clicks (Soldevilla et al. 2008). Because these two forms are impossible to distinguish visually and have an overlapping distribution, they are treated together as the COW population (Carretta et al. 2009). The best approximation of Pacific white-sided dolphin abundance is 26,814 animals, which is based on the geometric mean of estimates from summer/autumn ship-based, line-transect surveys of California, Oregon, and Washington waters in 2008 and 2014 (Carretta et al. 2019d). Barlow and Forney (2007) reported an average group size of 59 dolphins off northern California and an abundance estimate of 4,137 individuals. Thirty-eight Pacific white-sided dolphins were observed in low-elevation aerial surveys, mostly at depths of 656–6,562 ft (200–2,000 m) (Adams et al. 2014). Therefore, Pacific white-sided dolphin is likely to occur in the action area.

Risso's Dolphin**—**Risso's dolphins are typically seen in large groups along the continental shelf break where they feed primarily on squid (Barlow and Forney 2007; Baird 2008). The most recent approximation of Risso's dolphin abundance is 6,336 individuals, which is based the geometric mean of estimates from 2008 and 2014 summer/autumn ship-based line-transect surveys of California, Oregon, and Washington waters (Carretta et al. 2019e). Barlow and Forney (2007) reported an average group size of 16 individuals off northern California and an abundance estimate of 1,036. Two Risso's dolphins were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Fourteen individuals were observed in low-elevation aerial surveys, mostly at depths of 656–6,561 ft (200–2,000 m) (Adams et al. 2014). Therefore, this species is likely to occur in the action area.

Fin Whale**—**The fin whale was federally listed as endangered in 1970 (CDFW 2019b). They were depleted throughout their range by whaling; between 1922 and 1926, 139 fin whales were brought into the Trinidad whaling station (Clapham et al. 1997). Three populations are delineated in the MMPA population assessment reports for the ENP Ocean: Alaska, Hawaii, and COW (Carretta et al. 2009). Fin whales feed on dense aggregations of krill species (e.g., Pacific krill, *Thysoanoessa intermis*, *Thysoanoessa longipes*, and *Thysoanoessa spinifera*) and small fish (e.g., sardines) in the North Pacific Ocean from the surface to depths up to 656 ft (200 m) (Kawamura 1980; Aguilar 2008). One fin whale was reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Six fin whales were observed during low-elevation aerial surveys at depths of 656–6,561 ft (200–2,000 m) (Adams et al. 2014). Several fin whales have stranded along Humboldt County beaches during the past 2 decades. The fin whale is likely to occur in the action area due to its presence in waters of the continental shelf break and beyond.

Sperm Whale—The species was federally listed as endangered in 1970 (CDFW 2019b). Three populations of sperm whales are defined in the Pacific U.S.: Alaska, Hawaii, and COW (Carretta et al. 2019f). Sperm whales consume a variety of squid and fish; females feed mostly on deep-living species of squid, whereas males often forage for bottom-dwelling fish (Whitehead 2003, 2008). Sperm whales have been sighted throughout the year off California (Forney et al. 1995). Rice (1974) suggested that peaks in sightings in May and September correspond to seasonal movements north and south, respectively. Sullivan and Houck (1979) concluded that sperm whales are "relatively common" off northern California based on 19 animals sighted during oceanography cruises between 1965 and 1978 and reports of four strandings. Since 1978, there have been accounts of at least three other stranded sperm whales, including two in 2008, recorded by the HSU Vertebrate Museum. No sperm whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Only two sperm whales were observed in low-elevation aerial surveys, both at depths of 656–6,561 ft (200–2,000 m) (Adams et al. 2014); satellite tracking has indicated their migration occurs along the continental shelf break, and passive acoustic monitoring has detected them in the Eel River Canyon. Because of their offshore occurrence, sperm whales are likely to occur in the action area[6].

Northern Right Whale Dolphin—Northern right whale dolphins, which are protected under the MMPA, are primarily seen in waters overlying the outer continental shelf, shelf break, and beyond (Barlow and Forney 2007; Carretta et al. 2009). Sighting data suggest a seasonal movement from California during the winter and into Oregon and Washington in spring and summer (Carretta et al. 2009). Northern right whale dolphins feed on small fish and cephalopods and are highly mobile, likely in response to changing oceanic conditions (Forney and Barlow 1998). Sullivan and Houck (1979) reported five sightings from 1965–1978 off the Humboldt County coast 9.9–60 mi (16–97 km) from shore, and one stranded animal. No northern right whale dolphins were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Twenty-seven individuals were observed in low-elevation aerial surveys that were mostly at 656–6,561 ft (200–2,000 m) depths (Adams et al. 2014). Given their highly mobile nature and tendency to forage in deeper waters, northern right whale dolphins are likely to occur in the action area.

Sei Whale—The sei whale (*Balaenoptera borealis*) was federally listed as endangered in 1970 (CDFW 2019b). The International Whaling Commission recognizes only one population of sei whales in the North Pacific Ocean (Donovan 1991), but based on movements of tagged individuals, pigmentation, and distribution, up to three populations have been proposed: western, central, and eastern (Masaki 1977; Kanda et al. 2006). The sei whale occurs in temperate waters in all major oceans, usually beyond the continental shelf, and undergoes seasonal migrations to lower latitude breeding areas (Horwood 2008). Sei whales were hunted extensively throughout their range (Mizroch et al. 1984; Horwood 2008) and they are now rare in California waters (Forney et al. 1995). Sei whales feed primarily on swarms of copepods (e.g., *Calanus cristatus*, *Calanus plumchrus*, and *Calanus pacificus*)

[6] Jacobsen, J. Cetacean and Seabird Biologist. H. T. Harvey & Associates. September 7, 2019—communication with Dr. Sharon Kramer of H. T. Harvey & Associates regarding sperm whale migration and presence in the Eel River Canyon.

by using their fine baleen to skim them at the surface, and secondarily consume euphausids and small schooling fish (Kawamura 1980). No sei whales were observed in low-elevation aerial surveys (Adams et al. 2014). Because of their highly pelagic nature and small population size, it is unlikely that sei whales will occur in the action area.

***Bryde's Whale*—**Bryde's whales (*Balaenoptera edeni*) are globally distributed in tropical waters within 40° latitude from the equator. In five surveys during 1991–2005, there was one confirmed Bryde's whale sighting, and four sightings of either a sei or Bryde's whale off central California (Barlow and Forney 2007). Due to the low sighting rate, the COW population was omitted from the *2008 Pacific Stock Assessment Report* (Carretta et al. 2009). The closest substantial populations to the action area are in Hawaii (Carretta et al. 2009), the central Gulf of California (likely a resident population) (Tershy et al. 1990), and the eastern tropical Pacific, which is where they are the most frequently sighted large whale (Wade and Gerrodette 1993). No Bryde's whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009), and no Bryde's whales were observed in low-elevation aerial surveys (Adams et al. 2014). Because of their low numbers and the lack of sightings off Humboldt County, this species is unlikely to occur in the action area.

***North Pacific Right Whale*—**The North Pacific right whale (*Eubalaena japonica*) was federally listed as endangered in 1970 (NMFS 2017). Critical habitat was designated in 2008 and only includes waters off Alaska (NMFS 2008). Once abundant across the entire North Pacific Ocean, the right whale was rendered extremely scarce throughout its range by commercial whaling from 1820–1850. Humboldt County is at the southern edge of the species' current range. The species remains one of the most endangered of all whales (Scarff 1986; Brownell et al. 2001; Clapham et al. 2004). These whales are primarily skim feeders, swimming continuously at the surface with their mouths open to filter zooplankton (primarily copepods) with their fine baleen (Werth 2000). At present, the greatest concentrations of North Pacific right whales are in the Bering Sea and south of Kodiak Island, but there are so few individuals that accurate population estimates are difficult (Shelden et al. 2005; Angliss and Allen 2009); a total population of 100 or less animals is estimated (Muto et al. 2019a). No right whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009), and no right whales were observed in low-elevation aerial surveys (Adams et al. 2014). Because of their highly pelagic nature and very low numbers, it is unlikely that North Pacific right whales would occur in the action area.

***Killer Whale West Coast Transient Population*—**The west coast transient population is not federally or state listed and ranges from California to southeast Alaska (Angliss and Allen 2009). Transient killer whales are known to travel long distances in small groups in pursuit of marine mammals, their exclusive prey (Bigg et al. 1990; Jefferson et al. 1991; Ford et al. 1998; Herman et al. 2005; Krahn et al. 2007). From 1975 to 2012, 521 individual transient killer whales were photo-identified (Muto et al. 2019b). Transient killer whales can be identified acoustically by their unique stereotypic vocalizations and use of echolocation (Ford and Fisher 1982; Barrett-Lennard et al. 1996; Ford et al. 2000). Transient killer whales likely occur in the action area, although occurrences are expected to be sporadic given their low population numbers and immense home ranges.

***Killer Whale ENP Offshore Population*—**The ENP offshore population of killer whales is not federally or state listed. The offshore population of killer whales frequents waters beyond the continental slope from southern California to the Aleutian Islands (Dahlheim et al. 2008) and feeds on fish (especially sharks) and marine mammals (Herman et al. 2005; Krahn et al. 2007). During over 30 years of survey efforts throughout their range, most sightings (40 of 59 total) of ENP offshore killer whales were off southern and central California between September and March, with group sizes of 2 to 100 individuals (Dahlheim et al. 2008). Due to infrequent encounters, photographic identification of this population is not as complete as the other two ecotypes. A total of 300 ENP offshore killer whales have been photo-identified (Carretta et al. 2019g). No killer whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Given their distribution off the continental shelf, ENP offshore killer whales will likely be rare in the action area.

Killer Whale Southern Resident Distinct Population Segment**—**The Southern Resident distinct population segment (DPS) was federally listed as endangered in 2006 (CDFW 2019b). Critical habitat for this DPS was designated in Puget Sound (NMFS 2006a), and is being proposed southward along the U.S. West Coast to Point Sur, California, including offshore of Humboldt County between depths of 20–656 ft (6.1–200 m) (NMFS 2019b). Southern Resident DPS killer whales are composed of three matrilineal pods named J, K, and L (Bigg et al. 1990) and occur in the inland waterways of Puget Sound, Strait of Juan de Fuca, and southern Georgia Strait in spring, summer, and fall. Little is known about their fall, winter, and spring movements, but they have been reported in coastal waters off Oregon and Washington. In recent years, the K and L pods have been seen as far south as central California, presumably searching for salmon (Krahn et al. 2004; Carretta et al. 2009). On the basis of available information, it is likely that pods of Southern Resident DPS killer whales will travel by and perhaps through the nearshore portions of the action area (e.g., to depths of 656 ft [200 m] as proposed for the critical habitat designation in NMFS 2019a) at infrequent intervals in winter or spring. They could forage for migrating Chinook salmon at the Klamath River mouth because of the abundance of prey. The two rivers closest to the action area, the Mad and Eel, have very few Chinook salmon in comparison, although Chinook salmon from the Sacramento River are regularly caught in nearshore fisheries in the action area (Bellinger et al. 2015). It is unlikely that Southern Resident DPS killer whales would encounter the offshore wind project areas during their forays along the coast.

Bottlenose Dolphin**—**Two populations of bottlenose dolphins (*Tursiops truncatus*) are recognized in California: (1) the coastal population found south of San Francisco, and (2) the offshore population seen occasionally more than 115 mi (185 km) off Humboldt County, likely during warm water incursions (Carretta et al. 2009, 2019h). While the central California population occurs within sight of shore, no bottlenose dolphins were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009), and few individuals have been sighted along the Humboldt County coast[7]. Bottlenose dolphins are regionally rare, but may occur within the action area.

Short-Beaked Common Dolphin**—**Although the short-beaked common dolphin (*Delphinus delphis*) is the most abundant cetacean that occurs off California and north of Cape Mendocino, its distribution is off the continental shelf (Carretta et al. 2009). Fifty-two sightings of short-beaked common dolphins were reported

[7] Jacobsen, J. Cetacean and Seabird Biologist. H. T. Harvey & Associates. September 9, 2019—communication with Dr. Sharon Kramer of H. T. Harvey & Associates regarding bottlenose dolphin presence in Humboldt County.

offshore of northern California in five surveys from 1991–2005 (Barlow and Forney 2007). No sightings were recorded from 1965–1978 off northern California, or in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). One female was stranded in 1968 in Humboldt County (Sullivan and Houck 1979). Short-beaked common dolphins are likely too far offshore to occur in the action area.

Long-Beaked Common Dolphin**—**The long-beaked common dolphin (*Delphinus capensis*) occurs from Mexico to central California (Carretta et al. 2009). No sightings were recorded in northern California in five surveys from 1991–2005 (Barlow and Forney 2007), or in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Long-beaked common dolphins are therefore unlikely to occur in the action area.

Striped Dolphin**—**Striped dolphins (*Stenella coeruleoalba*) are typically sighted along the California coast from ship-based surveys conducted 115–230 mi (185–370 km) from shore (Carretta et al. 2009). There were 13 sightings off northern California in five surveys from 1991–2005 (Barlow and Forney 2007). None were reported in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Striped dolphins are likely too far offshore to occur in the action area.

Short-Finned Pilot Whale**—**Short-finned pilot whales (*Globicephala macrorhynchus*) are distributed worldwide; they feed primarily on squid but also prey on fish (Olson 2008). This species was once common off southern California, but sightings have been rare since the ENSO event of 1982–1983 (Carretta et al. 2009). During five ship-based surveys conducted from 1991–2005 off California, four short-finned pilot whales were sighted in 1993 and seven were seen in 2005 (Barlow and Forney 2007). The current population estimate for the COW population of short-finned pilot whales is 836 individuals (Carretta et al. 2019i). No short-finned pilot whales were reported in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Their presence off the northern California coast is variable and influenced by oceanographic conditions (Forney and Barlow 1998). The presence of pilot whales within the action area would depend on rare warm water incursions, and otherwise it is unlikely to occur in the action area due to the rarity of sightings.

Pygmy and Dwarf Sperm Whales**—**Pygmy and dwarf sperm whales (*Kogia breviceps* and *Kogia sima*, respectively), which are globally distributed throughout deep oceanic waters and along continental slopes, are difficult to distinguish in the field. Sightings of these species are rare in waters off California, Oregon, and Washington, and approximations of their abundance are uncertain (Carretta et al. 2009). One pygmy sperm whale was stranded in Humboldt County in 1966 (Sullivan and Houck 1979). No pygmy or dwarf sperm whales were reported in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). These species are unlikely to occur in the action area because of the lack of sightings in the region.

Beaked Whales**—**There are 21 recognized species in 5 genera within the beaked whale family (Ziphiidae) (Mead 2008), of which eight species are known to occur off northern California (Carretta et al. 2009). All beaked whales forage for squid and fish and are most frequently sighted in pelagic and continental margin habitats (Mead 2008; Pitman 2008). Due to their prolonged periods at depth, low surfacing profiles, and similar appearances among species, beaked whales are difficult to detect and conclusively identify during visual surveys

(Carretta et al. 2009). Advances in acoustic monitoring have improved detection ability and species identification from echolocation pulse features (Zimmer et al. 2008; McDonald et al. 2009).

During five ship-based surveys conducted from 1991–2005, there were only 11 sightings of beaked whales off northern California: three Baird's (*Berardius bairdii*), four Cuvier's (*Ziphius cavirostris*), and four *Mesoplodon* spp. (Barlow and Forney 2007). There were few sightings of beaked whales in the combined waters of California, Oregon, and Washington, and abundance estimates are unreliable (Carretta et al. 2009). Three Hubbs' beaked whales (*Mesoplodon carlhubbsi*) and one badly decomposed Baird's beaked whale were stranded along the Humboldt County coast from 1965–1978 (Sullivan and Houck 1979), and there have been a few additional strandings since 1978[8]. One Baird's beaked whale was reported in 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009).

Six species of beaked whales are in the genus *Mesoplodon*; they are treated as a group because they are difficult to distinguish in the field. These six species and their known distributions are as follows (Mead 1989, 2008):

- Hubbs' beaked whale is known only along the Pacific coasts of the U.S. and Japan.
- Lesser beaked whale (*Mesoplodon peruvianus*) is the smallest member of the family and is found in the eastern tropical Pacific as far north as southern California.
- Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*) is reported from scattered locations in tropical and warm temperate waters of the Indo-Pacific.
- Blainville's beaked whale (*Mesoplodon densirostris*) has a global distribution in tropical and warm temperate waters.
- Stejneger's beaked whale (*Mesoplodon stejnegeri*) is known only in the North Pacific Ocean from California to Alaska (including the Bering Sea) and Japan.
- Perrin's beaked whale (*Mesoplodon perrini*) is the newest mesoplodon to be recognized, known only from stranded specimens (Dalebout et al. 2002).

Beaked whales are rarely sighted in the region, but would likely be foraging in Mendocino Canyon if present in the action area.

Birds Associated with the Offshore Action Area, Cable Landing, and Humboldt Bay

Unlike offshore wind project sites in the nearshore marine environment in Europe and the east coast of North America, which has an extended continental shelf and limited topography, the Pacific Ocean nearshore and shelf marine environments are quite diverse topographically and the shelf break is much closer to the coast. Passive continental margins such as most of the Atlantic Ocean coasts have wide and shallow continental

[8] Jacobsen, J. Cetacean and Seabird Biologist. H. T. Harvey & Associates. December 17, 2009—communication with Dr. Sharon Kramer of H. T. Harvey & Associates regarding compilation of marine mammal strandings.

shelves (Pinet 2003). In addition to the narrow shelf and topographic heterogeneity, an important feature of the offshore environment of the northern California coast is the CCS. The CCS is one of five eastern boundary currents and is one of the most productive marine systems in the world due to its representation of a strong upwelling zone, which greatly enhances marine productivity by bringing nutrient-rich waters to the surface that support large numbers of seabirds and other marine life.

To date, most of the research on seabird spatial use of potential offshore wind project areas has been conducted in nearshore sites in Europe, where much of the seabird species composition is quite different from that of the continental shelf off the U.S. West Coast (although similar to nearshore waters) and where the conditions under which data were gathered were in 'moderate' winds (e.g., Cook et al. 2012; Johnston et al. 2013). In general, the immediate nearshore avifauna off the northern California coast is similar to the nearshore avifauna off Europe and the east coast of North America and hosts similar species of birds such as loons (divers), grebes, sea ducks, cormorants (shags), and alcids. The responses of these nearshore birds to the presence of offshore wind energy generating facilities have been relatively well studied in Europe, although fatality monitoring is quite difficult in the marine environment compared to that in the terrestrial environment.

In general, nearshore coastal seabird species in the Atlantic and Pacific Oceans typically use 'flapping' flight in most wind conditions, and have the most control over their flight trajectories compared to flight behavior that includes relatively extensive periods of gliding. Moreover, flappers typically fly just above the sea surface (e.g., within 5 m) to exploit the lower wind velocities found there, and easily avoid large objects such as buoys, wind turbines, and ships. Such research, while instructive, does not provide information on the wind conditions that most offshore seabirds experience over the continental shelf break and beyond off the California coast in persistently strong winds, which are typical of the offshore environment in northern California. This research is also not representative of the seabird species mix that is typically found offshore of the U.S. West Coast. In the waters off the west coast of North America there is a much higher prevalence of gliding and flap-gliding species whose behavior and flight height above the surface change with wind strength (Ainley et al. 2015). As previously indicated, the maximum monthly peak wind speeds recorded at NOAA weather buoy 46022 between 1997 and 2008 were 34–40 miles (55–64 km) per hour (National Data Buoy Center 2019), which greatly exceed wind conditions investigated off European shores. In high wind conditions, gliding species often fly in tall arcs above the surface.

The remainder of this section will: (1) present a summary of bird use of the habitats present in the offshore HB and CM areas, the subsea cable route areas, and the cable landfall locations; (2) provide an overview of special-status bird species present or potentially present in those areas; and (3) identify representative, non-special-status bird species that are known to be or highly likely to be present in those areas. The characterization of the cable landfall locations includes their associated terrestrial and wetland habitats, as well as the open water in the adjacent portion of Humboldt Bay. Rarely occurring bird species or species anticipated to be quite rare in a particular portion of the action area (based on species' spatial data) were not included in the list of birds for that area. The special-status and non-special-status bird species that occur or have the potential to occur in the action area are listed in Tables 4 and 5, respectively.

Table 4. Special-Status Bird Species that May Occur in the HB, CM, Subsea Cable Regions, and Cable Landfall Locations

Common Name	Scientific Name	Status	Action Area Components and Where They May Occur	Comments
Harlequin duck	*Histrionicus histrionicus*	CSSC	Nearshore, cable landfall locations, open water of Humboldt Bay	
Black brant	*Branta bernicula nigricans*	CSSC	Cable landfall locations, Humboldt Bay, migrant offshore (call area)	Primarily migrant and winter resident; does not breed in the action area region.
Common loon	*Gavia immer*	CSSC	Nearshore, cable landfall locations, open water of Humboldt Bay	
Short-tailed albatross	*Phoebastria albatrus*	FE, CSSC	Offshore (HB, CM), rare	Rare in pelagic waters south of Alaska. Highly unlikely in the action area and does not breed in the action area region.
Ashy storm-petrel	*Oceanodroma homochroa*	CSSC, BLM	Offshore (HB, CM)	Scarce in pelagic zones as far north as the action area; does not breed in the action area.
Fork-tailed storm-petrel	*Oceanodroma furcata*	CSSC, BLM	Offshore (HB, CM), open waters of Humboldt Bay (rare)	
Hawaiian petrel	*Pterodroma sandwichensis*	FE	Offshore (HB, CM), rare	
Brown pelican	*Pelecanus occidentalis californicus*	FP, USFS, BLM	Nearshore, cable landfall locations, open water of Humboldt Bay	
Northern harrier	*Circus hudsonius*	CSSC	Nearshore, cable landfall locations,	
Bald eagle	*Haliaeetus leucocephalus*	SE, FP, USFS, BLM, BCC	Nearshore, cable landfall locations	Year-round resident and could nest in forests in the action area region.
Prairie falcon	*Falco mexicanus*	BCC	Nearshore, cable landfall locations	
American peregrine falcon	*Falco peregrinus anatum*	FP, BCC	Nearshore, cable landfall locations	
Western snowy plover	*Charadrius alexandrinus nivosus*	FT, CSSC, BCC	Beaches in cable landfall locations	Uncommon year-round, but the South Spit cable landfall location contains designated critical habitat for this species.
Long-billed curlew	*Numenius americanus*	BCC	Nearshore, cable landfall locations, edge of Humboldt Bay	

Common Name	Scientific Name	Status	Action Area Components and Where They May Occur	Comments
Caspian tern	*Hydroprogne caspia*	BCC	Nearshore, cable landfall locations, edge of Humboldt Bay	
Marbled murrelet	*Brachyramphus marmoratus*	FT, SE	Nearshore	Common in nearshore waters (<0.93 miles [1.5 kilometers] from shore) and is occasionally farther offshore. Nests in old-growth coniferous forests in Oregon, no suitable nesting habitat in the action area.
Tufted puffin	*Fratercula cirrhata*	CSSC	Offshore (HB, CM)	
Cassin's auklet	*Ptychoramphus aleuticus*	CSSC, BCC	Offshore (HB, CM)	Fairly common offshore throughout the year. Nests on coastal islands in northern California but not in the action area.
Scripps's murrelet	*Synthliboramphus scrippsi*	FC, ST, BLM, BCC	Offshore (HB, CM)	Uncommon in late summer and fall; does not breed in the action area region.
Guadalupe murrelet	*Synthliboramphus hypoleucus*	FC, ST, BLM, BCC	Offshore (CM)	Uncommon, only recorded offshore of Mendocino and not documented off Humboldt; does not breed in the action area.
Short-eared owl	*Asio flammeus*	CSSC	Cable landfall locations	
Vaux's swift	*Chaetura vauxi*	CSSC	Occasional migrant over cable landfall locations	
Bank swallow	*Riparia riparia*	ST, BLM	Nearshore, cable landfall locations, open water of Humboldt Bay, scarce	
Yellow warbler	*Setophaga petechia*	CSSC, BCC	Nearshore, cable landfall locations	

Notes: HB=Northern California Humboldt Bay Call Area; CM=Hypothetical Cape Mendocino Area; CSSC=California species of special concern; SE=state listed as endangered; USFS=U.S. Forest Service sensitive species; BLM=U.S. Bureau of Land Management sensitive species; FP=California fully protected species; FT=federally listed as threatened; FE=federally listed as endangered; FC=candidate for federal listing; ST=state listed as threatened; BCC=U.S. Fish and Wildlife Service bird of conservation concern

Table 5. Non-Special-Status Bird Species that May Occur in the HB, CM, Subsea Cable Regions, Cable Landfall Locations, and Open Waters of Humboldt Bay

Common Name	Scientific Name	Offshore Areas (HB, CM, and Subsea Cable Routes)	Nearshore, Cable Landfall Locations, Open Water of Humboldt Bay
Greater white-fronted goose	*Anser albifrons*	X	X
Cackling goose	*Branta hutchinsii*	X	X
Canada goose	*Branta canadensis*		X
Tundra swan	*Cygnus columbianus*		X
Northern shoveler	*Spatula clypeata*		X
Gadwall	*Mareca strepera*		X
American wigeon	*Mareca americana*		X
Mallard	*Anas platyrhynchos*		X
Northern pintail	*Anas acuta*		X
Green-winged teal	*Anas crecca*		X
Canvasback	*Aythya valisineria*		X
Redhead	*Aythya americana*		X
Greater scaup	*Aythya marila*		X
Lesser scaup	*Aythya affinis*		X
Surf scoter	*Melanitta perspicillata*	X	X
White-winged scoter	*Melanitta deglandi*		X
Black scoter	*Melanitta americana*		X
Long-tailed duck	*Clangula hyemalis*		X
Bufflehead	*Bucephala albeola*		X
Common goldeneye	*Bucephala clangula*		X
Red-breasted merganser	*Mergus serrator*		X
Ruddy duck	*Oxyura jamaicensis*		X
Pied-billed grebe	*Podilymbus podiceps*		X
Horned grebe	*Podiceps auritus*		X
Red-necked grebe	*Podiceps grisegena*		X
Eared grebe	*Podiceps nigricollis*		X
Western grebe	*Aechmophorus occidentalis*		X
Clark's grebe	*Aechmophorus clarkii*		X
Band-tailed pigeon	*Patagioenas fasciata*		X
Mourning dove	*Zenaida macroura*		X
Anna's hummingbird	*Calypte anna*		X
Allen's hummingbird	*Selasphorus sasin*		X
Virginia rail	*Rallus limicola*		X
Sora	*Parzana carolina*		X
American coot	*Fulica americana*		X
American avocet	*Recurvirostra americana*		X
Black oystercatcher	*Haematopus bachmani*		X

Common Name	Scientific Name	Offshore Areas (HB, CM, and Subsea Cable Routes)	Nearshore, Cable Landfall Locations, Open Water of Humboldt Bay
Black-bellied plover	*Pluvialis squatarola*		X
Pacific golden-plover	*Pluvialis fulva*		X
Killdeer	*Charadrius vociferus*		X
Semipalmated plover	*Charadrius semipalmatus*		X
Whimbrel	*Numenius phaeopus*		X
Long-billed curlew	*Numenius americanus*		X
Marbled godwit	*Limosa fedoa*		X
Ruddy turnstone	*Arenaria interpres*		X
Black turnstone	*Arenaria melanocephala*		X
Red knot	*Calidris canutus*		X
Surfbird	*Calidris virgata*		X
Sanderling	*Calidris alba*		X
Dunlin	*Calidris alpina*		X
Rock sandpiper	*Calidris ptilocnemis*		X
Baird's sandpiper	*Calidris bairdii*		X
Least sandpiper	*Calidris minutilla*		X
Pectoral sandpiper	*Calidris melanotos*		X
Western sandpiper	*Calidris mauri*		X
Short-billed dowitcher	*Limnodromus griseus*		X
Long-billed dowitcher	*Limnodromus scolopaceus*		X
Wilson's snipe	*Gallinago delicata*		X
Spotted sandpiper	*Actitis macularius*		X
Wandering tattler	*Tringa incana*		X
Lesser yellowlegs	*Tringa flavipes*		X
Willet	*Tringa semipalmata*		X
Greater yellowlegs	*Tringa melanoleuca*		X
Red-necked phalarope	*Phalaropus lobatus*	X	X
Red phalarope	*Phalaropus fulicarius*	X	
South polar skua	*Stercorarius maccormicki*	X	
Pomarine jaeger	*Stercorarius pomarinus*	X	X
Parasitic jaeger	*Stercorarius parasiticus*	X	X
Long-tailed jaeger	*Stercorarius longicaudus*	X	
Common murre	*Uria aalge*	X	X
Pigeon guillemot	*Cepphus columba*		X
Ancient murrelet	*Synthliboramphus antiquus*	X	X
Rhinoceros auklet	*Cerorhinca monocerata*	X	
Black-legged kittiwake	*Rissa tridactyla*	X	X
Sabine's gull	*Xema sabini*	X	
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X

Common Name	Scientific Name	Offshore Areas (HB, CM, and Subsea Cable Routes)	Nearshore, Cable Landfall Locations, Open Water of Humboldt Bay
Heermann's gull	*Larus heermanni*		X
Mew gull	*Larus canus*	X	X
Ring-billed gull	*Larus delawarensis*		X
Western gull	*Larus occidentalis*	X	X
California gull	*Larus californicus*	X	X
Herring gull	*Larus argentatus*	X	X
Glaucous-winged gull	*Larus glaucescens*	X	X
Glaucous gull	*Larus hyperboreus*		X
Common tern	*Sterna hirundo*	X	X
Arctic tern	*Sterna paradisaea*	X	
Forster's tern	*Sterna forsteri*		X
Elegant tern	*Thalasseus elegans*		X
Red-throated loon	*Gavia stellata*		X
Pacific loon	*Gavia pacifica*	X	X
Laysan albatross	*Phoebastria immutabilis*	X	
Black-footed albatross	*Phoebastria nigripes*	X	
Leach's storm-petrel	*Hydrobates leucorhous*	X	
Northern fulmar	*Fulmarus glacialis*	X	X
Murphy's petrel	*Pterodroma ultima*	X	
Cook's petrel	*Pterodroma cookii*	X	
Buller's shearwater	*Ardenna bulleri*	X	
Short-tailed shearwater	*Ardenna tenuirostris*	X	X
Sooty shearwater	*Ardenna grisea*	X	X
Pink-footed shearwater	*Ardenna creatopus*	X	
Flesh-footed shearwater	*Ardenna carneipes*	X	
Black-vented shearwater	*Puffinus opisthomelas*		X
Brandt's cormorant	*Phalacrocorax penicillatus*		X
Double-crested cormorant	*Phalacrocorax auritus*		X
Pelagic cormorant	*Phalacrocorax pelagicus*		X
Brown pelican	*Pelecanus occidentalis*		X
Great blue heron	*Ardea herodias*		X
Great egret	*Ardea alba*		X
Snowy egret	*Egretta thula*		X
Black-crowned night-heron	*Nycticorax nycticorax*		X
Turkey vulture	*Cathartes aura*		X
Osprey	*Pandion haliaetus*		X
Northern harrier	*Circus hudsonius*		X

Common Name	Scientific Name	Offshore Areas (HB, CM, and Subsea Cable Routes)	Nearshore, Cable Landfall Locations, Open Water of Humboldt Bay
Sharp-shinned hawk	*Accipiter striatus*		X
Cooper's hawk	*Accipiter cooperii*		X
Red-tailed hawk	*Buteo jamaicensis*		X
Barn owl	*Tyto alba*		X
Belted kingfisher	*Megaceryle alcyon*		X
American kestrel	*Falco sparverius*		X
Merlin	*Falco columbarius*		X
Black phoebe	*Sayornis nigricans*		X
Say's phoebe	*Sayornis saya*		X
American crow	*Corvus brachyrhynchos*		X
Common raven	*Corvus corax*		X
Barn swallow	*Hirundo rustica*		X
Tree swallow	*Tachycineta bicolor*		X
Violet-green swallow	*Tachycineta thalassina*		X
Northern rough-winged swallow	*Stelgidopteryx serripennis*		X
Cliff swallow	*Petrochelidon pyrrhonota*		X
Marsh wren	*Cistothorus palustris*		X
Ruby-crowned kinglet	*Regulus calendula*		X
Swainson's thrush	*Catharus ustulatus*		X
Hermit thrush	*Catharus guttatus*		X
American robin	*Turdus migratorius*		X
European starling	*Sturnus vulgaris*		X
American pipit	*Anthus rubescens*		X
House finch	*Haemorhous mexicanus*		X
Purple finch	*Haemorhous purpureus*		X
Lesser goldfinch	*Spinus psaltria*		X
American goldfinch	*Spinus tristis*		X
Lapland longspur	*Calcarius lapponicus*		X
Fox sparrow	*Passerella iliaca*		X
Dark-eyed junco	*Junco hyemalis*		X
White-crowned sparrow	*Zonotrichia leucophrys*		X
Golden-crowned sparrow	*Zonotrichia atricapilla*		X
Savannah sparrow	*Passerculus sandwichensis*		X
Song sparrow	*Melospiza melodia*		X
Lincoln's sparrow	*Melospiza lincolnii*		X
Western meadowlark	*Sturnella neglecta*		X
Red-winged blackbird	*Agelaius phoeniceus*		X

Common Name	Scientific Name	Offshore Areas (HB, CM, and Subsea Cable Routes)	Nearshore, Cable Landfall Locations, Open Water of Humboldt Bay
Brown-headed cowbird	*Molothrus ater*		X
Brewer's blackbird	*Euphagus cyanocephalus*		X
Orange-crowned warbler	*Leiothlypis celata*		X
MacGillivray's warbler	*Geothlypis tolmiei*		X
Common yellowthroat	*Geothlypis trichas*		X
Palm warbler	*Setophaga palmarum*		X
Yellow-rumped warbler	*Setophaga coronata*		X
Townsend's warbler	*Setophaga townsendi*		X
Wilson's warbler	*Cardellina pusilla*		X
Lazuli bunting	*Passerina amoena*		X

Seabirds over the continental shelf break (depths of 656–6,529 ft [200–1,990 m]) comprise substantial densities of birds (Ainley and Terrill 1996). These waters are dominated by shearwaters, with the sooty shearwater (*Ardenna grisea*) being the dominant species; it is present year-round but most abundant from spring through fall (Harris 2006). The next two most abundant species are the pink-footed shearwater (*Ardenna creatopus*) that occurs primarily in summer and fall, and the Buller's shearwater (*Ardenna bulleri*) which is present in fall (Harris 2006). These species breed in the southern hemisphere and disperse into the North Pacific outside the breeding season, although nonbreeding (and primarily young) sooty and pink-footed shearwaters occur throughout the year. The fork-tailed storm-petrel (*Hydrobates furcatus*), which is a SSC, breeds on offshore rocks and islands off Humboldt and Del Norte Counties and is the most frequent storm-petrel species encountered in these waters. Leach's storm-petrels (*Hydrobates leucorhous*) travel these waters from coastal breeding sites to foraging sites in the deepwater pelagic zone (Harris 2006). Other species characteristic of this zone include the black-footed albatross (*Phoebastria nigripes*) and the rarer Laysan albatross (*Phoebastria immutabilis*), which both breed in the Hawaiian Islands; the Laysan albatross also breeds off the west coast of Mexico (Howell and Webb 1992). In the winter months, the northern fulmar (*Fulmarus glacialis*), which breeds in the North Pacific off Canada and Alaska, can be abundant in these waters although numbers fluctuate greatly from year to year (Harris 2006). Alcids that breed on offshore islands and rocks and occur off northern California as foragers include the common murre (*Uria aalge*), Cassin's auklet (*Ptychoramphus aleuticus*), rhinoceros auklet (*Cerorhinca monocerata*), and tufted puffin (*Fratercula cirrhata*). Three species of migrating jaegers (*Stercorarius* spp.) and nonbreeding South Polar skuas (*Stercorarius maccormicki*) engage in kleptoparasitism by chasing offshore terns (e.g., common [*Sterna hirundo*] and arctic [*Sterna paradisaea*] terns) during migration, as well as other species, including gulls. Offshore gulls in this zone include western gulls (*Larus occidentalis*), migrating Sabine's gulls (*Xema sabini*), and wintering mew gulls (*Larus canus*), California gulls (*Larus californicus*), herring gulls (*Larus argentatus*), glaucous-winged gulls (*Larus glaucescens*), and black-legged kittiwakes (*Rissa tridactyla*).

Gadfly petrels (*Pterodroma* spp.) are considered scarce but have become frequently detected off California (including Humboldt County) in deep water that is typically outside the continental shelf break; these increased observations are likely due to more reporting by birders on cruise ships. These species include the federally listed Hawaiian petrel (*Pterodroma sandwichensis*), Cook's petrel (*Pterodroma cookii*), and Murphy's petrel (*Pterodroma ultima*). Although these species typically occur in deep water west of the action area, Hawaiian petrels have been observed over the continental shelf break on a number of occasions off California, and Murphy's petrels have been reported fairly close to shore, including off the Mendocino County coast (eBird 2019a). Cook's petrels are typically in deep water outside the continental shelf break but are occasionally detected closer to shore. The Hawaiian petrel, which breeds in the Hawaiian Islands, is discussed in more detail in Section 2.2.3.1. The shearwaters, petrels and albatrosses represent species that glide a great deal under windy conditions and often arc high above the water's surface in strong winds.

In nearshore waters (i.e., inshore of the continental slope waters), the avifauna comprises birds such as the western grebe (*Aechmophorus occidentalis*) and waterfowl, including three species of scoters (*Melanitta* spp.), which often forage close to shore near the breakers. Brant's cormorants (*Phalacrocorax penicillatus*), pelagic cormorants (*Phalacrocorax pelagicus*), and postbreeding brown pelicans (*Pelecanus occidentalis*) are common in this zone. Other species associated with nearshore waters include three species of loons (*Gavia* spp.) and nearshore terns such as summering Caspian terns (*Hydroprogne caspia*) and postbreeding elegant terns (*Thalasseus elegans*). Gulls and common murres are quite abundant in nearshore waters, and red-necked (*Phalaropus lobatus*) and red (*Phalaropus fulicarius*) phalaropes occur during migration. The marbled murrelet (*Brachyramphus marmoratus*), listed as threatened under FESA and endangered under CESA, breeds in coastal old growth forest and is typically found close to shore where it forages (Nelson 1997). The marbled murrelet is described further in in Section 2.2.3.1. In winter, the marbled murrelet is joined by wintering ancient murrelets (*Synthliboramphus antiquus*) that breed in Canada and Alaska and winter offshore of northern California.

The cable landfall location on the South Spit is located at the north end near the entrance to Humboldt Bay. The area of effects for the South Spit cable landfall location encompasses beach, estuarine and marine deepwater, marine wetland, freshwater emergent wetland, grassland, and coastal scrub areas; it also includes designated critical habitat for the western snowy plover (*Charadrius alexandrinus nivosus*). The Fields Landing cable landfall location is more developed but still supports grasslands. The habitat types at the cable landfall locations support a variety of birds, including species associated with nearshore marine, mudflat and beach, open bay, freshwater wetland, and terrestrial areas. Shorebirds such as greater yellowlegs (*Tringa melanoleuca*), spotted sandpiper (*Actitis macularius*), and sanderling (*Calidris alba*) are present. Nearshore species occurring in the surf zone and adjacent bay and inlet waters include three species of loons (*Gavia* spp.), five species of grebes, waterfowl (including scoters [*Melanitta* spp.]), multiple gull species (with species richness and abundance increasing in winter), several species of terns, nearshore alcids such as common murres and pigeon guillemots (*Cepphus columba*), three species of cormorants (*Phalacrocorax* spp.), and other nearshore and bay species. Freshwater wetlands provide habitat for species such as the Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), marsh wren (*Cistothorus palustris*), and common yellowthroat (*Geothlypis trichas*). Barren areas function as habitat for American pipits (*Anthus rubescens*) and the coastal scrub provides habitat for terrestrial species such as Say's phoebes (*Sayornis saya*), migrant and wintering yellow-rumped warblers (*Setophaga coronata*), white-crowned sparrows (*Zonotrichia leucophrys*), and multiple migratory species passing through the region.

Threatened and Endangered Seabirds that could Occur Offshore at the HB and CM Areas

Scripp's Murrelet—The Scripps's murrelet (*Synthliboramphus scrippsi*) was listed as threatened under CESA on December 22, 2004. At the time of listing, the Scripps's murrelet was known as Xantus's murrelet and considered conspecific with the Guadalupe murrelet (now *Synthliboramphus hypoleucus*); therefore, most of the existing literature on Scripp's murrelet is associated with its former name. The highest numbers of the Scripp's murrelet have been reported from Point Conception to Monterey Bay and Point Año Nuevo, typically 12–62 mi (20–100 km) offshore, although it is occasionally seen from shore (Briggs et al. 1987). Scripp's murrelet is considered casual to rare in the offshore portions of the action area, and only 93 birds were reported from central Mendocino County to the Oregon border in 2005 (Harris 2006). These records were from the continental shelf, shelf break, and beyond the shelf break; most of the records were from beyond the shelf break and during the early to mid-fall postbreeding dispersal period. The Scripp's murrelet may occur in the offshore portions of the action area, but based on the species' known distribution it should only rarely occur during the postbreeding dispersal period, with a higher probability of potential occurrences during warm water years (e.g., El Niño years).

Guadalupe Murrelet—The Guadalupe murrelet was listed as threatened under CESA on December 22, 2004. The Guadalupe murrelet was known as Xantus's murrelet at the time of listing and regarded as conspecific with the Scripps's murrelet. Of the three species in this genus, the Guadalupe murrelet is the rarest and most geographically restricted, breeding only on Guadalupe and San Benito Islands off Baja California. Postbreeding dispersal north occurs primarily to waters off southern California, but birds rarely occur north to the pelagic zone off central California, especially during warm water events. This species is quite rare north of central California and there are no documented records off Humboldt County[9], although it undoubtedly occurs there as there are scattered records north to British Columbia. Four Guadalupe murrelets were documented offshore of Mendocino County north of Fort Bragg on September 16, 2018 (eBird 2020).

Short-Tailed Albatross—The short-tailed albatross was listed as endangered under FESA in 2000 (USFWS 2000) and is a SSC. Critical habitat has not been designated for the species. The short-tailed albatross was once an abundant species that numbered more than a million birds. The species was decimated by feather hunting and egg exploitation at the turn of the 20th century and by the late 1940s was thought to be extinct. Through intensive management efforts, the short-tailed albatross population has reached an estimated 4,354 individuals and is exhibiting relatively steep population growth (5–9% per year), mainly due to high survivorship, translocation of chicks and use of social attraction to establish a new colony, and reduction of bycatch in commercial fishing (USFWS 2014a). During the non-breeding season (summer), they range along the Pacific Rim from southern Japan to northern California, primarily along the continental shelf margins. Based on satellite tracking of 99 individuals between 2002 and 2012, juveniles generally range in shallower, nearer-to-shore waters than adults (e.g., less than 656 ft [200 m] depth), and are more likely than adults to occur off the

[9] Fowler, Rob. Seabird Ecologist. May 8, 2020—communication with Scott Terrill of H. T. Harvey & Associates regarding observations of Guadalupe murrelets in Humboldt and Mendocino Counties.

west coast of the U.S. and Canada (Suryan et al. 2006, 2007, 2008; Suryan and Fischer 2010; Deguchi et al. 2012; USFWS 2014a). The short-tailed albatross is quite rare off the U.S. West Coast, with 43 documented records in California waters that have been accepted by the California Bird Records Committee; only two of these are off the Humboldt County coast (CBRC 2020). The extreme rarity of this species off the California coast indicates that the short-tailed albatross is highly unlikely to be in the offshore portions of the action area; its presence is anticipated to be limited to occasional occurrences even as the population continues to grow.

Hawaiian Petrel—The Hawaiian petrel was listed as endangered under FESA in 1967 (USFWS 1967). No critical habitat has been designated. Hawaiian petrel breeding colonies are found only in remote or high elevation areas on the islands of Hawaii, Maui, Lanai, and Kauai (USFWS 2017b). Primary threats to the Hawaiian petrel include power line collisions, light attraction, predation by introduced predators (including cats [*Felis catus*], pigs [*Sus scrofa*], barn owls [*Tyto alba*], black rats [*Rattus rattus*], and mongoose [*Herpestes javanicus*]) (USFWS 2017b). Although predator control now occurs at several breeding sites, the threat posed by introduced predators remains significant throughout the species' range (USFWS 2019d). Hawaiian petrels are known to make long distance movements, including through waters off the U.S. West Coast, which have been documented by offshore sightings as well as satellite telemetry (Adams and Flora 2009). This species has only recently been detected off California, with the first documented records occurring in 1997 (CBRC 2020). The Hawaiian petrel was considered rare enough off California that records of the species were reviewed for accuracy by the California Bird Records Committee. However, as records increased it was recognized that Hawiian petrels were more regular than previously thought in California offshore waters and the Committee ceased reviewing records after 2013. Up to that point, there were 38 accepted records of Hawaiian petrels off California; 4 of these records were off the Humboldt County coast (CBRC 2020). There have been a number of records of this species offshore of California, including additional records off Humboldt County, since 2013. This species is typically encountered offshore in deep water, but occasionally individuals are observed over the continental shelf break. In addition to the rarity of the Hawaiian petrel off the California coast, the presence of this species in the offshore portions of the action area would likely be limited to rare occurrences.

Bats

The bat species that could occur offshore over federal waters are the hoary bat (*Lasiurus cinereus*) and western red bat (*Lasiurus blossevillii*). Hoary bats are known to migrate south in autumn offshore and along the coast of central California, and western red bats are also known to migrate offshore of central California (Cryan and Brown 2007). Some species of bats hunt for insects in offshore areas in areas where they normally migrate across open ocean areas, such as the Baltic Sea, and have been found to forage for flying insects around, and rest on, offshore wind turbines (Ahlén et al. 2007). No other species of bats are expected to occur in the marine portion of the action area based on the lack of museum records and literature.

2.2.2 Terrestrial Ecosystems

2.2.2.1 Affected Environment

Land Cover Types

The information regarding land cover types presented in this report represents a regional and programmatic characterization of the overland transmission routes and cable landfall locations. The land cover mapping is based on Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) data from the U.S. Forest Service (USFS) (USFS 2019). The CALVEG mapping is based on a minimum mapping unit of 2.5 acres, which captures general conditions, but is coarser than what would be appropriate for an individual project-level analysis because natural community areas that are smaller than 2.5 acres are not included. As a result, if identification of land cover types along specific segments (e.g., a wetland complex along the overland routes) or landfall locations were necessary, field mapping surveys would be required. For this assessment, the 2.5-acre mapping scale provides a general representation of land cover type attributes along each overland route and the two cable landfall locations.

The three land cover types that comprised the largest areas (i.e., 49% total) along the east route were annual grassland (23%), Douglas-fir (14%), and Sierran mixed conifer (11%). On the south route, annual grassland (35%), montane hardwood (19%), and Douglas-fir (16%) land cover types encompassed the largest areas (i.e., 70%). Tables 6 and 7 list the acreages of the land cover types mapped along the overland transmission routes and at the cable landfall locations, respectively, and a description of each is provided below (CNPS 2019; USFS 2019).

Annual Grassland—Annual grasslands are found scattered at moderately low elevations and generally occur between urban or agricultural developments and the foothill woodlands, and may intermix with agriculturally managed sites. Species include naturalized and native annual grasses such as bromes (*Bromus* spp.), bluegrasses (*Poa* spp.), wild oats (*Avena* spp.), fescues (*Festuca* spp.), dogtails (*Cynosurus* spp.), barleys (*Hordeum murinum*), needlegrass (*Stipa* spp.), oatgrasses (*Danthonia* spp.), and a variety of forbs such as checker mallow (*Sidalcea* spp.), brodiaea (*Brodiaea* spp.), wild hyacinths (*Dichelostemma* spp.), yampahs (*Perideridia* spp.) and Mariposa lilies (*Calochortus* spp.). In the Central Valley, dominant species may also include western needlegrass (*Stipa occidentalis*), cheatgrass (*Bromus tectorum*), purple owl's clover (*Castilleja exserta*), filarees (*Erodium* spp.), and Devil's lettuce (*Amsinckia tessellata*) (USFS 2019).

Barren—Barren lands are generally devoid of vegetation and include exposed bedrock, cliffs, and interior sandy areas. Agricultural lands may be mapped as barren and lacking vegetation on occasion, such as after harvesting and during seasons prior to crop growth (USFS 2019). This land cover type is not used to characterize areas considered as modified or developed (e.g., urban areas).

Blue Oak-Foothill Pine—Blue oak (*Quercus douglasii*) and foothill pine (*Pinus sabiniana*) are co-dominant in the tree canopy, and naturally occur on well-drained, gentle slopes, with blue oak dominant below around 2,000 feet (610 m), grading into foothill pine at higher elevations around 2,700 feet (823 m). Foothill pine forms sparse to prominent open stands up to about 5,200 ft (1,585 m), where soils are shallow, often stony, infertile, and moderately to excessively drained. Other associated species include Oregon white oak (*Quercus garryana*), California black oak (*Quercus kelloggii*), interior live oak (*ab wislizeni*) and minor amounts of ponderosa pine (*Pinus ponderosa*). Low elevation shrubs such as chamise (*Adenostoma fasciculatum*), shrub oaks (*Quercus* spp.), and annual and perennial grasses, such as oats, cheatgrass, and needlegrass are also generally present. Minor inclusions of trees such as valley oak (*Quercus lobata*) and California buckeye (*Aesculus californica*) and chaparral shrubs such as wedgeleaf ceanothus (*Ceanothus cuneatus*) may also occur in this community (CNPS 2019; USFS 2019).

Table 6. CALVEG Land Cover Types and Acreages Mapped Along the Overland Transmission Routes

Land Cover Type	East Route Acres (percent)	South Route Acres (percent)
Annual grassland	1,739.8 (23%)	3,367.2 (35%)
Barren	366.3 (5%)	611.6 (6%)
Blue oak-foothill pine	314.5 (4%)	0.5 (<1%)
Blue oak woodland	736.4 (10%)	11.6 (<1%)
Chamise-redshank chaparral	119.0 (2%)	30.0 (<1%)
Coastal oak woodland	—	25.5 (<1%)
Coastal scrub	46.7 (<1%)	48.9 (<1%)
Cropland	14.9 (<1%)	153.5 (2%)
Douglas-fir	1,084.3 (15%)	1,547.2 (16%)
Jeffrey pine	23.4 (<1%)	—
Klamath mixed conifer	38.2 (<1%)	—
Lacustrine	2.1 (<1%)	1.5 (<1%)
Mixed chaparral	150.5 (2%)	76.4 (<1%)
Montane chaparral	119.6 (2%)	18.5 (<1%)
Montane hardwood	470.6 (6%)	1,888.8 (19%)
Montane hardwood-conifer	597.8 (8%)	835.7 (9%)
Montane riparian	23.3 (<1%)	21.3 (<1%)
Pasture	76.4 (1%)	445.9 (5%)
Perennial grassland	15.0 (<1%)	3.9 (<1%)
Ponderosa pine	18.0 (<1%)	21.7 (<1%)
Redwood	492.9 (7%)	564.7 (6%)
Riverine	0.6 (<1%)	0.9 (<1%)
Saline emergent qetland	1.3 (<1%)	1.3 (<1%)
Sierran mixed conifer	825.6 (11%)	11.7 (<1%)
Urban	81.7 (1%)	59.3 (1%)
Valley oak woodland	50.4 (<1%)	12.5 (<1%)
Valley foothill riparian	2.5 (<1%)	—
Vineyard	0.4 (<1%)	—
Wet meadow	—	1.0 (<1%)
Total	**7,412.2**	**9,761.1**

Source: USFS 2019

Table 7. CALVEG Land Cover Types and Acreages Mapped at the Cable Landfall Locations

Land Cover Type	South Spit Acres (percent)	Fields Landing Acres (percent)
Annual grassland	85.96 (60%)	9.69 (52%)
Barren	14.05 (10%)	3.73 (20%)
Coastal scrub	16.54 (11%)	—
Marine	20.73 (14%)	5.10 (28%)
Perennial grassland	6.80 (5%)	—
Total	**144.1**	**18.5**

Source: USFS 2019

Blue Oak Woodland—Areas mapped as this community type, which generally occurs on well-drained, gentle slopes below 2,700 ft (823 m), may be dominated by blue oaks and or hybrid oaks (*Quercus* x *eplingii*). Other typical associates include coast live oak (*Quercus agrifolia*), interior live oak, California juniper (*Juniperus californica*), Oregon white oak, California black oak, and low elevation shrubs such as chamise and shrub oaks. Minor inclusions of trees such as foothill pine, ponderosa pine, valley oak, and California buckeye, and chaparral shrubs such as wedgeleaf ceanothus and chamise may also be present in blue oak woodland. The understory is dominated by grasses such as wild oats, cheatgrass, and needlegrass (CNPS 2019; USFS 2019). Blue oak woodland may be regulated under Section 21083.4 of the California Public Resource Code (see State Statutes section below).

Chamise-Redshank Chaparral—Chamise-redshank chaparral generally occurs below 5,900 ft (1,798 m), with chamise and redshanks (*Adenostoma sparsifolium*) as dominants or co-dominants. Other characteristic species include blue oak and interior live oak. Chaparral species such as wedgeleaf ceanothus, shrub canyon live oak (*Quercus chrysolepis* var. *nana*), and manzanitas (*Arctostaphylos* spp.) may be associated with chamise on steeper or more mesic locations. Conifers such as Douglas-fir (*Pseudotsuga menziesii*), knobcone pine (*Pinus attenuata*), and foothill pine are often found adjacent to or intermixed with these stands, in addition to dry grasses and herbaceous species (CNPS 2019; USFS 2019). Emergent trees may be present at low cover, and the herbaceous layer is generally sparse. Soils are often sandy loams derived from alluvium or bedrock and may be rocky.

Coastal Oak Woodland—Lands mapped as this community type are dominated by coast live oak, and associated hardwood tree species include blue oak, valley oak, California bay (*Umbellularia californica*), California black oak, and Oregon white oak. Scattered foothill pine and ponderosa pine trees may also be present. The herbaceous understory of this community type typically consists of annual grasses (CNPS 2019; USFS 2019). Coastal oak woodland generally occurs below 2,800 ft (853 m) on alluvial terraces, canyon bottoms, streambanks, slopes, and flats in deep, sandy, or loamy soils with high organic matter. Coastal oak woodland may be regulated under Section 21083.4 of the California Public Resource Code (see State Statutes section below).

Coastal Scrub—Areas mapped as coastal scrub occur between elevations of sea level and 3,600 ft (1,097 m), often have no clear single dominant shrub species, and include areas of northern maritime chaparral, northern coastal scrub, northern coastal bluff scrub, northern dune scrub, and other coastal shrub types. Characteristic shrub species are coyote brush (*Baccharis pilularis*), salal (*Gaultheria shallon*), wax myrtle (*Myrica californica*), poison oak (*Toxicodendron diversilobum*), California coffeeberry (*Rhamnus californica*), blueblossom ceanothus (*Ceanothus thyrsiflorus*), yellow bush lupine (*Lupinus arboreus*), coastal whitethorn (*Ceanothus incanus*), hairy manzanita (*Arctostaphylos columbiana*), California huckleberry (*Vaccinum ovatum*), and shorter forms of California bay. Associate species are western sword fern (*Polystichum munitum*), bracken (*Pteridium aquilinum*), California blackberry (*Rubus ursinus*), purple needlegrass (*Stipa pulchra*), tufted hairgrass (*Deschampsia caespitosa*), California oatgrass (*Danthonia californica*), and dune lupine (*Lupinus chamissonis*). Sites dominated by lupines (*Lupinus* spp.) are most developed on level terraces close to coastal bluffs. This community type may also contain European beachgrass (*Ammophila arenaria*), which is often planted for dune stabilization, red alder (*Alnus rubra*), and willows (*Salix* spp.) (USFS 2019).

Cropland—Areas mapped as cropland consist of irrigated or dry crop fields that are planted with cereal grains, vegetables, animal forage (e.g., hay, feed corn), or fiber. Representative crop types are alfalfa (*Medicago sativa*), sweet clover (*Trifolium* spp.), flax (*Linum usitatissimum*), and cotton (*Gossypium* spp.) (USFS 2019).

Douglas-Fir—Douglas-fir stands cover large areas in the Coast Ranges and foothills, typically at elevations below 5,600 ft (1,707 m). The common associate species present in the overstory are sugar pine (*Pinus lambertiana*), tree or shrub tanoak (*Notholithocarpus densiflorus* var. *densiflorus* and var. *echinoides*, respectively), madrone (*Arbutus menziesii*), canyon live oak (*Quercus chrysolepis*). Species that are less frequently observed in the overstory are redwood (*Sequoia sempervirens*), ponderosa pine, incense cedar (*Calocedrus decurrens*), white fir (*Abies concolor*), Oregon white oak, bigleaf maple (*Acer macrophyllum*), California bay, and tree chinquapin (*Chrysolepis chrysophylla*). The shrub understory may be quite diverse and contain huckleberry oak (*Quercus vaccinifolia*), salal, California huckleberry, California hazelnut (*Corylus cornuta* var. *californica*), poison oak, oceanspray (*Holodiscus discolor*), and hairy honeysuckle (*Lonicera hispidula*). Pure stands of Douglas-fir occur only sparsely on moist or shaded sites in the foothills at elevations up to about 4,600 ft (1,402 m), and are usually young, dense monotypic stands that occur adjacent to trees such as ponderosa pine, canyon live oak, and blue oak (USFS 2019).

Jeffrey Pine—Pure Jeffrey pine (*Pinus jeffreyi*) dominated stands have been mapped very sparsely in the foothills and can occur at elevations up to approximately 7,000 ft (2,134 m). The associate species present depend on abiotic factors such as elevation and substrate. Canyon live oak is the primary hardwood associate, and singleleaf pinyon pine (*Pinus monophylla*) often occurs in adjacent stands. Stunted Jeffrey pine stands are found at low to middle elevations, usually below 5,000 ft (1,524 m) on strongly serpentine peridotite sites in the western mountains and coast, and often include scattered Douglas-fir, ponderosa pine, incense cedar, Port Orford cedar (*Chamaecyparis lawsoniana*), sugar pine, lodgepole pine (*Pinus contorta* ssp. *murrayana*), or western white pine (*Pinus monticola*), with few (if any) hardwood species. Associated shrubs on serpentine substrates include shrub canyon live oak, wedgeleaf ceanothus, serpentine goldenbush (*Ericameria ophitidis*), and huckleberry oak. Above 5,000 ft (1,524 m) elevation, Jeffrey pine may occur in small, open stands in non-serpentine substrates with trees such as canyon live oak, Oregon white oak, sugar pine, and white fir, and shrubs such as pinemat manzanita (*Arctostaphylos nevadensis*) and huckleberry oak (USFS 2019).

Klamath Mixed Conifer—Klamath mixed conifer communities occur below elevations of 7,000 ft (2,134 m), and the vegetative composition varies depending on the substrate. The low to moderate elevations in ultramafic and serpentine areas in the western mountains, coast, and ranges often produce soils low in essential minerals such as calcium and magnesium, or have excessive accumulations of heavy metals such as nickel and chromium. Small, stunted western white pine, lodgepole pine, and Jeffrey pine occur in combinations or in nearly pure open stands on ophiolite areas. Other common tree associates on ultramafic soils include Douglas-fir, incense cedar, and Port Orford cedar. Hardwoods are often sparse, but shrubs such as pinemat manzanita, whiteleaf manzanita (*Arctostaphylos viscida*), huckleberry oak, Brewer oak (*Quercus garryana* var. *breweri*), California coffeeberry, shrub tanoak, western azalea (*Rhododendron occidentale*), boxleaf silktassel (*Garrya buxifolia*), and Siskiyou mat (*Ceanothus pumilus*) may occur on these sites (USFS 2019).

Lacustrine—Areas mapped as lacustrine include stock ponds, small lakes and reservoirs, water and sewage treatment facilities, large ditches, golf course ponds, and other utilitarian or recreational water features (USFS 2019). These open water features may support wetland or riparian vegetation communities along the edges. Lacustrine features are considered "other waters" (i.e., non-wetlands) that are potentially subject to state and/or federal regulation (see Wetlands and Other Waters section below).

Marine—The areas mapped as marine at the cable landfall locations encompass both dunes and ocean. The vegetation on the dunes may include morning glories (*Calystegia* spp.), beach-bur (*Ambrosia chamissonis*), sand verbena (*Abronia latifolia*), American dunegrass (*Leymus mollis*), and sand-dune blue grass (*Poa douglasii*) (USFS 2019).

Mixed Chaparral—Mixed chaparral is generally found in mountain ranges and foothills at elevations of approximately 1,000–6,500 ft (305–1,981 m), and contains a diversity of shrubs with few to no trees. No single shrub species is dominant, with varying mixtures of species depending on slope, topography, aspect, degree of disturbance, and soil type. Species present may include chamise, wedgeleaf ceanothus, Fremont silktassel (*Garrya fremontii*), common manzanita (*Arctostaphylos manzanita*), whiteleaf manzanita, shrubby California buckeye, wedgeleaf ceanothus, Lemmon ceanothus (*Ceanothus lemmonii*), pinemat manzanita, bush chinquapin (*Chrysolepis sempervirens*), bladderpod (*Isomeris arborea*), snowbrush (*Chrysolepis velutinus*), birchleaf mountain mahogany (*Cercocarpus betuloides*), and California buckwheat (*Eriogonum fasciculatum*). The oaks found in this community are Brewer oak, huckleberry oak, inland scrub oak (*Quercus berberidifolia*), shrub canyon live oak, leather oak (*Quercus durata*), Tucker scrub oak (*Quercus john-tuckeri*), and Sadler oak (*Quercus sadleriana*). Mixed chaparral may also contain scattered Douglas-fir and foothill pine, musk brush (*Ceanothus jepsonii*), California coffeeberry (*Rhamnus californica* ssp. *occidentalis*), silktassels (*Garrya elliptica*, *Garrya congdonii*), and Siskiyou mat. At higher elevations, species such as greenleaf manzanita (*Arctostaphylos patula*) and deerbrush (*Ceanothus integerrimus*) may occur. In ultramafic (i.e., unaltered peridotite, serpentine peridotite, or gabbro) areas, creeping barberry (*Berberis aquifolium* var. *repens*), boxleaf silktassel, and shrub tanoak are likely to occur (USFS 2019).

Montane Riparian—Montane riparian communities occur at elevations up to 5,800 ft (1,768 m) and the overstory frequently contains a mixture of hardwoods such as cottonwoods (*Populus* spp.), tree willows, white alder (*Alnus rhombifolia*), and red alder (USFS 2019). Shrubs and small trees found in montane riparian communities include Pacific dogwood (*Cornus nuttallii*), poison oak, shrub willows, blackberries (*Rubus* spp.), gooseberries (*Ribes* spp.), wild roses (*Rosa* spp.), and mulefat (*Baccharis salicifolia*). Representative species that may occur in the herbaceous understory are water sedge (*Carex aquatilis*), meadow barley (*Hordeum brachyantherum*), Nebraska sedge (*Carex nebrascensis*), and woolly sedge (*Carex lanuginosa*). Riparian habitats such as montane riparian communities are considered sensitive habitat types and are typically regulated by CDFW under California Fish and Game Code (CFGC) Section 1600 et seq. because they offer unique resources for wildlife.

Montane Chaparral—Montane chaparral occurs between elevations of 4,800–8,000 ft (1,463–2,438 m), generally on shallow, coarse, and rocky soils, especially those derived from ultrabasic and/or granitic rocks, where the abiotic conditions restrict the growth of conifers. The shrubs present depend on elevation, aspect, and soil type, and may include such species such as deerbrush, greenleaf manzanita, pinemat manzanita, hoary manzanita (*Arctostaphylos canescens*), mountain whitethorn (*Ceanothus cordulatus*), snowbrush, deerbrush, shrub canyon live oak, shrub tanoak, bush chinquapin, Fremont silktassel, huckleberry oak, pinemat manzanita, snowberry (*Symphoricarpus* spp.), gooseberry (*Ribes* spp.), or serviceberry (*Amelanchier* spp.) (USFS 2019). Montane chaparral may contain minor amounts of bitter cherry (*Prunus emarginata*) rock spiraea (*Holodiscus microphyllus*), Brewer oak, foothill pine, Douglas-fir, and singleleaf pinyon pine.

Montane Hardwood-Conifer—The montane hardwood-conifer community typically occurs at elevations below 5,600 ft (1,707 m) and the dominant species are Douglas-fir, tanoak, ponderosa pine, canyon live oak, interior live oak, and blue oak. Common associate species are sugar pine, madrone, redwood, incense cedar, white fir, Oregon white oak, bigleaf maple, California bay, Jeffrey pine, and tree chinquapin. The shrub understory may also be quite diverse, including huckleberry oak, salal, California huckleberry, California hazelnut, poison oak, oceanspray, whiteleaf manzanita, and hairy honeysuckle (USFS 2019).

Pasture—Pasture lands used exclusively for livestock pasture may be mapped as annual or perennial grassland if land uses are not discernible from aerial imagery, and the vegetative composition of pastures is comparable to grassland communities in the region.

Perennial Grassland—Perennial grasslands are dry to moist grasslands in which the species composition is a mix of perennial and some annual grasses and legumes which vary according to management practices. They have been mapped on the coast and very rarely in the foothills and mountains up to about 7,600 ft (2,316 m). The areas mapped as perennial grasslands on the coast are characterized by dune grasses such as American dunegrass and sand-dune blue grass, and also contain morning glories, beach-bur, and sand verbena (USFS 2019). The inland perennial grasslands contain native perennial grasses such as western needlegrass (*Stipa occidentalis*), squirreltail (*Elymus elymoides*), and wild rye (*Elymus* spp.). Rock cress (*Arabis* spp.), monardella (*Monardella* spp.), strawberry clover (*Trifolium fragiferum*), buckwheat (*Eriogonum* spp.), and occasionally alpine forbs such as Sierra primrose (*Primula suffrutescens*) may also be present.

Ponderosa Pine—Ponderosa pine stands typically occur on well-drained, non-serpentine soils, such as coarse-textured alluvial sites and southwest-facing or steep slopes, usually below 5,200 ft (1,585 m) in elevation. The associate tree species in this vegetation community include Jeffrey pine, California black oak, canyon live oak, Oregon white oak, Douglas-fir, and white fir (USFS 2019). Shrub and herbaceous associate species found in ponderosa pine stands may include whiteleaf manzanita, wedgeleaf ceanothus, and annual grasses such as bromes (*Bromus* spp.).

Redwood—Redwood forests and groves are associated with alluvial flats, streamside terraces, and colluvial slopes in a relatively narrow band along the coast (i.e., within the coastal fog belt) and at elevations typically below 2,400 ft (731 m) (USFS 2019). The soils in redwood forests often consist of sediments deposited during river flooding. The densities of the shrub and herbaceous layers are typically low. Associate species include Douglas-fir, tanoak, red alder, California hazelnut, California rose bay (*Rhododendron macrophyllum*), redwood sorrel (*Oxalis oregana*), western sword fern, wakerobin (*Trillium* spp.), hedge-nettle (*Stachys* spp.), and false lily-of-the-valley (*Maianthemum stellatum*).

Riverine—The areas mapped as riverine consist of rivers and streams with an open water channel that may support emergent wetland vegetation along the edges. These features are discussed below (see Wetlands and Other Waters section) and are considered "other waters" (i.e., non-wetlands) that are potentially subject to state and/or federal regulation.

Saline Emergent Wetland—Areas mapped as saline emergent wetlands include coastal salt marshes and brackish marshes. Dominant species include common pickleweed (*Salicornia virginica*), California cordgrass (*Spartina foliosa*), and sturdy bulrush (*Bolboschoenus robustus*). Common associate species are marsh jaumea (*Jaumea carnosa*), saltgrass (*Distichlis spicata*), arrow grass (*Triglochin* spp.), western goldenrod (*Euthamia occidentalis*), gumweed (*Grindelia stricta*), and silverweed (*Potentilla anserina* ssp. *pacifica*). The invasive salt water cordgrass (*Spartina alterniflora*) and dense-flowered cordgrass (*Spartina densiflora*) may also occur in coastal salt marshes in northern California (USFS 2019). Saline emergent wetlands are typically subject to state and/or federal regulation and are discussed below (see Wetlands and Other Waters section).

Sierran Mixed Conifer—Sierran mixed conifer communities generally occur between elevations of 3,600–7,600 ft (1,097–2,316 m), and the vegetative composition varies with elevation, soils, and slopes. The overstory typically contains white fir, Douglas-fir, sugar pine, incense cedar, ponderosa pine, and black oak (USFS 2019). Tanoak and canyon live oak are also common overstory species in more mesic or dry areas, respectively. Associate overstory species can include redwood, Oregon white oak, bigleaf maple, California bay, and tree chinquapin. Where present, the shrub understory is relatively diverse, and may contain Sadler oak, huckleberry oak, salal, California huckleberry, California hazelnut, poison oak, oceanspray, hairy honeysuckle, California hazelnut, and Pacific dogwood. At elevations above 5,500 ft (1,676 m), Jeffrey pine, western white pine, lodgepole pine, and red fir (*Abies magnifica*) become more abundant.

Urban—Areas mapped as the urban land cover type include development (commercial, residential, and industrial), roadways, city parks, and cemeteries (USFS 2019). The vegetation associated with urban areas typically consists of ornamental species planted for landscaping purposes and is actively maintained (e.g., mowed, irrigated).

Valley Oak Woodland—Valley oak woodlands occur inland at elevations generally below 3,400 ft (1,036 m) on the deep, loamy soils of alluvial deposits in foothill woodlands, valleys, and floodplains of rivers (USFS 2019). However, this community type is also found on gentle, low-elevation montane slopes up to about 5,600 ft (1,707 m) elevation. Associate tree species include blue oak, Oregon white oak, interior live oak, and canyon live oak. Where present, the shrub layer may include blue elderberry (*Sambucus nigra* ssp. *caerulea*), poison oak, coyote brush, chamise (*Adenostoma fasciculatum*), and gooseberries (*Ribes* spp.). Blue elderberry, which is the host plant for the federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), may occur in valley oak woodland. The herbaceous layer of valley oak woodland is typically dominated by annual grasses mixed with native forbs such as buttercups (*Ranunculus* spp.), clarkias (*Clarkia* spp.), and gumweed (*Madia gracilis*). Valley oak is considered a species of concern due to habitat loss and specific germination requirements (USFS 2019) and valley oak woodlands may be regulated under Section 21083.4 of the California Public Resource Code (see State Statutes section below).

Valley Foothill Riparian—This vegetation community occurs in inland valleys and foothills at elevations typically below 4,200 ft (1,280 m) (USFS 2019). Valley foothill riparian habitat is characterized by a mixture of hardwoods and shrubs, and the dominant tree species are willows, Fremont cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), valley oak, bigleaf maple, and alders (*Alnus* spp.). Representative shrubs include mulefat, dogwoods (*Cornus* spp.), spicebush (*Calycanthus occidentalis*), wild roses, and gooseberries. Blue elderberry shrubs, the host plants for the valley elderberry longhorn beetle, are typically associated with valley foothill riparian habitat. Woody vines such as California wild grape (*Vitis californica*) and blackberries (*Rubus* spp.) are common in valley foothill riparian habitat. Herbaceous species that occur in valley foothill riparian areas include California mugwort (*Artemisia douglasiana*), sedges (*Carex* spp.), willowherbs (*Epilobium* spp.), rushes (*Juncus* spp.), and meadow barley (*Hordeum brachyantherum*). Riparian habitats such as valley foothill riparian communities are considered sensitive habitat types and are typically regulated by CDFW under CFGC Section 1602 because they offer unique resources for wildlife. The CNDDB has identified occurrences of three sensitive valley riparian communities within 5 mi (8 km) of the east route: Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, and Great Valley valley oak riparian forest (CDFW 2019c).

Vineyard—Areas mapped as vineyard include grapevines, kiwi vines, and shrubby nut or fruit crops such as blueberries or raspberries.

Wet Meadow—Perennially or seasonally wet meadows and grasslands occur on level or gently sloping areas adjacent to perennial streams, seeps, springs, and lakes within a wide elevation range up to about 7,400 ft (2,255 m). These are usually small sites that are occupied by obligate hydrophytes such as sedges, rushes, and bulrushes (*Schoenoplectus* spp.), as well as perennial grasses such as bluegrass (*Poa* spp.), fringed brome (*Bromus ciliatus*), fescue (*Festuca* spp.), oniongrasses (*Melica* spp.), and reedgrasses (*Calamagrostis* spp.). These moist sites encourage the development of a rich herbaceous layer that includes lilies (*Lilium* spp.), false hellebore (*Veratrum* spp.), shooting star (*Dodechatheon* spp.), gentian (*Gentiana* spp.), and lousewort (*Pedicularis* spp.). Meadow edges often abruptly terminate in upper montane coniferous forest species such as lodgepole pine and Jeffrey pine. Wet meadows are potentially subject to state and/or federal regulation and are discussed below (see Wetlands and Other Waters section).

Non-Listed Special-Status Plants

The CNDDB searches identified numerous plant species along both overland transmission routes that are not federally or state listed but have been assigned a California Rare Plant Rank (CRPR) (CDFW 2019c). These species would be considered special-status under the California Environmental Quality Act (CEQA). There were 422 and 456 occurrences of plants with CRPRs within 5 mi (8 km) of the east and south routes, respectively (CDFW 2019c). The CNDDB is useful to identify the known locations of species in a given search area; however, there may be additional occurrences or additional species which have not yet been surveyed and/or mapped. Therefore, a lack of information in the CNDDB for a species or area cannot be used to determine that no special-status species occur within the area searched. Route-specific floristic surveys conducted during the appropriate times of year (i.e., when plants are evident and identifiable) would be required to document whether non-listed special-status plants are present in the affected areas along each route.

Wetlands and Other Waters

Wetlands and other waters that intersect with the overland transmission routes are potential waters of the United States and/or state subject to regulation under Section 404 of the Clean Water Act (USACE) and the Porter-Cologne Water Quality Control Act (Regional Water Quality Control Boards [RWQCBs]), respectively. Mapping data for wetlands and other waters along the overland transmission routes and at the cable landfall locations were obtained from the NWI (USFWS 2019b) (Figure 3). Stream crossing data for the overland transmission routes were derived from the NHD (USGS 2019) (Figure 3).

National Wetlands Inventory—The NWI provides maps and information on the status, extent, characteristics, and functions of wetland, riparian, deepwater, and related aquatic habitats in priority areas to promote the understanding and conservation of those resources. The mapping is provided at a scale of 1:24,000 and uses the U.S. Fish and Wildlife Service (USFWS) wetland definition, which differs from the three-parameter USACE definition by requiring that only a single wetland parameter (hydrophytic vegetation, hydric soils, or wetland hydrology) be present to determine that an area is a wetland. The NWI mapping shows the extent of wetlands and deepwater habitats that can be determined by using remotely sensed data, and originates from 1977 to the present. Accordingly, the NWI mapping cannot be used to delineate wetlands and other waters of the United States, but it can provide useful background information on the broad types of wetland and riparian vegetation communities that occur in the area of interest. The NWI types mapped within 250 ft (76 m) of the east and south routes are listed in Table 8, and the types mapped within 500 ft (152 m) of the cable landfall locations are provided in Table 9 (USFWS 2019b). Note that the acreages reported in these tables are approximate areas; site-specific analysis (i.e., formal delineation of aquatic resources) would be required to identify and map the locations and boundaries of wetlands and other waters that intersect with the overland routes and cable landfall locations. Detailed classification information and descriptions of the NWI types can be found in the *Classification of Wetlands and Deepwater Habitats* (Federal Geographic Data Committee 2013).

National Hydrography Dataset—The NHD characterizes the water drainage network of the United States and includes features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gages (USGS 2019). According the NHD, the east route crosses 279 channels (i.e., rivers, creeks, and unnamed tributaries or drainages); the south route crosses 192 channels (USGS 2019). The primary channels crossed by the east route are the Van Duzen River, Mad River, South Fork Trinity River, Rattlesnake Creek, and Cottonwood Creek (Figure 3). The main channels crossed by the south route are the Van Duzen River, Eel River, Forsythe Creek, Larabee Creek, and Russian River (Figure 3). Route-specific analysis would determine if additional drainage crossings (e.g., ephemeral streams) that were not including in this mapping are present.

Sensitive Habitat Types

Land cover types that represent sensitive habitats were identified along the overland transmission routes using a combination of the CALVEG mapping and occurrence information in the CNDDB (CDFW 2019c; USFS 2019). Habitats are considered sensitive if they have limited distribution, declining status, high species diversity, an unusual nature, or high productivity. The CNDDB maintains a list of sensitive natural communities found throughout California, and effects on these habitats, or any such natural community identified in local or regional plans, policies, and regulations, must be considered and evaluated under CEQA (CCR Title 14, Div. 6, Chap. 3, Appendix G).

The CNDDB sensitive natural communities that were documented within 5 mi (8 km) of the east and south routes are listed in Table 10. The wetland and riparian land cover types mapped in CALVEG along the overland transmission routes (Table 6 above) were characterized as sensitive habitats because federal, state, and local agencies consider them important (e.g., for wildlife foraging). Oak woodlands are also designated as sensitive under Section 21083.4 of the California Public Resource Code. The CALVEG mapping identified blue oak woodland and valley oak woodland along both routes, and was also present on the south route (Table 6 above). The overland transmission routes may traverse additional areas of sensitive habitat that are subject to regulation. For example, riparian habitats associated with creeks and streams are typically claimed by CDFW under CFGC Section 1602 because they offer unique resources for wildlife. CDFW's jurisdiction typically extends to the top of bank or to the outer edge of the riparian tree canopy. Route-specific analysis would be required to characterize and map these habitats.

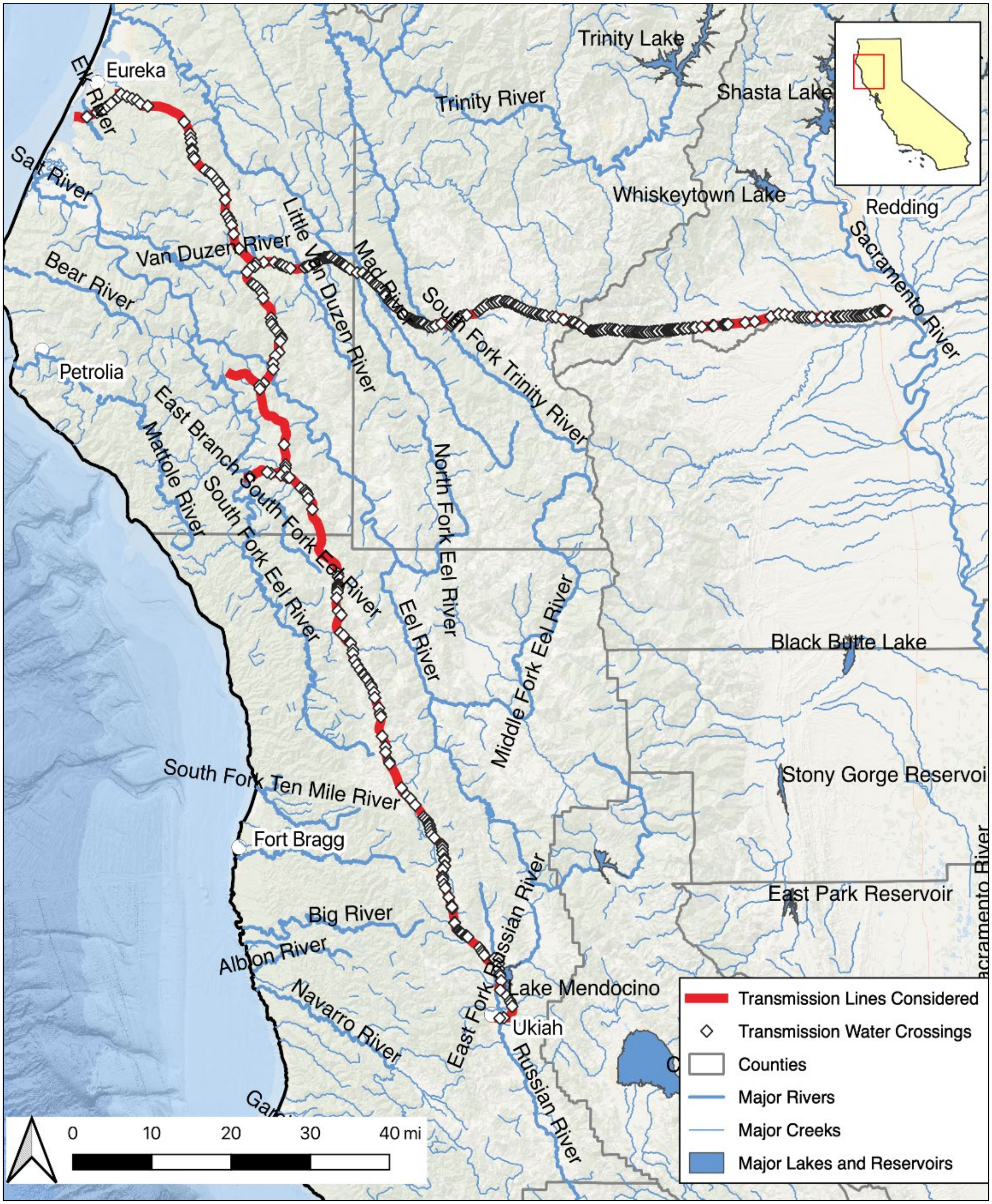

Figure 3. Transmission Line Stream Crossings and Major Watercourses

Table 8. NWI Types and Acreages Mapped along the Overland Transmission Routes

NWI Type	East Route Acres (percent)	South Route Acres (percent)
Estuarine and marine deepwater	19.24 (0.5)	19.24 (0.8)
Freshwater emergent wetland	614.57 (18)	619.51 (26)
Freshwater forested/shrub wetland	134.61 (4)	184.57 (8)
Freshwater pond	5.1 (0.1)	11.93 (0.5)
Riverine	2,684.21 (78)	1,539.92 (65)
Total	**3,457.73**	**2,375.17**

Source: USFWS 2019b

Table 9. NWI Types and Acreages Mapped for the Cable Landfall Locations

NWI Type	South Spit Acres (percent)	Fields Landing Acres (percent)
Estuarine and marine deepwater	66.68 (32)	25.58 (56)
Estuarine and marine wetland	113.29 (55)	20.41 (44)
Freshwater emergent wetland	25.49 (12)	—
Total	**205.46**	**45.99**

Source: USFWS 2019b

Table 10. CNDDB Sensitive Natural Communities Identified within 5 miles of the Overland Transmission Routes

CNDDB Sensitive Natural Community Type	East Route	South Route
Coastal terrace prairie	✔	✔
Northern coastal salt marsh	✔	✔
Sitka spruce forest	✔	✔
Upland Douglas-fir forest	✔	✔
Great valley cottonwood riparian forest	✔	
Great valley mixed riparian forest	✔	
Great valley valley oak riparian forest	✔	
Northern interior cypress forest		✔
Valley oak woodland[1]	✔	✔

Source: CDFW 2019c

Note: [1]Valley oak woodland was not identified in the CNDDB query results, but it was mapped in CALVEG and is included here because oak woodlands are considered sensitive natural communities.

Invasive Plant Species

The California Invasive Plant Council (Cal-IPC) maintains an inventory of invasive plants that are known to threaten wildlands or have a high potential of becoming invasive in the future. The Cal-IPC inventory categories for invasive species (e.g., high, moderate, and limited) are based on their ecological impacts, scientific criteria, and expert review. Invasive plants adversely affect ecosystems by degrading wildlife habitat, increasing wildlife fuel loads, displacing native vegetation, and altering hydrology (e.g., flood carrying capacity, water supply) (Cal-

IPC 2012). According to Calflora (2019) mapping data for species listed in the Cal-IPC inventory, 157 and 165 invasive species have been identified along the east and south routes, respectively.

Birds

Both overland transmission routes cross multiple land cover types that provide roosting, nesting, foraging, and wintering habitat for common and special-status bird species. Numerous bird species have been reported in the counties containing the overland transmission routes: Humboldt (477 species), Mendocino (414 species), Shasta (320 species), and Trinity (265 species) (eBird 2019b). The CNDDB query identified 22 special-status bird species along the south route, and 21 special-status bird species along the east route (CDFW 2019c). Special-status bird species are discussed in Section 2.2.3. Both special-status and common bird species receive protection under Section 3503 of the CFGC and the Migratory Bird Treaty Act (see Section 2.4) during their breeding season; the timing varies by species, but is generally considered to be February 1–August 31.

Bats

The CNDDB query identified seven bat species as occurring, or having the potential to occur along one or both the overland transmission routes: hoary bat, long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), pallid bat (*Antrozous pallidus*), silver-haired bat (*Lasionycteris noctivagans*), Townsend's big-eared bat (*Corynorhinus townsendii*), and Yuma myotis (*Myotis yumanensis*) (CDFW 2019c). The seven bat species use multiple roost types (e.g., maternity roosts) and the inhabitation of each type varies temporally and seasonally. Roosting habitats vary among the seven species, and may include caves/mines, cliffs/rock faces, tree bark/cavities, tree foliage, bridges, buildings, and riprap/dry rock wall. Both overland transmission routes cross numerous land cover types that contain potential roosting and foraging habitat, particularly the forest, woodland, and riparian types. Some of the primary threats to bat populations from anthropogenic activities are the loss, fragmentation, and degradation of roosting and foraging habitats. These effects may be temporary (e.g., construction noise, dust, ground vibrations) or permanent (e.g., habitat removal to install utility towers or access roads). Bats respond at the population and individual levels to large-scale anthropogenic changes in ecosystems and landscapes. Each bat species responds differently to anthropogenic stressors; some species respond positively, but many respond negatively (Altringham 2011). For example, Townsend's big-eared bats are so sensitive to noise disturbance that they are known to abandon their young when disturbed (Pierson and Rainey 1994).

Although none of these species are listed as threatened or endangered, they have been identified as sensitive species by CDFW, U.S. Bureau of Land Management (BLM), USFS, and/or the Western Bat Working Group. Pallid bat and Townsend's big-eared bat are SSC and BLM sensitive species, and pallid bat is also a USFS sensitive species. Long-eared myotis and Yuma myotis are BLM sensitive species. The Western Bat Working Group designations (low, medium, or high) for Region 5 (Mediterranean region that includes California) are assigned on the basis of species' status, including priorities for funding, planning, and conservation actions, as well as population stability (WBWG 2019). Long-legged myotis, pallid bat, and Townsend's big-eared bat have been designated as high priority species that are imperiled or at risk of becoming imperiled. Long-eared myotis is identified as a medium priority species because there is concern that addition research is needed to adequately assess their status. Yuma myotis is designated as a low priority species in Region 5 because most of the available data indicate that its populations are stable and it is unlikely that there will be a major change in status for this species in the near future. Four of the seven bat species have been reported along both overland transmission routes: Townsend's big-eared bat, long-eared myotis, long-legged myotis, and Yuma myotis (CDFW 2019c). Pallid bat has only been documented along the south route, and hoary bat and silver-haired bat have only been reported along the east route (CDFW 2019c).

2.2.2.2 Threatened and Endangered Species

Species listed as threatened and endangered under the federal and state Endangered Species Acts (FESA and CESA, respectively) are known to occur or have the potential to occur in the action area. The list of potentially affected species, locations of designated critical habitat, and records of species occurrences were obtained from the USFWS's IPac website (USFWS 2019c) and the CNDDB (CDFW 2019c). The discussion below focuses on species listed under FESA and CESA to provide context for the effects analyses that will be required for consultation with NMFS, USFWS, or CDFW during the permitting process. These analyses will determine the effects of implementing the proposed action on threatened and endangered species habitat, behavior, risk of injury or mortality of individuals, and population viability. Table 11 lists the threatened and endangered terrestrial species that are known to occur or may occur in the action area. Table 11 also contains species that have been identified as rare plant species, California fully protected species or species of special concern (SSC) by CDFW, species designated as sensitive by the USFS and BLM, and USFWS birds of conservation concern; effects analyses for these species would be required for compliance with other regulations (e.g., CEQA).

Freshwater Mollusks

Three special-status freshwater mollusk species have been identified as having the potential to occur in the action area: California floater (*Anodonta californiensis*), nugget pebblesnail (*Fluminicola seminalis*), and Tehama chaparral (*Trilobopsis tehamana*). The California floater and nugget pebblesnail are known to occur along the east route, and the Tehama chaparral has been reported along the south route. These three species have been designated as USFS sensitive species, and the Tehama chaparral is also a BLM sensitive species. Freshwater mussels are present year-round and are generally found on soft substrates of large streams and lakes in slow-moving currents (USFS 2018). Most freshwater mussels depend on host fish to complete their life cycles; after hatching, the glochidia (microscopic mussel infants) attach themselves to the gills or fins of a passing host fish (USFWS 2013a). The length of time that the glochidia stay attached varies from several weeks to several months, and when the glochidia release from the host fish, they burrow into the substrate (USFWS 2013a). Freshwater mussels are relatively immobile and their populations are thought to be dropping rapidly (USFWS 2013a).

Table 11. Threatened and Endangered Species that are Known to Occur or May Occur within the Terrestrial Portion of the Action Area

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat Designated	Critical Habitat in Action Area	East Route	South Route	Fields Landing Cable Landfall	South Spit Cable Landfall
Fish									
Chinook salmon	*Oncorhynchus tshawytscha*								
Upper Klamath and Trinity Rivers ESU			C, SSC	N	N	✓			
Sacramento River winter-run ESU		E	E	Y	N	✓			
Central Valley spring-run ESU		T	T	Y	N	✓			
Coho salmon	*Oncorhynchus kisutch*								
Southern Oregon/ Northern California Coast ESU		T	T	Y	N	✓			
Central California Coast ESU		E	E	Y	N		✓		
Steelhead	*Oncorhynchus mykiss irideus*								
Northern California DPS		T		Y		✓	✓		
Central Valley DPS		T		Y	N	✓			
Summer-Run steelhead			SSC	N	N	✓			
Coastal cutthroat trout	*Oncorhynchus clarkii clarkia*	USFS	SSC	N	N	✓	✓		
Green sturgeon Southern DPS	*Acipenser medirostris*	T	SSC	Y	Y	✓	✓		
Eulachon Southern DPS	*Thaleichthys pacificus*	T		Y	N		✓		
Longfin smelt	*Spirinchus thaleicthys*	C	T	N	N	✓			✓
Pacific lamprey	*Entosphenus tridentatus*	BLM, USFS	SSC	N	N	✓	✓		
Tidewater goby	*Eucycloglobius newberryi*	E	SSC	Y	Y	✓	✓		

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat Designated	Critical Habitat in Action Area	East Route	South Route	Fields Landing Cable Landfall	South Spit Cable Landfall
Mollusks									
California floater	*Anodonta californiensis*	USFS		N	N		✓		
Nugget pebblesnail	*Fluminicola seminalis*	USFS		N	N	✓			
Tehama chaparral	*Trilobopsis tehamana*	BLM, USFS		N	N	✓			
Invertebrates									
Conservancy fairy shrimp	*Branchinecta conservatio*	E		Y	N	✓			
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T		Y	N	✓			
Vernal pool fairy shrimp	*Branchinecta lynchi*	T		Y	N	✓			
Vernal pool tadpole shrimp	*Lepidurus packardi*	E		Y	Y	✓			
Western bumble bee	*Bombus occidentalis*	USFS		N	N	✓	✓		
Amphibians									
California red-legged frog	*Rana draytonii*	T	SSC	Y	N	✓	✓		
Foothill yellow-legged frog	*Rana boylii*	USFS, BLM	C, SSC	N	N	✓	✓		
Northern red-legged frog	*Rana aurora*	USFS	SSC	N	N	✓	✓		
Coastal tailed frog	*Ascaphus truei*		SSC	N	N	✓	✓		
Red-bellied newt	*Taricha rivularis*		SSC	N	N		✓		
Southern torrent salamander	*Rhyacotriton variegatus*	USFS	SSC	N	N	✓	✓		
Western spadefoot	*Spea hammondii*	BLM	SSC			✓			
Reptiles									
Western pond turtle	*Emmys marmorata*	BLM, USFS	SSC	N	N	✓	✓		
Terrestrial Mammals									
American badger	*Taxidea taxus*		SSC	N	N		✓		

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat Designated	Critical Habitat in Action Area	East Route	South Route	Fields Landing Cable Landfall	South Spit Cable Landfall
Fisher (West Coast DPS)	*Pekania pennanti*	PT, USFS, BLM	T, SSC	N	N	✓	✓		
Gray wolf	*Canis lupus*	E	E	Y	LNA	✓			
Humboldt marten	*Martes caurina humboldtensis*	PT, USFS	E, SSC	N	N	✓	✓		
Long-eared myotis	*Myotis evotis*	BLM		N	N	✓	✓		
North American wolverine	*Gulo gulo luscus*	PT, USFS	T, FP	N	N	✓			
Pallid bat	*Antrozous pallidus*	BLM, USFS	SSC	N	N		✓		
San Joaquin pocket mouse	*Perognathus inornatus*	BLM				✓			
Sonoma tree vole	*Arborimus pomo*		SSC	N	N	✓	✓		
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM, USFS	SSC	N	N	✓	✓		
Yuma myotis	*Myotis yumanensis*	BLM		N	N	✓	✓		
Birds									
Bald eagle	*Haliaeetus leucocephalus*	BLM, USFS	E, FP	N	N	✓	✓	✓	✓
Bank swallow	*Riparia riparia*	BLM	T	N	N	✓	✓	✓	✓
Golden eagle	*Aquila chrysaetos*	BLM, USFS	FP	N	N	✓	✓		
Grasshopper sparrow	*Ammodromas savannarum*		SSC	N	N	✓	✓		
Harlequin duck	*Histrionicus histrionicus*		SSC	N	N			✓	✓
Least Bell's vireo	*Vireo bellii pusillus*	E	E	Y	N	✓			
Little willow flycatcher	*Empidonax traillii brewsteri*	BCC	E	N	N		✓		
Loggerhead shrike	*Lanius ludovicianus*	BCC	SSC	N	N	✓	✓		
Long-eared owl	*Asio otus*		SSC	N	N	✓	✓		

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat Designated	Critical Habitat in Action Area	East Route	South Route	Fields Landing Cable Landfall	South Spit Cable Landfall
Marbled murrelet	*Brachyramphus marmoratus*	T	E	Y	Y	✓	✓		
Mountain plover	*Charadrius montanus*	BLM, BCC	SSC	N	N	✓	✓		
Northern goshawk	*Accipiter gentilis*	BLM, USFS	SSC	N	N	✓	✓		
Northern harrier	*Circus hudsonius*		SSC	N	N	✓	✓	✓	✓
Northern spotted owl	*Strix occidentalis caurina*	T	T	Y	Y	✓	✓		
Olive-sided flycatcher	*Contopus cooperi*	BCC	SSC	N	N	✓	✓		
Osprey	*Pandion haliaetus*	USFS				✓			
Purple martin	*Progne subis*		SSC	N	N	✓	✓		
Redhead	*Aythya americana*		SSC	N	N			✓	✓
Short-eared owl	*Asio flammeus*		SSC	N	N			✓	✓
Tricolored blackbird	*Agelaius tricolor*	BLM, BCC	T, SSC			✓			
Vaux's swift	*Chaetura vauxi*		SSC	N	N	✓	✓	✓	✓
Western snowy plover	*Charadrius alexandrinus nivosus*	T	SSC	Y	Y	✓	✓		✓
White-tailed kite	*Elanus leucurus*	BLM	FP	N	N	✓	✓		
Yellow-billed cuckoo	*Coccyzus americanus*	T, BLM, USFS	E	proposed	N	✓	✓		
Yellow-breasted chat	*Icteria virens*		SSC	N	N		✓		
Yellow warbler	*Setophaga petechia*	BCC	SSC	N	N		✓	✓	✓
Plants									
Baker's meadowfoam	*Limnanthes bakeri*	BLM	R	N	N		✓		
Beach layia	*Layia carnosa*	E		N	N	✓	✓		✓
Burke's goldfields	*Lasthenia burkei*	E		N	N		✓		
Contra Costa goldfields	*Lasthenia conjugens*	E		Y	N		✓		

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat Designated	Critical Habitat in Action Area	East Route	South Route	Fields Landing Cable Landfall	South Spit Cable Landfall
Hoover's spurge	*Euphorbia hooveri*	T		Y	N	✓			
Humboldt County milk-vetch	*Astragalus agnicidus*		E				✓		
Kellogg's buckwheat	*Eriogonum kelloggii*		E				✓		
Kneeland Prairie penny-cress	*Noccea fendleri* ssp. *californica*	E		Y	Y	✓	✓		
Mcdonald's rock-cress	*Arabis macdonaldiana*	E	E	N	N		✓		
Menzies' wallflower	*Erysimum menziesii*	E	E	N	N		✓		
Milo Baker's lupine	*Lupinus milo-bakeri*		T	N	N		✓		
North Coast semaphore grass	*Pleuropogon hooverianus*		E	N	N		✓		
Red Mountain catchfly	*Silene campanulata* ssp. *campanulata*		E	N	N		✓		
Roderick's fritillary	*Fritillaria rodericki*		E				✓		
Slender Orcutt grass	*Orcuttia tenuis*	E	E	Y	Y	✓			
Tracy eriastrum	*Eriastrum tracyi*		R			✓			
Two-fork clover	*Trifolium amoenum*	E		N	N		✓		
Water howellia	*Howellia aquatilis*		T	N	N		✓		
Western lily	*Lilium occidentale*	E		N	N		✓		✓

Sources: USFWS 2019c, CDFW 2019c, Harris 2006, Shuford and Gardali 2008

Notes: NA = not applicable, BLM = U.S. Bureau of Land Management Sensitive Species, USFS = U.S. Forest Service Sensitive Species, E = Endangered, T = Threatened, PT = proposed threatened, C = candidate, DPS = distinct population segment, ESU = evolutionarily significant unit, LNA = location not available, BCC = birds of conservation concern designated by U.S. Fish and Wildlife Service. SSC = Species of Special Concern, FP = Fully Protected, R = Rare.

Invertebrates

Valley Elderberry Longhorn Beetle—The valley elderberry longhorn beetle is federally listed as threatened; although critical habitat has been designated for this species, none is identified in the action area. The valley elderberry longhorn beetle is known to occur along the east route. The species' range extends throughout the Central Valley and associated foothills and its host plant is the elderberry shrub. Elderberry shrubs typically occur in riparian habitats and grasslands or savannas (USFWS 1999). Adult beetles mate from March through early June, and females lay single or small clusters of eggs on the elderberry stems. The emerging larvae burrow into the pith of the stems, where they develop for 1 to 2 years. Before pupating, the larvae chew an exit hole in the stem and plug it with chewed bark (frass plug). After metamorphosis, the pupae chew through the frass plug to emerge as adult beetles, which live for a few days to a few weeks (Talley et al. 2006).

Vernal Pool Branchiopods—Three federally listed vernal pool branchiopods are known to occur along the east route: conservancy fairy shrimp (*Brachinecta conservatio*), vernal pool fairy shrimp (*Branchinecta lynchi*), and vernal pool tadpole shrimp (*Lepidurus packardi*). Conservancy fairy shrimp and vernal pool tadpole shrimp are federally listed as endangered, and vernal pool fairy shrimp is federally threatened. Potential habitat for these species includes vernal pools and other seasonal wetlands. These species require ponding of sufficient duration and depth during the wet season to complete their life cycle, and occur as cysts in the substrate during the dry season. The east route overlaps with designated critical habitat for vernal pool tadpole shrimp.

Bumble Bees—Two bumble bee species have been reported along both overland transmission routes: western bumble bee (*Bombus occidentalis occidentalis*) and obscure bumble bee (*Bombus caliginosus*). The obscure bumble bee has also been documented in the vicinity of the cable landfall locations. The western bumble bee inhabits meadows and grasslands and typically nests in underground cavities (e.g., unused rodent burrows); colonies may contain as many as 1,685 worker bees (Xerces Society for Invertebrate Conservation et al. 2018). Like other bumble bee species, the western bumble bee is a generalist forager and requires plants that flower and supply adequate pollen and nectar throughout its life cycle, which is generally from early February to late November (Xerces Society for Invertebrate Conservation et al. 2018). In California, the western bumble bee has commonly been collected or observed on plants in the *Aster*, *Ceanothus*, *Cirsium*, *Erigonum*, *Penstemon*, and *Solidago* genera; however, these visits may have been more directly related to the relative abundance of these genera in the landscape than as the result of a floral preference (Xerces Society for Invertebrate Conservation et al. 2018). The Xerces Society for Invertebrate Conservation, Defenders of Wildlife, and Center for Food Safety submitted a petition to the California Fish and Game Commission to list four bee species, including the western bumble bee, as endangered under CESA in October 2018 (Xerces Society for Invertebrate Conservation et al. 2018). The petition indicated that the western bumble bee has recently experienced a dramatic decline in distribution and abundance, and is no longer present across much of its historic range (Xerces Society for Invertebrate Conservation et al. 2018). In California, the species' populations are currently largely restricted to high elevation sites in the Sierra Nevada; there have been relatively few observations from the northern California coast (Xerces Society for Invertebrate Conservation et al. 2018). The obscure bumble bee inhabits grasslands and shrublands and is primarily known from the Pacific Coast between southern British

Columbia and southern California, but has also been reported on the east side of California's Central Valley (IUCN 2019). This species nests underground and aboveground in unoccupied bird nests; it forages on plants in the *Ceanothus*, *Cirsium*, *Clarkia*, *Keckiella*, *Lathyrus*, *Lotus*, *Lupinus*, *Rhododendron*, *Rubus*, *Trifolium*, and *Vaccinium* genera (IUCN 2019). The obscure bumble bee has not been proposed for listing under CESA but is considered vulnerable because its populations are decreasing and is on the International Union for Conservation of Nature's Red List in the vulnerable species category (IUCN 2019).

Amphibians

California Red-Legged Frog—California red-legged frog (*Rana draytonii*) (CRLF) was listed as a threatened species under FESA on May 23, 1996, and is a SSC (USFWS 1996a, Thomson et al. 2016). The USFWS published a recovery plan for CRLF in 2002 and designated critical habitat for the species in 2006 that was revised in 2010 (USFWS 2002, 2010). The action area does not contain designated critical habitat for CRLF; however, the USFWS recovery plan includes the Cottonwood Creek watershed (west of Red Bluff in Tehama County) and the town of Cottonwood (Shasta County), which occur along the east route, as a core recovery area within the North Coast Range Foothills and Western Sacramento River Valley Recovery Unit (USFWS 2002). The CRLF is known to occur along both overland transmission routes. The species' habitat requirements include aquatic breeding sites with a suitable matrix of riparian and upland dispersal habitats. A variety of habitats are used for breeding including marshes, streams, lagoons, creeks, and particularly ponds (including frequent use of artificial impoundments such as stock ponds) (USFWS 2002, Thomson et al. 2016). Shrubby riparian or emergent vegetation associated with deep, slow-moving pools or ponds are important habitat characteristics for breeding, although ponds and streams lacking vegetation are also used (USFWS 2002, Thomson et al. 2016). CRLF are known to disperse distances greater than 2 mi (3 km) and can be found up to 100 ft (30 m) from water in adjacent vegetation but dispersal distances are considered to be dependent on habitat availability and environmental conditions (USFWS 2002).

Foothill Yellow-Legged Frog—The foothill yellow-legged frog (*Rana boylii*) (FYLF) is a SSC and is currently a candidate for listing as threatened under CESA. Due to its candidate status, this species is not currently subject to a recovery strategy as required under CFGC Sections 2112 and 2114. The FYLF is known to occur along both overland transmission routes and is typically found in perennial streams or rivers and intermittent creeks with pools. The species often breeds in low-gradient sections near junctions with tributary streams due to proximity to adult overwintering habitat in tributaries and to the presence of boulders and cobbles in these locations. In Humboldt County, FYLF have been observed during recent surveys in the Van Duzen River, Eel River, South Fork Eel River, Mad River, Trinity River, and a host of smaller watercourses (CDFW 2017; Stillwater Sciences 2017).

Northern Red-Legged Frog—The northern red-legged frog (*Rana aurora*) (NRLF) is a SSC and USFS sensitive species is known to occur along both overland transmission routes. The NRLF occurs in mesic forest and riparian areas that are primarily in steep coniferous forests and on coastal terraces; is relatively terrestrial and can occur hundreds of meters from water; and is often found in dense vegetated or downed log cover (Thomson et al. 2016). Breeding habitat includes permanent ponds, streamside pools, springs, marshes, lakes and reservoirs, as well as seasonal ponds and marshes with sufficient estivation retreats such as rodent burrows or moist debris piles nearby (Stebbins and McGinnis 2012). Systematic surveys are lacking and data on abundance in California is limited, however, surveys have found that NRLF is mostly absent from the river bottom lands of the Eel, Mad, and Smith Rivers (Thomson et al. 2016).

Coastal Tailed Frog—The coastal tailed frog (*Ascaphus truei*) is a SSC and has the potential to occur along both overland transmission routes. Coastal tailed frogs require cold, perennial, swift-flowing streams with coarse substrates, most commonly in old and mature cool coniferous forests and forest edges in pure or combined stands of redwood, Douglas-fir, grand fir (*Abies grandis*), Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and ponderosa pine (Stebbins and McGinnis 2012, Thomson et al. 2016). Stands may be interspersed with grassland, chaparral, shrubs, broadleaf deciduous woodland or combination thereof (Stebbins and McGinnis 2012). Adults are restricted to stream channels or within a few feet due to extreme sensitivity to dessication, but may move into damp woods in cool, wet weather especially near the coast (Stebbins and McGinnis 2012, Thomson et al. 2016).

Red-Bellied Newt—The red-bellied newt (*Taricha rivularis*) is a SSC and has the potential to occur along the south route. The species is endemic to California and occurs in redwood forests along the coast as well as other forest types such as mixed-conifer, Douglas-fir, tan oak, and madrone interspersed with patches of grassland (Stebbins and McGinnis 2012, Thomson et al. 2016). The red-bellied newt is aquatic only during the breeding season from February to May when winter flood levels recede, utilizing moderate to fast-flowing mountain streams with rocky, coarse bottoms and intermediate levels of canopy closure (Thomson et al. 2016). Adults leave the water after spawning and return to subterranean upland refugia until the next fall (Stebbins and McGinnis 2012).

Southern Torrent Salamander—The southern torrent salamander (*Rhyacotriton variegatus*) is a SSC and a USFS sensitive species that has the potential to occur along both overland transmission routes. The species is associated with cold, clear, flowing perennial seeps and headwater to low-order streams with coarse, rocky substrates in mesic to moist late-seral forests (Thomson et al. 2016). The southern torrent salamander is extremely susceptible to dessication, and only occasionally ventures into adjacent riparian and forest habitats during the wet season; adult movement on land is generally limited to an average of 3.3 ft (1 m) per year in the splash zone under rocks or other objects or in well-shaded environments with moss and ferns (Stebbins and McGinnis 2012, Thomson et al. 2016).

Western Spadefoot—The western spadefoot (*Spea hammondii*) is a SSC and a BLM sensitive species. Western spadefoots vary in length from 1.5–2.5 in (3.8–6.3 cm) and have a wedge-shaped, glossy black "spade" on each hind foot that is used for digging. The species is primarily terrestrial, and uses a variety of upland habitats (e.g., grasslands, woodlands, open chaparral) for feeding and burrowing during their dry-season dormant period (USFWS 2005). Western spadefoots require water bodies such as perennial and seasonal wetlands, rivers, and pools in intermittent streams for reproduction. This species has the potential to occur along the east route.

Reptiles

Western Pond Turtle—The western pond turtle (*Emmys marmorata*) is a SSC and a USFS sensitive species. The species' range is from western Washington south to northwest Baja California, mostly west of the Cascade-Sierran crest (Stebbins 2003). The species occupies perennial or intermittent fresh or brackish waters, including ponds, lakes, marshes, rivers, and streams, at elevations from sea level to 4,500 ft (1,372 m) (USFS 2018). Adult western pond turtles prefer low-gradient, low-velocity reaches of creeks and rivers with sunny banks and undercuts (USFS 2018). Basking structures, such as protruding or floating woody debris, exposed rocks, emergent vegetation, and banks, are very important habitat elements (USFS 2018). Western pond turtle has the potential to occur along both overland transmission routes.

Plants

Nineteen federally and/or state listed plant species were identified as occurring or having the potential to occur along the overland transmission routes: five species have been documented within 5 mi (8 km) of the east route, and 16 have been reported within 5 mi (8 km) of the south route (CDFW 2019c). Two federally endangered species, the beach layia (*Layia carnosa*) and Kneeland Prairie penny-cress (*Noccea fendleri* ssp. *californica*), were associated with both overland transmission routes and occur in coastal habitats (e.g., dunes, coastal scrub). The Kneeland Prairie penny-cress, which is only known from Humboldt County, has designated critical habitat that overlaps with both overland transmission routes. Slender Orcutt grass (*Orcuttia tenuis*), which is a vernal pool endemic, has designated critical habitat along the east route. Mcdonald's rock cress (*Arabis macdonaldiana*), Menzies' wallflower (*Erysimum menziesii*), and slender Orcutt grass are both federally and state listed; the rest of the 19 species are either only federally or state listed. Two species, Baker's meadowfoam (*Limnanthes bakeri*) and Tracy's eriastrum (*Eriastrum tracyi*), are state listed as rare[10].

The South Spit cable landfall site contains occurrences of two federal and state endangered plants, beach layia and western lily (*Lilium occidentale*) (CDFW 2019c). There is no designated critical habitat for plants at either cable landfall location.

Birds

Western Snowy Plover—The western snowy plover was listed as threatened under FESA in 1993 due to loss of nesting habitat and declines in breeding populations (USFWS 1993) and is a SSC. The main threats to the species include habitat loss and degradation from human disturbance, urban development, introduced beachgrass (*Ammophila* spp.), and expanding predator populations (USFWS 2007a). Critical habitat was revised in 2012 and there are critical habitat units in California, Oregon, and Washington (USFWS 2012a). The western snowy plover feeds on invertebrates in wet sand within the intertidal zone, in dry sand above high tide, on salt pans and spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. The breeding season for the western snowy plover is from March through September, and they nest on sand spits, dune-backed beaches,

[10] This refers to a listing status previously assigned under the California Native Plant Protection Act (CNPPA); plants listed as rare under the CNPPA are protected under CEQA but not CESA.

beaches at creek and river mouths, and salt pans at lagoons and estuaries from southern Washington to Baja California (USFWS 2007a). The nesting on the California coast is initiated as early as the first week of March and peaks from mid-April to mid-June (Warriner et al. 1986, Page et al. 1995, Powell et al. 1997). Western snowy plover chicks hatch between early April and mid-August and reach fledging age approximately 1 month after hatching (Powell et al. 1997). Some western snowy plovers remain in their coastal breeding areas year-round while others migrate south or north for winter, and most inland-nesting plovers migrate to the coast for the winter (USFWS 2007a). This species may be found wintering at any beach with suitable habitat along the California coast, including the cable landfall locations in the action area. Western snowy plovers were reported during winter surveys of beaches in Humboldt County between 2011 and 2018, including on the South Spit (USFWS 2018b). The South Spit contains designated critical habitat for western snowy plover (USFWS 2019c), and nesting has been observed on the North and South Spits of Humboldt Bay (USFWS 2007a).

Marbled Murrelet—The marbled murrelet was listed in 1992 as threatened under FESA (USFWS 1992) and endangered under CESA. Critical habitat has been revised several times since the first designation in 1996 and the most recent designation was in 2016 (USFWS 2016). In coastal waters from the United States–Canada border south to San Francisco Bay, the areas representing the upper 20th percentile of abundance were along the Strait of Juan de Fuca in Washington, the central Oregon coast, and northern California (Raphael et al. 2014). Although only 2% of the population occurs in Washington, Oregon, and California, this area represents 18% of the species' linear coastal range and likely supported far greater murrelet numbers historically (McShane et al. 2004). The action area is in Conservation Zone 4 (from Shelter Cove, California, north to Coos Bay, Oregon) for marbled murrelets (Falxa et al. 2016), and 2017 population estimates for this zone were approximately 8,574 murrelets (CI=6,358–11,155) (McIver et al. 2019).

Marbled murrelets nest on naturally occurring branch platforms high in old-growth coniferous trees (Nelson 1997). They fly between coastal/ocean foraging areas and inland nesting habitat (Miller et al. 2002). Both nesting and non-nesting adult murrelets fly between the forests and the ocean; non-nesting murrelets fly inland, presumably to locate and claim nest sites and establish pair bonds for future nesting, while nesting murrelets fly inland to attend to nests (e.g., switch incubation duties with the partner) and feed chicks (Naslund 1993; Hébert and Golightly 2006). At-sea abundance has been strongly correlated with proximity to inland areas containing contiguous old-growth forest with suitable nesting habitat (Raphael et al. 2016). In California, the at-sea density of marbled murrelets during the breeding season is highest (five to more than 10 murrelets per 0.39 mi^2 [1 km^2]) in the nearshore waters between Trinidad, California, and Brookings, Oregon (Falxa et al. 2016), which is directly offshore from large tracts of inland nesting habitat. At sea, marbled murrelets forage on small schooling fishes and large pelagic crustaceans (euphausiids, mysids, amphipods) and occur primarily in very nearshore waters (less than 0.9 mi [1.5 km] from shore) (Sealy 1974, Strachan et al. 1995, Hébert and Golightly 2008, Strong 2009, Raphael et al. 2014, Falxa et al. 2016). Peak densities of marbled murrelets in northern California occur within 1 mi (1.6 km) of shore, and they are rare but consistently present beyond 2.5 mi (4 km) from shore (Hébert and Golightly 2008, Falxa et al. 2016). There is some evidence that they occur farther offshore over the continental shelf during the non-breeding season (Hébert and Golightly 2008), thus it is possible that they are more likely to occur in the action area from fall through spring. The overland transmission routes cross designated critical habitat for the marbled murrelet. There is potential nesting habitat for marbled murrelets in the land cover types that support conifers (e.g., Douglas-fir), and individuals could fly over and through the terrestrial land cover types in the action area as they travel between foraging and nesting habitats.

Northern Spotted Owl—The northern spotted owl (*Strix occidentalis caurina*) was listed as threatened under FESA in 1990 due to habitat loss from timber harvest (USFWS 1990) and is also listed as threatened under CESA. The main threats to this species are past and current habitat loss and competition from the barred owl (*Strix varia*). Critical habitat was designated in 1992 and revised in 2008 and 2012; there are critical habitat units in California, Oregon, and Washington (USFWS 2012b). There is no designated critical habitat for northern spotted owls in the action area. Northern spotted owl nesting, roosting, and foraging habitat occurs in structurally complex, older coniferous forests (USFWS 2011). Important habitat features include a moderate to high canopy closure (60–90%); multilayered, multi-species canopy with large overstory trees; a prevalence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe [*Phoradendron* spp.] infections, and other evidence of decay); presence of large snags; accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). They have the potential to occur in the forests along the overland transmission routes; however, this is unlikely because the surrounding forests are relatively fragmented by housing developments and timber harvesting.

Bald Eagle—Bald eagle (*Haliaeetus leucocephalus*) was removed in August 2007 from the list of federally threatened species, but the species remains listed as endangered under the CESA and is also a fully protected species (USFWS 2007b, CDFW 2019b). Because the species is no longer federally listed, critical habitat does not apply. It is also protected under the Bald and Golden Eagle Protection Act as amended in 1962 (16 U.S.C. 668–668c). Bald eagles winter throughout most of California, with large concentrations in the Klamath Basin (Polite et al. 1999). Several bald eagle nest sites have been documented in Humboldt County (CDFG 2009a). In winter, bald eagles form large, communal roosts at traditional sites (Thelander et al. 1994). These roosts are generally located close to open water but can be over 32 km (20 mi) from foraging areas (Marshall et al. 1996). Important perch and roost sites include snags and dead-topped, live trees in areas with minimal human disturbance (Brown and Stevens 1997; USFWS 1995). They are often found in stands of mature or old-growth conifers (Marshall et al. 1996). Fish are the primary dietary component of bald eagles; however, waterfowl, gulls, and other birds, mammals, and carrion may also be taken. Bald eagles generally require large bodies of water for hunting, including estuaries and coastal waters, rivers, and large lakes and reservoirs. The bald eagle has the potential to occur along both overland transmission routes, and forage at the cable landfall locations.

Golden Eagle—The golden eagle (*Aquila chrysaetos*) is a California fully protected species and a BLM sensitive species (CDFW 2019d). It is also protected under the Bald and Golden Eagle Protection Act as amended in 1962 (16 U.S.C. 668–668c). Golden eagles are found throughout California as residents and migrants in forests, canyons, shrub lands, grasslands, and oak woodlands where suitable prey is accessible and nesting sites are available (Peeters and Peeters 2005, CDFW 2019e). In northwestern California, golden eagles are a rare to uncommon resident associated with open woodlands, forests and grasslands along the higher inland ridges and are known to forage in the lowlands and estuaries along the coast including around Humboldt Bay (Harris 2006). Golden eagles have the potential to occur in the action area along the overland transmission routes. Several CNDDB records indicate that golden eagles nest within 5 miles of the overlapping segment of the overland transmission routes in Humboldt County and within 5 miles of the south route (CDFW 2019c). Golden eagles may also potentially forage in the high prairies along both overland transmission routes and roost on transmission poles and high tension towers, in surrounding forest habitats, and on rocks and other structures adjacent to the overland transmission routes.

White-Tailed Kite—The white-tailed kite (*Elanus leucurus*) is a BLM sensitive species and a California fully protected species in California (CDFW 2019d). White-tailed kites are chiefly neotropical but occur in small populations in Arizona, the Gulf Coast, throughout California, and into Oregon and Washington (Peeters and Peeters 2005). Habitats rich in rodents are preferred and include marshy areas, grasslands, savannah, freeway medians, and remnant patches within subdivisions. Treetops, fence posts, and wires are common perch sites. White-tailed kites are typically found in lowlands and foothills and avoid coniferous forests (Peeters and Peeters 2005). The species has been known to form communal roosts that sometimes contain hundreds of individuals, with the largest roosts formed in the fall and winter (Peeters and Peeters 2005, Harris 2006). In Humboldt County, white-tailed kites are common residents of the river bottoms, agricultural, and riparian areas of the coastal plain and occasionally occur inland along riparian areas and mountain prairies (Harris 2006). White-tailed kites have the potential to nest and forage in the vicinity of the transmission route around Humboldt Hill and Fields Landing cable landfall, in the Elk River and Freshwater Creek lowlands, the high prairies along the east and south transmission routes and the interior foothills and Central Valley lowlands to the west of and surrounding Cottonwood.

Osprey—The osprey (*Pandion haliaetus*) is a CDFW watch list species (CDFW 2019d). Ospreys occur throughout California with the largest populations concentrated in the northern portion of the state, particularly the northern Coast Ranges and mountains (Peeters and Peeters 2005). Ninety-nine percent of the osprey diet consists of fish, and typical habitat includes lakes and reservoirs, bays, seashores, and rivers (Peeters and Peeters 2005, Bierregaard et al. 2016). Nests area placed on a wide variety of natural and artificial substrates including dead-topped trees, high-tension towers, telephone poles, artificial nest sites, and other human-made structures most often near water with adequate prey base (Peeters and Peeters 2005, Bierregaard et al. 2016). In Humboldt County, Hunter et al. (2005) reported that there were several hundred breeding pairs and nests were almost always built in flat- or broken-topped live conifers or conifer snags. Most ospreys migrate from the area and are absent from November through February but a small portion are resident (Hunter et al. 2005, Harris 2006). Osprey have the potential to roost on transmission poles and high tension towers along the east and the south routes and to nest in the vicinity of the routes. CNDDB records indicate that nesting occurs in proximity to the overlapping segment of the overland transmission routes in Humboldt County, and at various locations along both routes.

Northern Goshawk—The northern goshawk (*Accipiter gentilis*) is a SSC and a BLM and USFWS sensitive species (CDFW 2019d). Northern goshawk is uncommon but widely distributed in the mountain coniferous and mixed hardwood–coniferous forests of the northwestern California region (Harris 2006). Goshawks typically nest in mature to old-growth forests in large stands with primarily large trees however, smaller stands are also used (Squires and Reynolds 1997). Dispersing juveniles will occasionally use coastal lowlands in the fall and winter (Harris 2006). Northern goshawks have the potential to occur in the forests along both of the overland transmission routes, however this is unlikely because the surrounding forests are relatively fragmented due to housing developments and timber harvesting.

Northern Harrier—The northern harrier (*Circus hudsonius*), a SSC, is a nomadic species that occurs throughout the lower elevations in California primarily in association with marshes, wet meadows, and grasslands with adequate vegetative cover, abundance of suitable prey (e.g., rodents and passerines) and scattered perches such as shrubs or fence posts (Davis and Niemela 2008). In northwestern California, northern harriers are uncommon in the summer breeding season but populations increase substantially with an influx of fall migrants (Harris 2006, Davis and Niemela 2008). Northern harriers nest on the ground in tall grass or brushland cover. Nesting locations include the North and South Spits of Humboldt Bay and throughout the Humboldt Bay lowlands and potentially in the mountain prairies (Hunter et al. 2005, Harris 2006). Northern harriers have a high potential to occur in the vicinity of the South Spit and Fields Landing cable landfall areas; in the open grasslands of the Elk River and Freshwater Creek lowlands along the segment of both of the overland transmission routes in Humboldt County; and in the pasturelands and foothill grasslands along the east route in and around Cottonwood, Shasta County. The species has a lower potential to occur in the high prairies and grasslands along both the east and south routes.

Least Bell's Vireo—The least Bell's vireo (*Vireo bellii pusillus*) was listed as endangered under CESA in 1980 and under FESA in 1986. Critical habitat was designated in 1994 and is entirely contained in southern California (USFWS 1994a, CDFW 2019b). The least Bell's vireo primarily inhabits dense, willow-dominated riparian habitats with lush understory vegetation in the immediate vicinity of water courses, nesting in willows and occasionally a variety of other trees, shrubs, and vines, and foraging in riparian and adjoining chaparral habitats (USFWS 1986). Least Bell's vireo was widespread throughout the Central Valley, Sierra Nevada foothills and Coast Ranges with a range extending from north of Red Bluff, Tehama County, to northwestern Baja California, Mexico, but is now essentially extirpated from the Central Valley although recent breeding has been discovered in the San Joaquin Valley and Yolo County (CDFW 2019g, NatureServe 2019). The least Bell's vireo has a low potential to occur in the action area.

Little Willow Flycatcher—The little willow flycatcher (*Empidonax traillii brewsteri*) was included as a California threatened subspecies when willow flycatcher (*Empidonax traillii*) was listed in 1991 and is a USFWS bird of conservation concern (CDFW 2019b, 2019d). The little willow flycatcher breeds in California west of the Sierra/Cascade crestline from Tulare County north and is limited to montane and north coastal locations. This subspecies generally breeds in shrubby riparian vegetation with at least some surface water or saturated soil within the defended territory early in the breeding season (from late June to late August) (Bombay et al. 2003). In northwestern California, breeding habitat includes riparian cottonwood and willow thickets, as well as regenerating clearcuts (Hunter et al. 2005, Harris 2006). The little willow flycatcher is considered a rare summer resident and breeder and uncommon migrant in northwestern California, although it is known to breed in the vicinity of the south route along the Eel River (Hunter et al. 2005, Harris 2006, CDFW 2019c). However, the potential for the species to occur in the action area is low.

Western Yellow-Billed Cuckoo—The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) was listed as threatened under CESA in 1971 and downgraded to endangered in 1988. The species was listed as threatened under FESA in 2014 and is a BLM and USFS sensitive species (CDFW 2019b, 2019d). Western yellow-billed cuckoos are riparian obligate breeders and in California, the species is mainly found in riparian patches of willow mixed with Fremont cottonwood greater than 198 acres (0.8 km^2) in size and rarely under 49 acres (0.2 km^2) in low to moderate elevation, arid to semiarid landscapes including portions of the upper Sacramento River (Halterman et al. 2015). Critical habitat is proposed for the species and includes the lower portion of the Eel River in Humboldt County west of the town of Fortuna (USFWS 2014b). However, the species is not known to nest in northwestern California and is considered a casual migrant in Humboldt County (Hunter et al. 2005, Harris 2006). The transmission routes do not fall within critical habitat and CNDDB records do not occur in the action area (USFWS 2014b, CDFW 2019c). The potential for this species to occur in the action area is low.

Yellow-Breasted Chat—The yellow-breasted chat (*Icteria virens*) is a SSC. In northwestern California, the yellow-breasted chat is an uncommon to common breeder from mid-April to September and rare winter migrant breeder in well-developed riparian cover along streams from the inner edges of the coastal plain and throughout the inland river valleys (Hunter et al. 2005, Harris 2006). The species' dependence on riparian habitat, particularly understory and shrubby riparian vegetation, for nesting makes them vulnerable to vegetation removal along river and stream channels (Comrack 2008). The yellow-breasted chat has the potential to occur along both of the overland transmission routes in riparian habitat at stream and river crossings.

Yellow Rail—The yellow rail (*Coturnicops noveboracensis*), a SSC, forages and breeds in densely vegetated marshes with moist soil or shallow standing water and overwinters in wet meadows and coastal marshes (Sterling 2008). Yellow rails are known to occur in the marshes around Humboldt Bay and have been observed on the North Spit of Humboldt Bay (CDFW2019c, Harris 2006, Sterling 2008). The yellow rail has low potential to occur in the action area.

Yellow Warbler—The yellow warbler (*Dendroica petechia*) is a SSC and a USFWS bird of conservation concern. The species occurs throughout most of California, mainly as a migrant and summer resident; however, it is absent from most of the desert regions and the Owens Valley, and is close to extirpation from the Central Valley. Migrants appear in late May, breeding occurs from April to late July, and fall migration occurs from late September to October (Harris 2006, Heath 2008). In northwestern California, breeding is closely associated with riparian stands of cottonwood, alder, and willow, although breeding does not occur on the immediate coastal strip and the species is mostly absent from industrial timberlands (Hunter et al. 2005, Harris 2006). The yellow warbler has the potential to occur along both overland transmission routes in lowland riparian habitat at stream and river crossings.

Tricolored Blackbird—The tricolored blackbird (*Agelaius tricolor*) is listed as threatened under CESA, is a SSC, and is a BLM sensitive species. This species forms large breeding colonies that typically nest in dense emergent or riparian vegetation (e.g., blackberry thickets, tules, riparian scrub) in areas with open, accessible water, suitable foraging space (e.g., irrigated pastures and forage crops, annual grasslands, riparian scrub and marsh borders, feed lots) with adequate insect prey within a few miles of the colony (Beedy 2008). The largest tricolored blackbird colonies occur in the Central Valley and in most years, more than 90% of breeding adults (Beedy 2008). This species has low potential to occur along the east route, particularly in the vicinity of Cottonwood, Shasta County.

Bank Swallow—The bank swallow (*Riparia riparia*) was listed as threatened under CESA in 1989 and is a BLM sensitive species (CDFW 2019b, 2019d). Bank swallows nest in burrows excavated in friable alluvial soil or sand on vertical, or near vertical banks and bluffs along rivers, lakes, and oceans and forage over wetlands, open water, grasslands, riparian woodland, orchards, agricultural fields, shrublands, and upland woodlands within 150–650 ft (45–198 m) of colonies (Bank Swallow TAC 2013, Hunter et al. 2005). Seventy to 90% of known bank swallow populations in California nest in colonies on the Sacramento and Feather Rivers (Bank Swallow TAC 2013). In northwestern California, few breeding records exist including only one recent Humboldt County site on the lower Eel River (Harris 2006). CNDDB records indicate nesting occurs on the Sacramento River east of Cottonwood outside of the action area (CDFW 2019c). The bank swallow has low potential to occur in the action area.

Mountain Plover—The mountain plover (*Charadrius montanus*) is a SSC and a USFWS bird of conservation concern (CDFW 2019d). The mountain plover is a winter visitor in California, primarily in the low elevation interior valleys and plains from the southern Sacramento Valley south. The mountain plover is strongly associated with short-grass habitats or similar such as fallow, grazed, or burned fields that are flat and nearly devoid of vegetation and is primarily insectivorous (Hunting and Edson 2008). The mountain plover occasionally winters in Humboldt County in the Arcata bottoms and coastal beaches, including the South Spit where it has the potential to occur in the South Spit cable landfall area (Harris 2006, CDFW 2019c) although it would occur quite rarely based on its distribution and local records to date.

Terrestrial Mammals

American Badger—The American badger (*Taxidea taxus*) is a SSC that occurs throughout California, most commonly in the Great Basin region but also occasionally in the Central Valley; it is not known from the northern portion of the North Coast region (Williams 1986, Ahlborn and White 1990, Jameson and Peters 2004). Habitat requirements include relatively open, uncultivated lands with sufficient food and friable soils such as grasslands, savannas, and mountain meadows near the timberline (Williams 1986). American badgers are carnivorous and feed primarily on fossorial rodents, especially ground squirrels and pocket gophers, which inhabit grasslands. American badgers have the potential to occur in the open prairies and grasslands along the south route.

Fisher (West Coast DPS)—The West Coast DPS of fisher (*Pekania pennant*) is currently proposed for threatened status under FESA (USFWS 2019e) and is a USFS and BLM sensitive species. The action area overlaps with the distribution of the Northern California ESU. The California Fish and Game Commission determined that listing of the Northern California ESU under CESA was not warranted; however, it remains a SSC (CDFW 2019b). Fishers occur in low- to mid-level elevation forests from approximately 900 to 7,000 ft (275 to 2,150 m). They inhabit a variety of forest types including redwood, Douglas-fir, Douglas-fir-tanoak, white fir, mixed conifer, mixed conifer-hardwood, and ponderosa pine. The structural attributes of a forest appear to be more important for habitat value than the tree species composition, and include a moderate to dense canopy, diverse tree sizes and shapes, snags, cavities, and fallen trees/limbs, and limbs close to the ground. Fishers are associated with mid- to late-seral forests with complex structures and low proportions of open areas. They use cavities or platforms, particularly on large deformed or deteriorating live trees, snags, or logs for resting, protection from predators, thermoregulation, and prey consumption (Aubry et al. 2013, CDFW 2015). Fishers have the potential to occur along both overland transmission routes.

Gray Wolf—The gray wolf (*Canis lupus*) was listed as endangered under CESA on January 1, 2017 (CDFW 2019b) and CDFW published a conservation plan in December 2016 (Kovacs et al. 2016). Gray wolf was listed as endangered by the USFWS in the lower 48 states (except for Minnesota, where it was listed as threatened) and in Mexico in 1978 (USFWS 2019g). On March 15, 2019, USFWS published a proposed rule to delist the gray wolf in the contiguous U.S. and Mexico (USFWS 2019g). No critical habitat has been designated in California for gray wolf. Wolves were extirpated from California from 1924 until 2011, when a radio-collared male from Oregon traveled south through the vicinity of Cottonwood at the terminus of the east route before returning to Oregon. There is currently only one known wolf pack in California in Lassen and Plumas Counties, and five individuals are known to have traveled from Oregon to northeastern California (including Shasta County) since 2015 (CDFW 2019f). Wolves are habitat generalists, and primarily require the presence of adequate ungulate prey and water, sufficient availability of den sites, and low likelihood of human contact (CDFG 2011). Wolf packs (typically three to 11 individuals) establish, maintain, and defend territories for hunting and annual denning, which can occur in rock crevices, hollow logs, or soil underneath tree roots (Kovacs et al. 2016). Since their return to California, gray wolves have not been documented in Humboldt, Trinity, or Mendocino Counties. The USFWS range map for gray wolf extends west into Trinity National Forest and Six Rivers National Forest and encompasses a portion of the east route in Trinity and Shasta Counties south of Hayfork (USFWS 2019h). Dispersing wolves could potentially occur along this segment of the route; however, it is unlikely that the project would affect these individuals due to the species' aversion to human interaction.

Humboldt Marten—The Humboldt marten (*Martes caurina humboldtensis*) was listed as endangered under CESA on March 18, 2019 (CDFW 2019b) and is a USFS sensitive species. The coastal DPS of Pacific marten (*Martes caurina*), which includes the Humboldt marten, is currently proposed for listing as threatened under FESA (USFWS 2018c). Humboldt martens are associated with old-growth late-successional conifer forests with: (1) dense mature shrub layers; (2) diverse tree sizes; (3) high density of large snags and live trees that have decay; (4) large downed trees and serpentinite piles/outcrops for denning, resting, and escape cover; and (5) cavities in large trees and snags for breeding (CDFW 2018a, USFWS 2018d). The Humboldt marten has the potential to occur in the forested habitat along both the east and the south routes. However, the Humboldt marten is extirpated from more than 95% of its historical range, largely as a result of logging and timber management practices, and is currently only known from northern Humboldt, Del Norte, and Sisikiyou Counties, therefore this species is considered unlikely to occur in the action area (Slauson et al. 2009, CDFW 2018a).

North American Wolverine—The North American wolverine (*Gulo gulo*) (wolverine) is a fully protected species in California and was listed as threatened under CESA in 1971 (CDFW 2019b). Wolverine is proposed for threatened status under FESA and is a USFS sensitive species (CDFW 2019b, USFWS 2019f). The historical range of this species included the North Coast Ranges, but it is considered extirpated from California except for a lone male that was recorded in the Sierra Nevada near Truckee, California, in 2008 (Aubrey et al. 2007, Moriarty et al. 2009). The wolverine was previously reported from 1,600–4,800 ft (500–1,500 m) in the North Coast Ranges in Douglas-fir and mixed conifer habitats (Johnson et al. 1990). Wolverine distribution is limited because the species requires persistent spring snow cover through late April/mid-May for its denning and breeding period (Aubrey et al. 2007, Copeland et al. 2010). This species has low potential to occur along the east route; however, it is considered highly unlikely given the species' known distribution in California and its breeding period requirements.

San Joaquin Pocket Mouse—The San Joaquin pocket mouse (*Perognathus inornatus*) is a BLM sensitive species that occurs in the Central Valley, western Sierra Nevada foothills, and the western Mojave Desert. The species inhabits open grassland, savanna, and desert shrub. The San Joaquin pocket mouse has a low likelihood of occurrence along the segment of the east route that overlaps with the Central Valley.

Sonoma Tree Vole—The Sonoma tree vole (*Arborimus pomo*) is a SSC occurring in the coastal fog belt forests dominated by Douglas-fir and where Douglas-fir co-occurs with redwood, Sitka spruce, western hemlock, or grand fir from Marin County north to the Oregon border. Sonoma tree voles feed on the needles of Douglas-fir and grand fir and are strictly tree dwelling (Brylski et al. 1990, Jones 2003, Jameson and Peters 2004, Chinnici et al. 2012). Both males and females construct nests, and mature stands with larger Douglas-firs and higher densities of Douglas-fir tend to have the most nests (Chinnici et al. 2012, Jones 2003, Thompson and Diller 2002). Sonoma tree vole has the potential to occur in Douglas-fir trees along both overland transmission routes.

Fish

Chinook Salmon—Chinook salmon (*Oncorhynchus tshawytscha*) are the largest of Pacific salmon and historically ranged from southern California (Ventura River) to northern Alaska (Point Hope). There are two evolutionarily significant units (ESUs) of federally listed Chinook salmon that could occur in the terrestrial portion of the action area: Sacramento River winter-run ESU and Central Valley spring-run ESU.

***Sacramento River Winter-Run ESU*—**The Sacramento River winter-run ESU was federally listed as threatened in 1989 (NMFS 1989), and reclassified as endangered in 1994 (NMFS 1994). It was also listed as endangered by the State of California in 1989. Critical habitat was designated in 1993 and includes the Sacramento River from Keswick Dam, Shasta County, to Chipps Island at the westward margin of the Sacramento-San Joaquin Delta; all waters from Chipps Island west to the Carquinez Bridge; San Pablo Bay west of the Carquinez Bridge; and San Francisco Bay from San Pablo Bay to the Golden Gate Bridge (NMFS 1993b). Critical habitat does not extend into the open ocean.

***Central Valley Spring-Run ESU*—**The Central Valley spring-run ESU was federally listed as threatened in 1999 and includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River and the Feather River Hatchery spring-run Chinook program (NMFS 1999). Critical habitat was designated in 2005 and consists of the Sacramento River and its tributaries in California (NMFS 2005). Critical habitat does not extend into the open ocean.

Coho Salmon—Coho salmon (*Oncorhynchus kisutch*) are a widespread Pacific salmon species that inhabit most major river basins in western Oregon. Coho salmon typically exhibit a 3-year life history, divided between 18 months in freshwater and 18 months in saltwater phases. In freshwater, coho salmon spawn and rear in small streams with stable gravels and complex habitat features, such as backwater pools, beaver dams, and side channels. Marine survival and growth of coho salmon are linked to food availability, environmental conditions, and stressors present in the nearshore environment. The two coho salmon ESUs that could occur in the action area are the Southern Oregon/Northern California Coast ESU, and the Central California Coast ESU. Critical habitat was designated for the Southern Oregon/Northern California Coast ESU on February 16, 2000, and for the Central California Coast ESU on May 5, 1999 (ECOS 2019).

Steelhead—Steelhead (*Oncorhynchus mykiss*) are rainbow trout that exhibit an anadromous life history pattern. After emergence, young steelhead rear in freshwater streams for 1 to 4 years before out migrating to the ocean. There are two DPSs of steelhead that may occur in the action area and one state candidate.

***Northern California Steelhead DPS*—**This DPS was federally listed as threatened in 2000 and includes all naturally spawned steelhead populations below natural and manmade impassable barriers in coastal rivers, from Redwood Creek in Humboldt County, California, south to, but not including, the Russian River (NMFS 2000). Critical habitat was designated in 2005 and consists of river reaches between Redwood Creek south to Point Arena on the Mendocino coast (NMFS 2005). Critical habitat does not extend into the open ocean.

***California Central Valley Steelhead DPS*—**This DPS was federally listed as threatened in 1998 and reaffirmed in 2006, and includes all naturally spawned steelhead populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers of California and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries (NMFS 2006b). Critical habitat was designated in 2005 and consists of accessible river reaches of the Sacramento and San Joaquin Rivers and their tributaries (NMFS 2005). Critical habitat does not extend into the open ocean.

***Summer-Run Steelhead*—**The summer-run steelhead is a state candidate for listing. This species occurs in coastal rivers in California from Redwood Creek to the Mattole River.

Coastal Cutthroat Trout—The coastal cutthroat trout (*Oncorynchus clarkii clarkii*) is a SSC and a USFS sensitive species. Although the coastal cutthroat trout is not currently a listed species, its status is under review by USFWS (HBMWD 2004). Coastal cutthroat trout are found in the Pacific Ocean and rivers, lakes, and estuaries from southeastern Alaska to northern California (Johnson et al. 1999) and is likely to occur in the action area.

Green Sturgeon (Southern DPS)—NMFS listed the southern DPS of North American green sturgeon (*Acipenser medirostris*) as threatened in 2006 (USFWS 2006). This DPS is defined as green sturgeon originating from the Sacramento River basin and from coastal rivers south of the Eel River in California. The green sturgeon is a long-lived (up to 70 years), anadromous fish species that occurs along the Eastern Pacific Coast from the Bering Sea south to Ensenada, Mexico, although their consistently inhabited range is much smaller, primarily concentrating in the coastal waters of California, Washington, Oregon, and Vancouver Island (NMFS 2015). They spend most of their lives in coastal marine waters, coastal bays, and estuaries along the Pacific coast, including Humboldt Bay (Lindley et al. 2011). This species is present in the action area and designated critical habitat is offshore in the action area out to the 328-ft (100-m) isobath.

Eulachon (Southern DPS)—The federally threatened eulachon (*Thaleichthys pacificus*; commonly called smelt, candlefish, or hooligan) is a small, anadromous fish endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. Eulachon leave saltwater to spawn in their natal streams from late winter through early summer. During spawning, they release eggs over sandy river bottoms. Shortly after hatching, the larvae are carried downstream and dispersed by estuarine and ocean currents. There is a low potential for this species to occur in the action area.

Longfin Smelt—The longfin smelt (*Spirinchus thaleichthys*) was listed as threatened under the CESA on March 5, 2009. In California, the longfin smelt was historically found in the San Francisco Bay estuary and the Sacramento–San Joaquin Delta, Humboldt Bay, and the estuaries of the Eel and Klamath Rivers; this species uses a variety of habitats from nearshore waters to estuaries and the lower portions of freshwater streams (Garwood 2017). Spawning occurs in fresh water during the winter months (February through April) over sandy or gravel substrate. This species occurs within Humboldt Bay in the action area.

Pacific Lamprey—The Pacific lamprey (*Entosphenus tridentatus*) is a SSC, USFWS species of concern, and a USFS sensitive species. Pacific lamprey is the most widely distributed lamprey species on the west coast of North America and its historical distribution includes major rivers (e.g., Fraser, Columbia, Trinity, Eel, Sacramento, and San Joaquin Rivers), and intervening streams (Goodman and Reed 2012). Spawning occurs in gravel nests in low-gradient stream riffles from April through July (Goodman and Reed 2012). Once eggs hatch into larvae (ammocoetes), they drift downstream to low-velocity habitats and live in silty substrates as filter feeders for 3–7 years (Goodman and Reed 2012). Larvae then transform to juveniles (macropthalmia) and migrate to the Pacific Ocean (Goodman and Reed 2012). As adults, Pacific lamprey develop teeth on a sucking disc and live in the ocean for 1–3 years feeding on host fish (Goodman and Reed 2012). This species is likely to occur in streams and rivers in the action area.

Tidewater Goby—The tidewater goby (*Eucyclogobius newberryi*) was listed as endangered under the FESA in 1994 and proposed for reclassification as threatened under the FESA in 2014 (USFWS 1994b). Critical habitat was designated for the tidewater goby in 2013 and includes approximately 12,156 acres in Del Norte, Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego Counties, California (USFWS 2013b). The tidewater goby is entirely estuarine dependent and its fundamental life history requirements consist of low-velocity, low-salinity (i.e., less than 15 parts per thousand) habitats during the egg, spawning, and early larval and juvenile life stages in spring and early summer (Hellmair and Kinziger 2014). This species is likely to occur in sloughs and ponded estuary habitat in the action area.

Critical Habitat

The USFWS defines critical habitat for federally listed species as "the specific areas within the geographic area occupied by the species at the time it was listed that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection." (USFWS 2017a). Areas designated by USFWS as critical habitat may also consist of areas that were not occupied by the species at the time of listing but have been identified as essential to its conservation (USFWS 2017a). The USFWS requires that potential effects on critical habitat be evaluated in addition to determining the effects on the listed species themselves (USFWS 2019c). The South Spit cable landfall location contains critical habitat for western snowy plover, and there is designated critical habitat along the overland transmission routes for the following species (USFWS 2019c).

- Kneeland Prairie penny-cress
- slender Orcutt grass
- vernal pool tadpole shrimp
- tidewater goby
- northern spotted owl
- marbled murrelet
- western snowy plover

The following fish species have critical habitat designated by NOAA Fisheries (ECOS 2019).

- Northern California steelhead DPS
- California Central Valley steelhead DPS

- Sacramento River winter-run Chinook salmon ESU
- Central Valley spring-run Chinook salmon ESU
- Southern Oregon/Northern California Coast coho salmon ESU
- Central California Coast coho salmon ESU
- green sturgeon (Southern DPS)

NMFS designated critical habitat for Northern California steelhead DPS, California Central Valley steelhead DPS, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon ESU in freshwater streams and rivers in the action area.

Essential Fish Habitat

The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect EFH. The primary components of EFH are substrate; water quality; water quantity, depth, and velocity; channel gradient and stability; food availability; cover and habitat complexity; space; access and passage; and habitat connectivity. Pursuant to the Magnuson-Stevens Act, EFH in streams and rivers in the terrestrial portion of the action area have been designated for salmon.

2.3 Potential Environmental Effects of Offshore Wind Scenarios

2.3.1 Potential Environmental Effects on Marine Species and Habitats

The potential marine environmental effects of the project scenarios can be categorized into: (1) short-term effects associated with construction (e.g., disturbances associated with installing the wind farm array and electrical infrastructure, deploying offshore anchors and moorings); (2) longer-term operation and maintenance effects associated with the above-water and underwater structures, including wind turbines and floating platforms; subsea structures including platforms, moorings, offshore substation, subsea and interrarray cables and anchors; and vessels to support, monitor, and maintain equipment; (3) short-term effects during decommissioning activities; and (4) short-term and long-term effects of project-related activities in Humboldt Bay, including marine construction associated with facility improvements needed to support wind farm assembly, operations, and maintenance. Table 12 summarizes the likely potential stressors and receptors, and temporal and spatial scale of interactions. The potential effects, and their relative risks to the affected environment from stressors associated with the build-out scenarios were categorized as low, medium, and high. Stressors are considered to have a low risk if their potential effects are relatively well understood and/or they appear to present a low risk for harm to the affected environment (e.g., if only a small spatial scale or temporal scale of effect). If the potential environmental effects from stressors are not well understood (i.e., a higher level of uncertainty) and additional studies are required to improve understanding, the stressors are considered to have a medium risk. Stressors were classified as high risk if their potential effects are known to pose substantial risks to the affected environment (e.g., potential to have a negative effect over a longer term and spatial scale) and will require the implementation of avoidance, minimization, and/or mitigation measures.

2.3.1.1 Potential Short-Term Marine Environmental Effects Associated with Construction

Construction includes installation of electrical infrastructure including the subsea transmission cable and wind farm components involved in mooring and anchoring the floating platforms and turbines. The subsea transmission cable exporting power from the offshore wind project's substation to shore will be buried to minimize interactions with fisheries. The subsea export cables should be placed to avoid marine geological features such as submarine canyons and faults and marine protected areas, and where possible, rocky/hard substrates, to minimize effects. Cable laying is typically done by specialized vessel/s with dynamic positioning (DP) in order to maintain position, and carry, lay, and bury the miles of cable; burial usually is done by plowing or trenching equipment (Sharples 2011). It is assumed that the cable route will avoid hard bottom substrates to the extent feasible, and where unavoidable, cables would be shielded with concrete mattresses or other types of protection. Potential environmental effects include disturbance of benthic habitat, effects on water quality, increased noise from DP vessels and burial operations, and vessel interactions with marine wildlife. The nearshore terminus of the export cable will be at approximately 30 ft (9 m) depth, where the remaining segment of the cable route will be completed with horizontal directional drilling (HDD) to shore; a jack-up barge could be used to connect the HDD and buried cable. Effects of HDD construction are addressed in Section 2.3.2.

Anchor pile installation will require an Anchor Handling Vessel (AHV) to set the anchor and tension the mooring chain and line (Ma et al. 2019). Installation of anchor piles requires lowering the anchor pile using a crane and allowing it to self-penetrate into the seabed due to pile weight, and finally embedding it by evacuating seawater from the pile interior with a special remotely operated vehicle (ROV)-mounted pump skid (Ma et al. 2019). It is assumed for this analysis that the substrate in the wind farm areas is soft substrate that will support anchor piles; seafloor surveys will be required to validate this assumption.

The floating platform and turbines would be assembled dockside in Humboldt Bay, towed out to the offshore mooring location, and installed. The platforms would then be connected to electrical cables and moorings. Potential environmental effects may include vessel noise during transport and collision with cetaceans.

Table 12. Summary of Environmental Effects Evaluated for Construction, Operations, and Maintenance Phases in the Offshore Marine Environment, Humboldt Bay, and Overland Transmission Lines

Stressor	Receptors	Temporal and Spatial Scale of Effects
Offshore Marine Construction (Section 2.3.1.1)		
Benthic habitat disturbance (cable lay and anchors)	Benthic communities (invertebrates)	Short-term, spatial scale dependent on scenario
Water quality (turbidity from bottom disturbance, spills)	Fish, invertebrates	Short-term, spatial scale dependent on scenario
Acoustic (vessel noise, cable lay)	Marine mammals, seabirds, fish	Temporal and spatial scale dependent on scenario
Collision (vessels)	Marine mammals, bird flocks	Temporal and spatial scale dependent on scenario
Artificial lighting	Seabirds, bats	Short-term, small spatial scale depending on scenario
Offshore Marine Operations and Maintenance (Section 2.3.1.2)		
Rotating turbine blade collision/strike	Seabirds, bats	Long-term, spatial scale dependent on scenario
Acoustics	Marine mammals	Long-term, likely small spatial scale
Underwater structure: habitat	Fish, invertebrates	Long-term, spatial scale dependent on scenario
Underwater structure: entanglement/collision	Marine mammals	Long-term, spatial scale dependent on scenario
Above-water structure	Seabirds, pinnipeds	Long-term, spatial scale dependent on scenario
EMF	Fish, invertebrates	Long-term, small spatial scale but dependent on scenario
Humboldt Bay Port Construction, Operations and Maintenance (Section 2.3.1.4)		
Dock improvements (shading, disturbance, acoustic)	Fish, eelgrass, marine mammals	Short-term, spatial scale dependent on scenario
Dredging	Fish, invertebrates, birds, marine mammals, water quality	Short-term and longer-term effects, spatial scale dependent on scenario.
Vessel traffic	Fish, invertebrates, birds, marine mammals	Short-term and longer-term effects, spatial scale dependent on scenario.
Turbine assembly	Birds, invertebrates, fish	Mostly short-term effects and small spatial scale, except for 1800 MW scenarios
Terrestrial Construction and Operations (Section 2.3.2)		
Ground disturbance and vegetation clearing	Plants, sensitive communities (e.g., wetlands and other waters), terrestrial wildlife	Long-term, especially for invasive plant management; spatial scale dependent on site-specific biological resources
Construction (acoustics, air quality)	Birds, mammals (including bats)	Short-term; spatial scale dependent on site-specific biological resources
Upgraded towers and transmission lines (collision, perching)	Birds, bats	Long-term, large spatial scale

Potential Benthic Habitat Disturbance

The benthic habitat disturbances from construction include the export cable laying and the anchor installation. Export cable laying will entail trenching or burial of the cable to a depth of 3–7 ft (1–2 m) beneath the substrate, and anchor pile installation would disturb much deeper into the seafloor. Displaced sediment would be placed back in the trench to cover the cable, but some sediment would be dispersed by currents and re-deposited in a thin layer beyond the immediate vicinity of the trench. Ploughing and jetting methods generally have a quicker recovery of bottom topography, because the trench is filled with displaced and re-suspended material immediately after digging and cable laying (Taormina et al. 2018). This disturbance could cause small-scale topographic changes in the seafloor along the path of the cable; however, the natural movements of the sediments by ocean currents would reestablish natural bottom topography. For example, a study of the Monterey Accelerated Research System (MARS) cable in California that used remotely operated vehicle video transection and sediment samples found little detectable effect on seafloor geomorphology and no discernible change in mean grain size after cable installation at both 18 and 37 months (Kuhnz et al. 2011).

Disturbance of benthic habitat could directly affect benthic communities by displacement, damage, or crushing of organisms (Taormina et al. 2018). However, the spatial scale of disturbance is relatively localized, for example, the footprint for direct effects would be long but linear/narrow for the cable laying (e.g., on the order of 7–26 ft [2–8 m] width) (Taormina et al. 2018) (Table 13). Effects on benthic communities are dependent on community resilience, which is due in part to the nature and stability of the substrate, habitat depth, and life cycle of disturbed species (Taormina et al. 2018). For example, in extensive studies of benthic communities conducted offshore of California, Oregon, and Washington across the continental shelf, depth may be the primary factor in structuring assemblages, with the inner shelf (less than 164 ft [50 m]) differentiating from the mid- to outer shelf, which is secondarily structured by sediment composition (% sand) with finer resolution depth differentiation occurring within sediment types (Henkel et al. 2014).

From a regulatory standpoint, benthic communities are considered sensitive ecosystems because they support fish species of concern under FESA (e.g., threatened green sturgeon) or managed through the Magnuson-Stevens Fishery Conservation and Management Act. Changes in benthic ecosystem functions (e.g., availability of prey resources) can adversely affect fish species. The spatial and temporal context of disturbance and recovery times are important for understanding effects on ecosystem functions.

Table 13. Relative Environmental Effects of Construction by Scenario Alternative

Scenario Alternative[1]	Benthic Habitat Disturbance in Build-Out Area *Anchor #*	Subsea Cable Length[2] *Nautical Miles (kilometers)*	Benthic Habitat Disturbance along Subsea Cable *Acres[3] (hectares)*	Relative Effects of Construction on Water Quality[4]	Relative Effects of Construction Noise[5]	Relative Effects of Construction Vessel Collision[6]
HB-50	12	25 (46)	91.6 (36.8)	Medium	Medium	Low
HB-150	36	25 (46)	91.6 (36.8)	Medium	Medium	Medium
HB-1800	459	25 (46)	91.6 (36.8)	High	High	High
HB-1800-subsea	459	232 (430)	850 (344)	High	High	High
CM-150	36	45 (83)	164.8 (66.4)	Medium	Medium	Medium
CM-1800	459	45 (83)	164.8 (66.4)	High	High	High
CM-1800-subsea	459	232 (430)	850 (344)	High	High	High

[1] Scenarios from Table 1, North Coast Offshore Wind Study: Offshore Wind Scenario Description

[2] The cable length between the centroid point of the site and the interconnection point along the approximate cable route (as reported in Table 3, Severy and Garcia 2020). Subsea Cable to from Humboldt Bay Generating Station to San Francisco Bay assumed to be approximately 430 km

[3] Calculated as cable length multiplied by 26.2 feet (8 meters); 13.1 feet (4 meters) of seafloor on each side of the cable

[4] Vessel Collision based on # turbines, High = 1800 scenario, Medium = 150 scenario, Low = 50 scenario

[5] Noise based on construction duration: High = 4 years, Medium = 2 years

[6] Water quality based on construction duration: High=4 years, Medium = 2 years

Water Quality

Water quality would be affected during construction, including the cable laying and the anchor installation, and could also be degraded by unintentional spills or contaminants from vessels, cables, or other project components. Sediment suspended during construction, depending on sediment type, can disperse by currents and the resulting turbid plumes may last for hours to days (Taormina et al. 2018). Finer grained particles will remain in the water column and travel further distances than coarser sediment particles; however, it is expected that the area affected and duration of this effect will be short term regardless of particle size. Unintentional releases of fuels or hydraulic fluids are possible, but vessels used for construction purposes have spill prevention plans in place to address these circumstances. The longer duration of construction, scaled with project size, will influence the likelihood of effects on water quality (Table 12).

Water quality effects can be indirect; for example, the resuspension of fine sediment can affect the ability of fish to feed, or for benthic invertebrates to filter feed. Turbidity increases resulting from the installation of the undersea cable, anchors, and wind turbines are likely to constitute localized and short-term effects (Taormina et al. 2018). Direct effects from contaminants can result in death, particularly to vulnerable life stages (e.g., larvae, eggs). Chemical contamination of water quality is considerably less likely to occur than turbidity increases, but also is expected to be localized and short term.

Acoustic Effects

Construction will have short-term effects on underwater acoustic levels; underwater noise will be produced from activities associated with cable laying (e.g., jet plow, HDD vessels), and vessels used for anchor installation and deployment of the offshore substation and wind turbines. Intensity and propagation of underwater noise will vary according to bathymetry, seafloor characteristics (e.g., sediment type and topography), vessels and machines used, and water column properties (Taormina et al. 2018). Ambient sound in the marine environment originates from both natural (e.g., wave action, marine life, wind, and rain) and anthropogenic sources (e.g., commercial and recreational vessel traffic). The coast off Humboldt Bay and surrounding region experiences considerable vessel traffic-related noise associated with commercial shipping and commercial and recreational fishing activities.

Sound in the ocean may result in a range of effects on marine species, from no discernible effect to acute, lethal effects. Increases in acoustic noise, especially higher sound pressure levels, can cause marine mammal behavior modification (150 decibels [dB]) that results in reduced growth and survival (NMFS 2019c). Physical injury for marine mammals may result from peak or cumulative sound pressure levels (SPL), depending on whether the sound is continuous or impulsive, that can result in temporary or permanent hearing threshold shifts, and varying among the marine mammal species and the hearing groups (NMFS 2018). The threshold for underwater sound to result in behavioral effects (e.g., flushing, avoidance) to marbled murrelets is 150 dB root-mean-square pressure (USFWS 2014c). For fish, guidance is available for pile driving with primarily related to effects of sound pressure levels on species with swim bladders, and are typically for injury higher than threshold levels for marine mammals (Buehler et al. 2015, Hawkins et al. 2020).

DP vessels used for cable laying and other construction activities would likely produce the greatest increase to ambient acoustic levels: a vessel with dynamic positioning thrusters could be used during cable laying operations and potentially during installation of anchors and individual wind turbines. For the Virginia Offshore Wind Technology Advancement Project on the outer continental shelf in the Atlantic Ocean offshore of Virginia, sound source-level for the dynamic positioning cable laying vessel was estimated to be 177 dB re 1 micropascal (μPa) at 3 ft (1 m) (BOEM 2015), and Deepwater Wind LLC's Block Island Wind Farm estimated the sound source-level for the dynamic positioning cable laying vessel would be 180 dB re 1 μPa at 3 ft (1 m) (NMFS 2015). Cable-laying operations will likely occur for 24 hours per day for several weeks to months, assuming no weather delays, because DP vessels move very slowly. Based on DP vessel sound levels described above, the area surrounding the vessel where sound would be reasonably certain to exceed 150 dB re 1 μPa would be up to approximately 328 ft (100 m) laterally in all directions from the vessel (NMFS 2019c). Therefore, the longer the cable, the larger the number of anchors, and the longer the construction period, the greater the noise effects would be on the marine environment (Table 12). However, the noise is not anticipated to reach levels of injury except for adjacent to vessels, and the area around the vessels where noise may result in behavior modification (e.g., avoidance) is relatively small. In addition, compared with other anthropogenic sources of noise, such as impulsive sonar, piling, or explosions, underwater noise linked to vessels and undersea cables is spatially localized and temporary. Mitigation for noise often involves monitoring by marine mammal observers to inform when marine mammals are within a specific distance of vessels where noise levels may be harmful and stop or decrease noisy operations during that time.

Vessel Collisions with Wildlife

Construction vessels are likely to be moving slowly for cable laying, as well as the transport and installation of anchors, moorings, and wind turbines; however, as the amount of time during which vessels are engaged in construction increases, there may be a corresponding increase in the risk of collision (Table 12). The probability of vessel collision with whales increases with ship speed, hence vessel speed restrictions are considered an approach to minimize lethal ship strikes (Vanderlaan and Taggart 2007, Rockwood et al. 2017). The only BIA in the project's action area is for gray whales (see Section 2.2.1); the likelihood of collision is less where cetaceans are not concentrated, although vessel collision models suggest some risk to humpback whales and fin whales in the action area (Rockwood et al. 2017). Gray whales tend to be seasonally abundant during their migration, which typically occurs in nearshore coastal waters, so vessels can be operated to minimize and avoid collisions (Gende et al. 2019).

Artificial Lighting

Artificial lighting will be required during construction activities conducted 24 hours per day (e.g., cable laying). Ship lighting during nighttime construction operations will follow U.S. Coast Guard regulations for safety and navigation purposes, but may also require additional deck lighting or in-water lighting if cable laying activities involve underwater video. Artificial lighting may attract some seabird species to ships, which would increase the risks of grounding, collision with structure, and interference with night feeding. However, minimizing deck lighting and avoiding the use of bright white lights (BOEM 2019) can reduce lighting effects, especially because ships are moving and construction is temporary.

2.3.1.2 Potential Longer-Term Marine Environmental Effects Associated with Operations and Maintenance

The above-water structures include the rotating turbine blades; static nacelle, tower, and upper deck of the floating platform; and offshore substation. The potential direct operational effects of the rotating turbine blades includes seabird and bat collision, strike, and avoidance/displacement. The rotating turbine blades may create an acoustic vibration that can become transmitted into the water column and have acoustic effects on marine mammals. Potential indirect effects include changes to prey distribution. Static above-water components also represent potential collision hazards for seabirds, especially during high wind or inclement visibility conditions. They may also create roosts for birds and bats, and haul-out areas for pinnipeds.

Underwater structures have the potential to result in direct and indirect effects on the marine environment. Direct effects include collision, biofouling (i.e., colonization by algae and invertebrates), and changes to habitat and community structure such as artificial reef and fish aggregation. Indirect effects can include entanglement in lost fishing gear that becomes fixed to moorings or other structure, scour or deposition around project anchors and moorings in contact with the bottom, and establishment of a "de-facto" marine preserve.

Electrical infrastructure includes interarray cables, export cables, and the offshore substation cables. Electromagnetic fields (EMF) are generated by current flow passing through power cables during operation and can be divided into electric fields (E-fields, volts per meter [Vm^{-1}]) and magnetic fields (B-fields, microtesla [μT]). The higher the electrical current, the stronger the emitted magnetic field and induced electric field will be for cables (Gill 2016). The AC generates an alternating magnetic field near the cable that increases with current flow over the cable and the magnetic field creates a weak induced electric field of a few μVm^{-1} near the cable; cable burial does not eliminate EMF but reduces exposure to it (Taormina et al. 2018). Potential effects of EMF on marine organisms include behavioral effects such as avoidance or attraction, effects on species navigation or orientation, changes in predator/prey interactions, and physiological or developmental effects (Taormina et al. 2018). Studies conducted on cables to date indicate many marine organisms can detect EMF from cables; however, detection does not appear to result in significant behavioral changes (Gill 2016).

Operations and maintenance will require vessels to support, monitor, and maintain equipment. As discussed in Section 2.3.1.1, vessels increase underwater noise, increase risks of collisions with marine mammals, and have the potential to affect water quality due to unintentional spills of contaminants.

Avian and Bat Collision/Avoidance with Rotating Turbine Blades

The potential effects of rotating turbine blades include possible turbine avoidance by birds and thus, a reduction in habitat, as well as risk of collision with rotating turbine blades and attraction to structure for perching and foraging. To date, most of the research on seabird spatial use of potential offshore wind project areas has been conducted in Europe, where the seabird species composition overlaps but is substantially different from that of the U.S. West Coast and where the conditions under which data were gathered were in 'moderate' winds (e.g., Cook et al. 2012; Johnston et al. 2013). In the European studies, the coastal species mix includes mostly ducks, loons, grebes, shags, gulls, terns, and alcids. All of these species typically use 'flapping' flight in most wind conditions, and have the most control over their flight trajectories compared to flight behavior that includes relatively extensive periods of gliding. Moreover, flappers typically fly just above the ocean surface to exploit lower wind strengths found there, and easily avoid large objects, such as buoys, wind turbines, and ships. Such research, while instructive, does not provide information on the wind conditions that most offshore seabirds experience, at least episodically (e.g., in storms or even in persistently strong winds), nor with respect to the species mix that is typical of the U.S. West Coast. In waters off the U.S. West Coast, there is a much higher prevalence of gliding and flap-gliding species, whose behavior and flight height above the ocean surface changes with wind strength (Ainley et al. 2015). In particular, most of the glide-flappers (e.g., pelicans, boobies), flap-gliders and gliders (e.g., diving and surface-feeding shearwaters, small and large gadfly petrels [Procellariidae], and small albatrosses [Diomedeidae]) would be highly vulnerable to offshore wind-generating facilities, as their flight heights bring them well within the blade-swept zone of typical turbines when winds are strong, and their more prevalent gliding makes them less maneuverable than flappers. Winds off the U.S. West Coast during the upwelling season typically reach 30–35 knots (56–67 km/hr) daily, greatly exceeding the wind conditions investigated off European shores.

The area north of Cape Mendocino to Hecata Bank, which includes HB but not CM, is a potential multispecies seabird hotspot in Northern California/Southern Oregon (Nur et al. 2011). Factors affecting prey distribution influence seabird behavior; there is a positive association between bird concentration zones and areas where prey tend to concentrate (Ainley et al. 2009). However, the potential for collision depends upon the vertical use of space of seabirds in strong wind conditions; seabird flight behavior and flight height is affected by wind strength (Ainley et al. 2015). For permitting purposes, it may be necessary to estimate the potential of injury or fatality of birds due to turbine collision using collision models, however, models must include assumptions on the ability of birds to avoid turbine blades; for example, waterfowl are known to avoid wind turbines (Desholm and Kahlert 2005, Fox et al. 2006, Masden et al. 2012). There currently are no measurements of avoidance for U.S. West Coast seabirds with rotating turbine blades (e.g., Stumpf et al. 2011).

Even though wind resources are stronger at CM than HB, which affects flight height as discussed above, the location of HB within a potential seabird hotspot (based on Nur et al. 2011) presents an increased risk of collisions with seabirds compared with CM (Table 14). However, CM is closer to shore than HB and can potentially result in effects on a different community of nearshore birds (e.g., common murre) than HB (see Table 4). It should be pointed out that in the absence of data on behavioral responses of high flying seabirds to wind turbines off the west coast of North America, only probabilistic risk models are realizable until data on behavioral responses can be collected.

Bat distributions offshore of California are poorly understood; however, hoary bats have been seasonally observed on offshore islands such as the Farallon Islands (20 mi [32 km] due south of Point Reyes, Marin County, California [the nearest land] and 30 mi [48 km] west of San Francisco) and may be more susceptible than other bats to offshore wind farms because of their highly migratory behavior (Cryan and Brown 2007). Because CM is closer to shore than HB site, and because bats are more likely to fly across the water using visual cues, it is: (1) less likely that they will be attracted to HB than CM; and (2) more likely they will be at risk of collision with a larger project size (number of turbines) where there is a greater visual cue (Cryan and Brown 2007).

Similarly to bats offshore of California, migrant landbirds and shorebirds generally migrating along the coast generally do not occur in numbers far offshore because there is no migratory destination offshore of the northern California coast. Other offshore areas such as the North Sea, and areas of the Atlantic Ocean and the Gulf of Mexico represent oceanic areas that landbird and shorebird migrants regularly cross because there is a wintering or breeding destination on the other side of the water crossing. Landbirds and shorebirds do occasionally drift offshore of California, but typically during relatively offshore (easterly) winds or light south wind conditions (for example, reaching Southeast Farallon Island off central California). Thus, it is likely that landbirds and shorebirds would drift offshore on occasion, but not regularly, and in relatively small numbers.

Table 14. Relative Environmental Effects of Operations and Maintenance by Scenario Alternative

Scenario Alternative[1]	Relative Risk of Turbine Collision (m^2; # turbines* rotor swept area[2])	Relative Effects of Operations on Acoustics[3]	Relative Effects Structure on Habitat[4]	Relative Effects of EMF Emissions[5]
HB-50	143,872	Low	Low	Low
HB-150	431,616	Low	Medium	Low
HB-1800	5,503,104	High	High	Medium
HB-1800 subsea	5,503,104	High	High	High
CM-150	431,616	Low	Medium	Low
CM-1800	5,503,104	High	High	Medium
CM-1800-subsea	5,503,104	High	High	High

[1] Scenarios from Severy and Garcia (2020), Table 1

[2] Rotor swept area = 35,968 m^2 for the 12 MW turbine.

[3] Acoustics based on scenario scale: High = 1800 scenario, Low = 50 and 150 scenarios

[4] Effects of structure on habitat based on project footprint, High = 1800 scenario, Medium = 150 scenario, Low = 50 scenario

[5] Effects of EMF based on cable length and project capacity: High = 1800-Subsea, Medium = 1800, Low = 150 and 50 scenarios

Acoustic Effects of Operating Turbines and Maintenance Vessels

The noise from the operation of wind turbines is generated by the gearbox and generator and transferred into the ocean; typically noise source levels from offshore wind farms are influenced by the size and shape of the foundation, the age and model of the turbines, and the number of turbines (Statoil 2015). However, with floating platforms anchored to the seafloor, sound transmission from the wind turbines to the ocean is considered to be less than for offshore wind farms with fixed foundations (Statoil 2015). There are few measurements of acoustic emissions from floating offshore wind farms; one such study was conducted for the Hywind Tampen Project (Equinor 2019). Using measurements and models, they found:

> None of the threshold values for injury were exceeded in the vicinity of Hywind Tampen. The continuous sound generated by Hywind Tampen has a low sound pressure, far below any threshold values, and the accumulated energy over 24 hours also stayed below the threshold values except for the group of low frequency cetaceans where the SEL threshold for TTS onset was exceeded at distances closer than 148 ft [45 m] to the shaft of the wind turbine. The probability of an animal to stay for 24 hours within a 148 ft [45 m] radius to a wind turbine was evaluated as zero, so no overall risk was found. The continuous sound created by Hywind Tampen is only audible for marine mammals at a couple of hundred meters at average levels of ambient sound.
>
> The transient (snapping) sound has stronger sound pressure values that could approach some of the threshold levels for harassment. There are, however, many uncertainties on the exact source strength of this sound and the assessment can only be an indication. The sound pressure (SPL) from the transient

sound was below accepted criteria for injury. The accumulated energy over 24 hours (SEL) did not exceed accepted threshold values for injury.

It is reasonable to apply these findings to the HB and CM floating platform wind turbine alternatives, however, there are differences that affect model results, such as varying salinity, temperature, and depth that will need to be evaluated for the selected scenario. It is also uncertain how the number of turbines will affect sound properties, although the acoustic emissions from each turbine are likely to be additive (Madsen et al. 2006). Vessel traffic will increase between Humboldt Bay and the offshore wind sites; however, substantial vessel traffic already exists in the region and the amount of additional vessel traffic will depend on the project scale, as well as types of vessels. As described for construction, if DP vessels are needed for maintenance, acoustic levels that affect cetaceans would only occur in proximity to vessels. Therefore, the effects of acoustic emissions are likely to be minimal for the small build-out scenarios and greatest for the full scale build-out scenarios (Table 14).

Water Column and Benthic Structure: Artificial Reef, Fish Aggregating, Benthic Effects

Subsurface structures (e.g., floating platforms, offshore substation, anchors, moorings, and interarray cables) would introduce structure on the seafloor, in the water column, and at the surface, which could result in changes to marine community composition and behavior, and affect aquatic life in the action area. Areas of shelter, structure, or cover often are used by fish for protection from predators (Johnson and Stickney 1989). At full build-out, seafloor structure could include up to 459 anchors (Table 1), and water column and/or surface structure of up to 153 wind turbines with associated mooring lines and interarray cables. These structures would be placed on soft substrate that is generally lacking vertical habitat features, which could result in localized seafloor habitat changes such as scour and deposition as the hard structures (e.g., anchors, mooring chains) are deployed. Based on reviews of bottom changes resulting from deployment of renewable energy devices, artificial reefs, and offshore oil platforms, sedimentary changes could be expected to occur at least 66 ft [20 m] away from an anchor installation (Henkel et al. 2014). Structures in shallow water would likely become biofouled by algae and invertebrates such as barnacles, mussels, bryozoans, corals, tunicates, and tube-dwelling worms and crustaceans (Boehlert et al. 2008). Changes to the benthos (particularly shell hash accumulation) may be expected to occur adjacent to structure (Meyer-Gutbrod et al. 2019). Anchors may also reduce available benthic foraging habitat.

The change in habitat complexity resulting from the exposure of anchors and mooring chains above the seafloor and any resulting localized scour or shell mounding might also increase habitat complexity and provide habitat for structure-associated fish. Some types of pelagic fishes are also known to associate with floating objects (Castro et al. 2002, Nelson 2003), so project structures in the water column and at the surface (e.g., platforms, mooring lines) and associated biofouling might act as fish aggregating devices (FADs) and attract pelagic fishes through visual and/or olfactory cues (Dempster and Kingsford 2003). If project-related structures do attract marine life regularly, predictably, and in substantial numbers, they might also attract larger fish predators, which could then prey on the attracted organisms.

In the marine environment along the U.S. West Coast there are natural and human-made objects in the water column and at the surface that can serve as analogues to offshore wind farm project components and inform potential environmental effects; these include navigational and weather buoys, kelp, floating debris, piers, and oil platforms, as well as seafloor structure such as large, natural rocky reefs, artificial reefs, marine debris, and oil platform foundations; some types of fish (e.g., rockfishes) are known to associate with these structures (Kramer et al. 2015). The following describes the potential use of seafloor, water column, and surface project structures by fish, and potential effects on marine life as a result of changes to community composition, forage opportunities, and predator/prey abundances.

Project structures in the water column and at the surface are unlikely to act as FADs that would attract pelagic fish off the northern California coast. In general, fish associations with FADs are not found in temperate waters like they are known to in tropical waters, based on evaluation of the fish assemblages found at various types of natural and manmade structures in marine waters along the U.S. West Coast and in Hawaii (Kramer et al. 2015). At existing wind and wave energy projects (that have both seafloor and vertical structure) in cold-temperate waters off Europe, none of them reported a measurable FAD effect, but all of them reported an artificial reef effect where demersal fish were attracted (e.g., Wilhelmsson et al. 2006, Langhamer et al. 2009, Leonhard et al. 2011, Bergstrom et al. 2013, Reubens et al. 2014, Krone et al. 2013). In temperate ocean waters off California, Oregon, and Washington, fish associations with midwater and surface structures were generally limited to pelagic juvenile rockfishes, which have been reported at various structures such as attached kelp (Matthews 1985, Bodkin 1986, Gallagher and Heppell 2010), floating kelp (Mitchell and Hunter 1970, Boehlert 1977), oil platforms (Love et al. 2010, 2012), vertical structures of docks and pilings (Gallagher and Heppell 2010), and "SMURFs" (Standard Monitoring Unit for the Recruitment of reef Fishes) (Ammann 2004, Caselle et al. 2010, Woodson et al. 2012, Jones and Mulligan 2014). Given that pelagic fish, such as juvenile and adult salmonids and albacore tuna, are highly mobile and generally follow available prey, which includes highly mobile pelagic or surface-oriented crustaceans and fish, they could occasionally occur at project structures in the water column and at the surface but are unlikely to remain in those areas. Therefore, pelagic juvenile rockfish could occur at project structures in the water column and at the surface before settling to the bottom, but other typical FAD-associated taxa, such as piscivorous scombrids, are unlikely to occur at HB or CM due to their locations in cold-temperate waters.

Ultimately, project size (numbers of anchors, platforms, and moorings/cables) is likely to have the greatest influence on pelagic and benthic habitat and species composition (Table 14). However, the larger bathymetric span (328 ft to over 3,281 ft [100 m to over 1,000 m]) of the CM site will potentially have a greater artificial reef effect than the HB site, and affect a greater number and diversity of fish species.

Perching and Haul-Out Effects

Offshore oil and gas platforms offer perching structures for bird species including gulls, cormorants, and brown pelicans (Ronconi et al. 2015), and haul-out space for pinnipeds including California sea lions and Steller sea lions (Orr et al. 2017); these species may also occasionally prey on fish species that are present. Increased foraging is not expected to occur with pinniped haul-out or seabird perching because attraction of forage fish to underwater project structures is not expected to be significant (as discussed above with regards to community changes).

Underwater Structure and Marine Mammal Interactions

The large size of the floating platforms and moorings is expected to be readily perceived by an approaching humpback, blue, or fin whale. Even though humpback whales may be common in the HB and CM areas, the risk of a humpback whale colliding with a floating platform, anchor, interarray cable, or mooring structure is expected to be low, as examined by visualization of the likelihood and potential mechanism of encounter (Copping and Grear 2018). In addition, whales are not known to collide or become entangled with heavy, taut moorings, and heavy interarray cables, which would be used at the offshore wind project; whale entanglement appears to be associated with fishing gear such as crab pots (especially buoy lines) and lost nets (NOAA 2019c).

A potential indirect effect of deploying project structures is that they could accumulate lost fishing gear (Baird and Hossfeld 2017) transported by currents into the offshore wind project areas. This gear could include crab pots with buoy lines or commercial fishing nets (e.g., trawl or ghost nets) that may have flotation devices which make them more likely to foul or become entangled on project structures. Marine mammals could become entangled in lost fishing gear if it accumulates on surface or underwater structures. This secondary entanglement risk can be avoided or minimized by monitoring and maintaining project structure to detect and remove entangled gear. Project scale will influence the probability of encountering lost fishing gear on project structures; the greater the number of mooring lines and interarray cables, the higher the likelihood of lost fishing gear accumulation and entanglement.

Electromagnetic Field Effects

EMF would be emitted by the interarray cables, export cable to shore, and offshore substation. The interarray cables would be medium voltage (MV), cross-linked polyethylene cables rated for 33 kV. The export cable would be a cross-linked polyethylene cable rated for high voltage alternating current (HVAC). Both types of cables would be shielded and armored to prevent them from directly emitting electric fields; however, electric fields could be induced by the movement of fish and currents through the magnetic fields produced by the cables.

In general, the higher the electrical current transmitted through AC cables, the stronger the emitted magnetic field and induced electric field (Gill 2016); therefore, there is greater concern about EMF transmission with the export cables than the interarray cables. It is notable, however, that there has been remarkable consistency in the measured attenuation of AC magnetic fields (i.e., EMF strength) among 10 different project cables (most of them associated with large offshore wind farms in the EU) (Normandeau Associates et al. 2011, Bull 2015, Gill 2016). These cables exhibited an exponential decline in magnetic field strength that reached near-ambient levels within approximately 6 ft (2 m) of the cables (Normandeau Associates et al. 2011, Bull 2015, Gill 2016), and it is expected to be similar for the HB and CM scenarios. Most of the length of the export cable would be buried approximately 3–7 ft (1–2 m) below the seafloor, and installing the cable at this depth will effectively reduce the exposure of organisms at the seafloor/seawater interface to the magnetic field produced by the cable by around 80% (Normandeau Associates et al. 2011). Therefore, it is likely that EMF generated by the export cable will be similar or less than other cables that have been measured, and that EMF generated by export cable above ambient levels would not extend substantially beyond 3–7 ft (1–2 m). The backfilling of seafloor substrate over most of the length of the export cable will also minimize any likelihood that the marine environment will be exposed to EMF associated with the cable. The interarray cables will not be buried but carry a lower power output (i.e., medium voltage) than the export cable, and therefore have a lower EMF transmission relative to the export cables.

Electric fields are detected by fishes with specialized electroreceptors, including electroreceptive elasmobranchs (e.g., sharks, skates, and rays) and holocephalans (e.g., ratfish), as well as electrosensitive agnatha (e.g., lamprey), acipenseriformes (e.g., sturgeon), and some teleost fish (Normandeau Associates et al. 2011, Gill et al. 2014). Electroreception may be used to detect bioelectric fields emitted by prey, potential mates, and predators; it can also be used for short- and long-term movements or migration (Normandeau Associates et al. 2011, Gill et al. 2014). Elasmobranchs and holocephalans are the most electroreceptive marine animals because of the Ampullae of Lorenzini, which are specialized electroreceptive organs that enable them to detect very weak electric fields (i.e., as low as 5–20 nanovolts per meter [nV/m]) (Normandeau Associates et al. 2011, Gill et al. 2014). Elasmobranchs are repelled by strong anthropogenic electric fields (Gill et al. 2014). Electroreceptive teleost fish have a minimum sensitivity threshold of about 0.01 nV/m (Normandeau Associates et al. 2011) and may respond to strong electric fields (i.e., 6–15 V/m) (Gill et al. 2014).

Some animals use geomagnetic fields to orient during migration; animals that are considered to be capable of this behavior include cetaceans, sea turtles, certain fishes and crustaceans, and mollusks (Gill et al. 2014). For many of these species, geomagnetic fields are one of numerous cues used to influence migration (Normandeau Associates et al. 2011). For cetaceans and sea turtles, potential responses from EMF could include a temporary change in swim direction or a deviation from a migratory route (and subsequent slowing of the migration), but these are theoretical, untested responses (Normandeau Associates et al. 2011). Subsea transmission cables could create a very localized change in the magnetic field, but modeling EMF from cables suggests that the likelihood of such a change affecting a large enough area to elicit a significant course alteration would be low (Normandeau Associates et al. 2011). Species in the project area that may be capable of detecting magnetic fields include the Dungeness crab, green sturgeon, leatherback sea turtle, and salmonids (Normandeau Associates et al. 2011). Fish, in particular salmonids and scombrids (e.g., tuna), have a magnetite receptor system and respond to magnetic fields in the 10–12 µT range (Normandeau Associates et al. 2011). In the laboratory, juvenile salmon that were subjected to the magnetic field intensity and inclination angles similar to those found at the latitudinal extremes of their ocean distribution (northern and southern intensity used in laboratory experiments of 555.5 µT and 444.6 µT, respectively), changed their orientation (e.g., direction of swimming) (Putman et al. 2014). This study also found that subjecting fish to unnatural pairings of magnetic field intensity and inclination resulted in more random orientation (Putman et al. 2014). Dungeness crab have also been examined in the laboratory, and only subtle changes in behavior were observed for relatively high B-fields (from ~0.05 milliTesla (mT) background to 1.0–1.2 mT direct current [DC]), that were considered to represent the upper limits of an anthropogenic source that might be encountered based on reviewed literature (Woodruff et al. 2012).

EMF emissions from the offshore wind project scenarios are expected to be minor and limited to the immediate vicinity of the interarray and export cables. As described above, previous studies on EMF emitted from subsea cables detected little or no behavioral changes in invertebrates or fish, and a similar lack of responses is expected at the offshore wind project scenarios. However, there is greater uncertainty about the effects of EMF emissions from cables for the large-scale scenarios. Although it is indeterminate whether electro- and magneto-sensitive species would be capable of detecting EMF emissions from the cables, as well as the type and degree of these species' responses to EMF[11], the proportion of a given population that might be exposed to site-specific EMF generated by project scenarios is expected to be low for most of these species due to factors such as migratory range and available habitat, and low likelihood of exceeding biologically relevant EMF emission thresholds. Even if individuals encounter and are exposed to magnetic fields or induced electric fields, any potential effects are expected to be short term and minor because of the very localized fields relative to the earth's geomagnetic field potentially being used for navigation; therefore these species are not expected to be affected by EMF. Bottom-oriented fish and invertebrates could be more exposed to EMF from the export cables than pelagic fish; however, all of the cables will be shielded and armored, and most of the length of the export cables will be buried, limiting the exposure of these organisms to EMF. Based on the low levels of EMF expected, and spatially limited exposure to fishes, it is anticipated that relatively minor, short-term potential effects, if any, could occur (Table 14).

2.3.1.3 Potential Marine Environmental Effects Associated with Decommissioning

Decommissioning will entail removal of project components including anchors, interarray and export cables, etc., and restoring or implementing mitigation for effects on the seafloor. Similar to construction effects, decommissioning will have short-term potential effects on the marine environment that include disturbance of benthic habitat, changes in water quality (e.g., sedimentation, contaminants), increased noise from DP vessels and cable removal operations, and vessel interactions with marine wildlife, which are all described in Section 2.3.1.1.

2.3.1.4 Potential Marine Environmental Effects Associated with Humboldt Bay Port Construction, Operations and Maintenance

Construction, operations and maintenance within Humboldt Bay will include improvements to or installation of new port infrastructure to support offshore wind turbine assembly and deployment, such as dock facilities, channel improvements (e.g., new dredged areas, increased frequency of dredging), increased vessel use and assembly (e.g., potential effects of acoustics, collision, propeller wake, and invasive aquatic species), anchoring and ballasting of platforms or anchoring of vessels supporting platforms within Humboldt Bay (e.g., bird

[11] Ongoing research on species' responses to EMF can be queried using the Environmental Studies Program Information System available online: https://marinecadastre.gov/espis/#/

collision, benthic habitat effects associated with anchoring, fish entrainment associated with ballasting) (Table 15).

Dock improvements and construction will vary by scenario. For the 1800 build-out scenario much larger dock facilities will likely be required with a significant increase in dock area that shades intertidal shoreline areas. Smaller build-out scenarios will not require new dock areas but will necessitate improvements or rebuilding of existing docks, and may actually result in a decrease in dock area that shades intertidal shoreline from the existing docks at Redwood Marine Terminal 1 (Table 15). Dock rebuilds or new dock installations will include removal of old dock structures, including piles, and replacement with new piles (with likely different pile configurations) and stronger overwater structures to support the weight of offshore wind turbine assembly. Potential effects associated with dock construction will include increased suspended sediment and turbidity, direct and indirect effects on eelgrass and subtidal/intertidal habitat, and noise associated with pile driving or vibration hammers. Long-term effects on eelgrass may be mitigated by decreasing intertidal shading from the existing dock installation at Redwood Marine Terminal 1 to a smaller dock footprint for the smaller build-out scenarios; however, new dock installation for the full build-out will increase shading over intertidal habitat that supports eelgrass and will require additional mitigation for effects on eelgrass (Gilkerson and Merkel 2017). Short-term effects include replacement of existing piles or the installation of new piles, which will require pile driving or installation by vibratory hammer, as well as disturbance associated with use of barges on intertidal areas during construction, which can be avoided, minimized, or offset by various methods. There is potential for long-term indirect effects of overwater structure on shorebirds that require exposed shoreline for feeding, and black brant, which is dependent on eelgrass for forage, unless impacts to eelgrass can be mitigated.

Dredging will have both long-term and short-term effects. All project scenarios will likely entail a greater frequency and duration of dredging than currently occurs in existing channels, and for the full build-out scenario additional new areas will likely require deepening by dredging. The effects of dredging include: (1) short-term effects of elevated levels of suspended sediment and turbidity from dredging and dredge disposal; (2) longer-term effects of removal of epibenthic and benthic invertebrates that are prey items for fish and other marine animals; and (3) burial of prey items from dredge disposal (NMFS 2019). Because dredging existing channels has been an ongoing activity, mitigation actions have been developed to minimize impacts on listed species, their designated critical habitat, and EFH (NMFS 2019); however, increased duration and frequency of dredging may result in more types of substantial adverse effects or increases in the magnitude of existing effects and will require new consultation with the regulatory agencies. The effects of deepening new areas that have not been previously dredged represents an increase in the magnitude of existing effects that would result in: (1) removal of subtidal habitat (and associated benthic organisms) and replacement with deeper channel habitat; and (2) potential changes to Humboldt Bay hydrodynamics associated with greater tidal exchange and volumes, depending on the area that is deepened. Deepening new or existing channels will be a challenge that will require additional permitting and that will take several years (Port of Long Beach 2019).

Table 15. Relative Environmental Effects of Construction, Operations and Maintenance by Scenario Alternative in Humboldt Bay

Scenario Alternative[1]	Relative Effects of Dock Improvements[2]	Relative Effects of Dredging[3]	Relative Effects of Increased Vessel Traffic[4]	Relative Effects of Turbine Assembly[5]
HB-50	Low	Low	Low	Low
HB-150	Low	Low	Medium	Medium
HB-1800	High	High	High	High
HB-1800-subsea	High	High	High	High
CM-150	Low	Low	Medium	Medium
CM-1800	High	High	High	High
CM-1800-subsea	High	High	High	High

[1] Scenarios from Table 1, North Coast Offshore Wind Study: Offshore Wind Scenario Description
[2] Dock Improvements: Low = 50 and 150 scenarios, High = 1800 scenario
[3] Dredging: Low = 50 and 150 scenarios, High = 1800 scenario
[4] Effects of vessel traffic, High = 1800 scenario, Medium = 150 scenario, Low = 50 scenario
[5] Effects of turbine assembly: High = 1800, Medium = 150, and Low = 50 scenarios

Increased vessel traffic is a given with a new industry to Humboldt Bay; however, the types of vessels, frequency of transit, and need for additional dock space will depend on the build-out scenario (Table 15). Increased vessel traffic will: (1) increase vessel traffic noise, which could affect use of Humboldt Bay by marine mammals; (2) increase the risk of collision with marine mammals that occur in the bay; (3) increase propeller turbulence and wake, which may affect nearshore habitat by increasing erosion; and (4) potential to introduce marine invasive species. In addition, increased vessel traffic may increase disturbance to waterbirds and shorebirds associated with Humboldt Bay. Humboldt Bay is already a port with existing vessel traffic, so ambient conditions include vessel activities that may currently be more seasonal in nature (e.g., during Dungeness crab commercial fishing season, or summer recreational salmon fishing season). Most of the effects associated with increased vessel traffic can be minimized; for example, lowering speed limits can reduce the noise from vessels, risk of collision, and the effects of propeller turbulence and wake. In addition, the California Marine Invasive Species Act has regulations for vessel ballast water exchange and management practices to minimize spreading of invasive species from vessel hull fouling (see Public Resources Code – PRC Division 36. Marine Invasive Species Act [71200–71271]). Lastly, there is an increased risk of unintentional contaminant spills, which would degrade water quality (Section 2.3.1.1).

The port facilities will support assembly of the turbines prior to deployment offshore. During assembly, several activities can have environmental effects, depending on the scenario. When the turbines are being assembled at dock facilities, there is an increased risk of collision with shorebirds and other bird species known to use the bay. The full build-out scenario will have a much larger number of turbines and hence will entail a longer assembly time at the port, increasing the risk of collision (Table 15). Anchoring of vessels and platforms will locally affect benthic habitat and organisms, although the effects are likely to be small in scale and localized. There is a potential need to ballast or partially ballast the floating platforms prior to deployment off the coast.

Potential environmental concerns associated with ballast include entrainment of fish and other small organisms into the ballast tanks. Species listed under the ESA will be a priority concern, including longfin smelt and coho salmon; there may be times of year when ballasting activities should be avoided to minimize effects on these species, or measures can be taken to screen species from ballast water intakes.

2.3.2 Potential Environmental Effects on Terrestrial Species and Habitats

Implementation of the proposed action would result in environmental effects on the components of terrestrial ecosystems, including sensitive natural communities, wetlands and other waters, and non-listed plant and wildlife species. The general types of environmental effects anticipated include habitat alteration or loss, ground disturbance, and exposure to disturbance from noise and vibration. The terrestrial ecosystems present at the cable landfall sites would be affected by HDD, including the associated noise, ground disturbance, and likely use of artificial lighting for nighttime work. The proposed action also has the potential to result in the introduction and spread of invasive plant species. This section discusses these effects as they pertain to terrestrial ecosystem components, provides relative comparisons between the overland transmission routes and cable landfall locations, and includes environmental measures to avoid and/or minimize effects on terrestrial ecosystems.

2.3.2.1 Non-Listed Special-Status Plant Species

The ground disturbance that would occur during implementation of the transmission line upgrades and construction at the cable landfall locations would be the primary effect mechanism for non-listed special-status plant species subject to regulation under CEQA. The overland transmission routes did not differ substantially in the number of CNDDB occurrences for non-listed special-status plants; most of the vegetation community types mapped along each route represent potential habitat for one or more of these species. There are CNDDB records for pink sand-verbena (*Abronia umbellata* ssp. *breviflora*), which has a CRPR 1B.1 (rare or endangered in California and elsewhere; seriously endangered in California), at both cable landfall locations (CDFW 2019c). The South Spit site also intersects with CNDDB records for western sand-spurrey (CRPR 2B.1; rare, threatened, or endangered in CA but common elsewhere) and dark-eyed gilia (CRPR 1B.2; rare, threatened, or endangered in CA and elsewhere) (CDFW 2019c).

Implementation of the following environmental measures would avoid and/or minimize effects on non-listed special-status plants.

- Retain qualified botanists to conduct floristic surveys to document special-status plant populations in areas where ground disturbance would occur; one or more surveys may be required to coincide with the identification periods of the applicable species.
- Conduct the floristic surveys in accordance with CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018b).

If special-status plant populations are found in areas where ground disturbance would occur, contact CDFW to determine appropriate measures for the affected species. These measures may include redesigning the construction footprint, installing high-visibility exclusion fencing and/or flagging around the populations, and retaining a biological monitor.

2.3.2.2 Listed Plants

The ground disturbance that would occur during implementation of the transmission line upgrades would be the primary effect mechanism for threatened and endangered plants. Both routes overlap with designated critical habitat for Kneeland Prairie penny-cress, and the east route also intersects with designated critical habitat for slender Orcutt grass (USFWS 2019c). Therefore, consultation (formal or informal) with USFWS under Section 7 of the FESA would be required for both routes. Slender Orcutt grass is also listed as endangered under CESA, and coordination with CDFW would be necessary to determine whether an incidental take permit for this species would be required under CFGC Section 2081. According to CNDDB, there are more reported occurrences of federally and/or state listed threatened and endangered plant species within 5 mi (8 km) of the south route than the east route (CDFW 2019c). However, route-specific floristic surveys conducted during the appropriate times of year (i.e., when plants are evident and identifiable) would be required to document whether federally or state listed plant species are present in the affected areas along each route. Multiple floristic surveys will likely be needed (e.g., in spring and summer) in a given year to coincide with the reported identification periods (typically the blooming or reproductive periods) of the species with the potential to occur in the survey area. USFWS and CDFW may also require that the floristic surveys be conducted during one or more years of average or above-average rainfall.

Implementation of the following environmental measures would avoid and minimize effects on listed plant species.

- Retain qualified botanists to conduct floristic surveys to document listed plant populations in areas where ground disturbance would occur; one or more surveys may be required to coincide with the identification periods of the applicable species.
- Conduct the floristic surveys in accordance with CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018b) and USFWS's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 1996b).
- If listed plant populations are found in areas where ground disturbance would occur, contact USFWS and/or CDFW (for state listed species only) to determine appropriate measures for the affected species.

2.3.2.3 Terrestrial Wildlife

Ground-disturbing activity, including tower pad preparation and construction, grading of new access roads, tower removal, and use or improvement of existing access roads, has the potential to disturb terrestrial wildlife species. In addition, helicopter construction would generate noise, vibration, dust, air turbulence, and visual disturbance. The potential effects on terrestrial wildlife species are discussed below.

Short-Term Onshore Construction Effects on Birds

Sound from HDD and other construction activities (e.g., transmission line upgrades, port facility improvements) could disturb birds in the vicinity of the nearshore (sub-surface) and onshore cable interconnection points during the project's construction phase. Nesting and non-nesting birds that could be affected by project activities include western snowy plovers that may use the beach for nesting, wintering, or foraging; seabirds such as scoters, gulls, loons, and marbled murrelets that may be present in nearshore waters; shorebirds that may be present on the sandy beaches; and nesting or non-nesting songbirds and raptors, including golden eagles, in coastal and inland habitats.

Masking of HDD noise is expected to be substantial due to heavy surf and strong onshore winds. Auditory perception is dependent, in part, on filtering background noise: near-constant ambient noise is expected to largely or completely mask the sound associated with the HDD.

Ground-disturbing activity, including tower pad preparation and construction and grading of access roads, has the potential to disturb vegetation used by nesting birds. The removal of habitat during the breeding season would likely result in the displacement of breeding birds and the abandonment of active nests. Noise from helicopter operation, which would occur in many sections of the transmission corridor, could also adversely affect nesting birds. Transmission line upgrades could also result in direct or indirect effects on raptors that utilize the existing towers for nesting or burrowing owls that utilize the edges of the agricultural fields, existing roads, and irrigation canals for wintering or breeding habitat. Breeding birds and other wildlife may temporarily or permanently leave their territories to avoid construction activity, which could lead to reduced reproductive success and increased mortality. The use of helicopters for project construction would increase noise, vibration, dust, and air turbulence, and would cause visual disturbance to nesting birds. These factors could result in the disruption of breeding activity, and subsequent nest failure (particularly golden eagles). Several CNDDB records indicate that golden eagles nest within 5 miles of the overlapping segment of the overland transmission routes Humboldt County and within 5 miles of the south route, including two nests within 0.5 mile: one east of Kneeland Road before the east/south route split, and one 2.5 miles east of Miranda, west of Dyerville Loop Road on the south route (CDFW 2019c). Golden eagles are a fully protected species in California and they are further protected under the federal Bald and Golden Eagle Protection Act. Coordination with CDFW would be necessary to determine avoidance measures. With the exception of a few species, nesting birds are protected under the Migratory Bird Treaty Act. Nesting birds are also offered protection by the CDFW under CFGC Section 3503 and others. Construction and maintenance activities associated with the transmission line for the 1800 MW scenarios could also remove or alter terrestrial bird habitat, including habitat for threatened or endangered bird species. However, the effects of construction activities on terrestrial birds would be temporary, and bird species' use of the affected area would be expected to resume following completion of construction and site restoration activities. Nesting season is generally from February 1 through August 31. To minimize effects, pre-construction nesting bird surveys would need to be conducted prior to any project site disturbance (e.g., vegetation removal, helicopter flight paths). If nesting birds are found in areas where project site disturbance would occur, USFWS and CDFW would be contacted to determine appropriate avoidance and/or minimization measures for the affected species, which typically involve establishing disturbance-free buffer zones around the active nests. These measures may also include altering helicopter flight paths for nesting raptors (e.g., eagles), installing high-visibility exclusion fencing and/or flagging around nest sites to delineate buffer zones, and retaining a biological monitor to ensure that take of protected birds does not occur. If these measures are implemented, construction and maintenance activities are not likely to result in substantial adverse effects on terrestrial birds.

Longer-Term Operations and Maintenance Effects on Birds

Utility structures can benefit birds by providing perching, roosting, or nesting structures in areas where few natural perches, roost sites, or nest sites exist. However, utility structures also can pose a risk to birds through collisions and electrocutions.

Avian mortality from collisions with power lines is well-documented and some birds are more susceptible to collision, such as heavy bodied waterbirds (e.g., loons and pelicans) and falconiformes (e.g., eagles and hawks) (APLIC 2012). For most species, mortality from collisions does not result in population-level effects (Loss et al. 2014). Flying birds generally depend on free air space for their movements; however, several species have evolved sophisticated behavioral and biomechanical adaptations for moving around in structurally complex habitats. A steadily growing number of human-created obstacles have increased the collision hazards for birds, particularly through the erection of overhead wires for energy transmission and telecommunication, with risk affected by several physical, biological, and behavioral factors discussed below (APLIC 2012).

Factors Affecting Risk—

Line Placement—Transmission lines are most hazardous for collision when they: (1) transect or parallel areas associated with relatively high concentrations of birds (e.g., wetlands, riparian areas); or (2) separate areas used for different life history functions (e.g., breeding, foraging, and roosting) (APLIC 2012). Therefore, the risk of collision increases near wetlands, valleys that are bisected by transmission lines, and within narrow passes where lines run perpendicular to flight paths.

Line Type and Configuration—The type and configuration of transmission lines influences avian collision risk. Shield wires, which are smaller, less visible, and located above conductors and towers cause the majority of avian collision mortalities (APLIC 2012). Collision risk is also affected by the number of cable levels, with more levels resulting in higher risk, apparently because only a small change in flight altitude is needed to avoid a single level of cables. However, the influence of power line design on collision rates is not well understood, but bird friendly line modification are available (APLIC 2012).

***Weather*—**Decreased visibility as a result of low light conditions, rain, snow, or fog, can increase the risk of avian collision (APLIC 2012). High winds can also increase the risk of collision by blowing birds into transmission lines.

***Age*—**Juveniles tend to have a higher risk of collision than adults (APLIC 2012). Three factors may account for this pattern: (1) juveniles normally constitute the majority of bird populations, especially in fall; (2) juveniles generally have poorer flying abilities than adults; and (3) juveniles generally are less aware of hazards than adults.

***Flight Performance*—**Flight performance (e.g., maneuverability) strongly influences species' risk of collision (APLIC 2012). Species with high wing loading and low aspect ratio (i.e., species with large, heavy bodies and comparatively small wings) also have a higher risk of colliding with power lines. These birds are characterized by rapid flight, and the combination of a heavy body and small wings restricts swift reactions to unexpected obstacles. Examples of such species include some Anseriformes (ducks and geese) and Gruiformes (coots and rails), which are especially prone to collisions with transmission lines. Some Ciconiiformes (herons, egrets, and ibises) and Pelecaniformes (pelicans and cormorants) are also particularly susceptible to these collisions.

***Behavior*—**Bird collisions generally occur when: (1) birds cross power lines in daily use areas (e.g., while moving between foraging and roosting habitat); and (2) migrating individuals encounter lines while traveling at reduced altitudes (APLIC 2012). Therefore, species whose foraging, breeding, and/or roosting areas are geographically separated and migrating individuals that fly at low altitudes are at a higher risk of collision. Although passerines (songbirds) and waterfowl are known to collide with wires during nocturnal migration or poor weather conditions, they have a lower potential for collisions than larger birds, such as raptors (APLIC 2012). Some behavioral factors contribute to a lower collision mortality rate for these birds. Passerines and waterfowl tend to fly under power lines, while larger species generally fly over lines, where they risk colliding with higher ground wires (see the discussion of line type and configuration above). Also, many smaller birds tend to reduce their flight activity during poor weather conditions. Aerial hunters such as raptors possess excellent flying abilities. However, they spend a major part of their life in the air, and the probability of crossing (and colliding with) transmission lines is higher compared to ground-dwelling species, which may explain why aerial predators are regularly recorded as collision victims, although in seemingly small numbers. Likewise, gulls are frequent collision victims, presumably because they spend much of their time in the air, are social, and are numerous—traits that increase collision risk compared with more solitary, terrestrial species. The influence of social behavior on collision risk is well illustrated by comparing eagles and cranes. Eagles are rarely reported as collision victims probably due to both low exposure (i.e., low number of crossings per day) and their solitary habits, whereas cranes are at relatively high risk of collision and tend to travel in flocks.

Electrocution of birds can take place when a bird touches either two conductors or one conductor and a grounded device simultaneously, especially when their feathers are wet. Body size and behavior, such as perching and roosting on poles and wires, are the keys to understanding bird electrocution risks. Small birds (smaller than an American crow) have a reduced chance of becoming electrocuted because the conductors and grounded wire and devices are generally too far apart. However, flocks of birds crossing a power line (and when several roosting birds take off simultaneously) have resulted in short circuits, as the current can pass through several individuals. Due to the recent implementation of transmission structure guidelines in APLIC (2012) resulting in improvements in distribution and transmission line structure and conductor configurations, electrocutions of even very large birds on power lines have been substantially reduced (APLIC 2012). Larger transmission lines, with their greater insulator lengths and distances between metal structures and conductors, are not typically responsible for electrocutions, even in large birds; electrocution is mainly a problem associated with distribution lines and structures (APLIC 2012).

Effects on Mammals, Amphibians, and Reptiles—The removal of vegetation from the transmission line upgrades for the 1800 MW scenarios would result in direct effects on wildlife from the temporary and permanent loss of habitat. Construction activities would result in the displacement and/or potential mortality of resident wildlife species that are poor dispersers such as snakes, lizards, and small mammals. Construction may also result in the temporary habitat degradation in and adjacent to the transmission line upgrade area. Noise, dust, and visual disturbances from increased human activity, helicopter operation, and exhaust fumes from heavy equipment used during construction would temporarily result in reduced habitat quality for wildlife adjacent to the construction zone. Direct mortality of small mammals, amphibians, and reptiles that are less mobile would likely occur during construction. The primary mechanisms would be habitat removal (e.g., vegetation clearing), ground disturbance (e.g., grading, excavation), and equipment staging and movement. More mobile species (i.e., birds, larger mammals) are expected to disperse into nearby habitat areas during construction.

Clearing, grading, and noise (e.g., from helicopters) would result in the most substantial construction effects on wildlife, especially in undeveloped segments of the transmission line. If removal of trees or snags is necessary within the project footprint, arboreal mammalian species (e.g., Pacific fisher) may be disturbed and if removal occurs during denning periods, this may result in take of dependent young. Surveys conducted in conjunction with nesting bird surveys would facilitate identification of denning mammals. CNDDB records indicate that the east route passes through areas with known Pacific fisher presence near State Route 36 in Trinity County and in the vicinity of the south overland transmission route near Laytonville, Mendocino County. It is unlikely that Pacific fisher will occur in the transmission corridor however, if denning is detected, USFWS and CDFW would be contacted for appropriate measures. Construction would affect wildlife in adjacent habitats by interfering with breeding or foraging activities and movement patterns, causing animals to temporarily avoid areas adjacent to the construction zone. Nocturnal wildlife would be affected less by construction than diurnal (i.e., active during the day) species because construction would occur primarily during daylight hours. More mobile species like birds and larger mammals are expected to disperse into adjacent habitat areas during the land clearing and grading phases associated with tower construction. Depending on the timing and location of project activities, construction may also result in temporary disruption along terrestrial and riparian wildlife movement corridors crossed by the overland transmission routes.

Vehicle and equipment travel on existing access roads may also disturb wildlife. Access to the tower locations varies greatly depending on the project segment. Most of the routes have clearly defined access roads that run adjacent to the existing tower locations. In many instances vehicle access would be accomplished by traveling on roads within the existing transmission line corridor. In addition, the relatively flat or gently sloping topography in these segments facilitate access, staging, and construction near each tower footing. In these areas vehicle disturbance would be limited to a narrow swath of habitat immediately adjacent to the existing structures. Pre-activity surveys for burrowing mammals that may occur within proposed staging areas and project disturbance areas in grassland habitats and high prairies would reduce or eliminate effects on species such as American badger. If burrow complexes or dens are detected during pre-activities surveys, CDFW would be contacted to determine appropriate measures for the affected species. These measures may include altering/establishing no-disturbance buffers, installing high-visibility exclusion fencing and/or flagging around burrow complexes, and retaining a biological monitor. A common mitigation measure employed for project vehicle travel to, from, and within project sites is enforced reduced speed limits which reduces the probability of collisions with wildlife.

However, much of the topography consists of sharply rising slopes, deep canyons, and mountainous terrain. Vehicle access to many of the towers is restricted by the terrain and may not be possible in some locations. These areas would likely require the use of helicopter construction techniques. Similarly, the terrain limits the use of access roads that run adjacent to the existing transmission line corridor. However, existing forest roads would be used to access many of the towers; and it is likely that these roads were utilized during the construction of the original transmission line. Depending on their location, these roads may cross numerous small drainages, creeks, dense woodlands, and highly erodible slopes. While some of these roads occur in proximity to the existing line, vehicle and equipment travel would occur in habitat areas that are used by many wildlife species. In addition, the many small drainages and creeks that are crossed by the roads provide important riparian habitat and water sources for wildlife.

The transmission line improvements would be constructed along the existing Pacific Gas & Electric designated utility corridor. Most of the wildlife expected to be affected by construction in these disturbed easements are composed of common, wide-ranging species. Due to the narrow area of disturbance along this project and the short duration of disturbance, many common wildlife species occurring along the transmission line route are expected to quickly re-colonize the area after construction activities have been completed. However, re-colonization rates will depend on the rate of revegetation at each disturbed site, with slower wildlife re-colonization in vegetation communities that are difficult to restore and slow to recover from disturbance. The use of access roads would also result in the temporary decline of species in the immediate vicinity of the road and may result in vehicle collisions with wildlife; however, the effects of traffic are typically short term and vehicle speeds would be limited.

Effects on Bats—Construction activities (e.g., bright lights used for nighttime construction or construction activities that generate high frequency sound) have the potential to disturb roosting bats to the extent that the bats may abandon the roost. For example, adult female bats at a maternity roost (i.e., females that are pregnant or are raising young) that are disturbed may abandon the roost and possibly their young. If bats abandon a roost during daylight hours, they are subject to predation by raptors, corvids, and other birds. The following is a discussion of the potential direct and indirect effects of the proposed action on bats.

Effects of High Frequency Sound on Roosting Bats—Ultrasonic sounds can disturb roosting bats to the point that the bats will abandon a roost (California Department of Transportation 2016, DTSC 2017). The operation of small gasoline generators and the use of backhoes for trenching produce high frequency sounds that could potentially disturb a colony. Additionally, operating cranes, graders, trucks, and other construction equipment are expected to emit high frequency sounds that could disturb bats that are not typically exposed to such sounds.

Increase in Artificial Light Levels at Night on Roosting and Foraging Bats—Whereas a few species of bats benefit from foraging around lights that attract nocturnal insects, many bat species show an aversion to areas with anthropogenic lights (Mathews et al. 2015, DTSC 2017). An increase in light values for permanent or temporary situations near roosts can potentially increase predation on bats and possibly cause bats to abandon a roost. A review of lighting and impacts on bats is provided by Fure (2006) and Rowse et al. (2016). To mitigate, lighting should be minimized at night or construction limited to daytime activities, and employ buffer zones between lights and bat roost sites based on species (California Department of Transportation 2016).

Air Quality Degradation—Idling motor vehicles and generators produce exhaust that can substantially affect roosting bats to the extent that the bats will abandon their roosts. This is especially true during the maternity season when bats tend to be more sensitive and are more easily disturbed. Preconstruction surveys for roosting bats should be conducted near the areas to be disturbed and buffer zones employed (California Department of Transportation 2016) for exhaust-generating construction equipment around roosts.

Wetlands and Other Waters

Wetlands and other waters in the terrestrial component of the action area may be affected by ground disturbance if it results in hydrological interruption or the discharge of fill materials into aquatic resources. Runoff from construction areas (e.g., storm water, fuel, or motor oil) could also result in adverse effects on wetlands and other waters by degrading water quality. On the basis of the available data from NWI and NHD, the transmission line improvements along the east route would result in relatively higher environmental effects on aquatic resources than the south route. The east route contains a substantially greater acreage of NWI-mapped water bodies than the south route. The difference in the NWI acreage totals between the two routes was primarily due to additional riverine habitat mapped along the east route, which has a correspondingly higher number of stream crossings. The cable landfall locations would both entail drilling underneath Humboldt Bay, and HDD has the potential to result in the inadvertent release of drilling fluid (i.e., frac-out) in the bay.

The environmental measures listed above for sensitive natural communities would be implemented for the avoidance and/or minimization of effects on wetlands and other waters, and the following additional measures would also be applied.

- Develop and implement a Storm Water Pollution Prevention Plan (SWPPP)

- Develop and implement a Spill Prevention Control and Countermeasure Plan (SPCCP)
- Develop and implement an HDD Contingency Plan

The SWPPP, SPCCP, and HDD Contingency Plan would need to be approved by the applicable USACE District/s and RWQCB/s prior to implementation of the proposed action. These regulatory agencies may require additional environmental measures during their respective permitting processes. The east route intersects with the jurisdictions of the North Coast and Central Valley RWQCBs and two USACE Districts: San Francisco and Sacramento. The south route occurs within the jurisdictions of the North Coast RWQCB and the San Francisco USACE District.

Aquatic Organisms—Fish, particularly FESA- and CESA-listed salmonids, amphibians (especially FESA listed California red-legged frog) and aquatic invertebrates could be affected by habitat modification if transmission line upgrades include clearing of additional riparian vegetation at stream crossings; vegetation removal can decrease aquatic habitat complexity (e.g., large woody material, overhanging vegetation), and result in increased stream temperatures by decreasing shade over watercourses, and decrease nutrient input, having detrimental effects to habitat quality in the short- and long-term. New roads or road improvements can alter drainage to watercourses and modify or divert water flow. Because the upgrades for the 1800 MW scenarios will be along existing transmission line corridors, it is anticipated that there will only be minor, incremental long-term effects to aquatic habitat.

Transmission line improvement activities upslope from aquatic habitats could also generate runoff that enters these habitats and adversely affects fish, invertebrates, and amphibian through direct mortality or sublethal effects to all life stages (e.g., egg masses, larvae, and adults). Runoff could include erosional silt and spills of toxic chemicals that may be washed into aquatic habitats during rain events. Toxic chemicals subject to spillage and runoff include, but are not limited to, engine fuels (e.g., gasoline and diesel); motor oil; hydraulic fluid; and various other oils, greases, and solvents. Silt can adhere to the eggs of fish and amphibians and interrupt gas exchange, while toxic chemicals may poison inhabitants of aquatic habitats. In addition to measures listed above for wetlands and other water habitats, implementation of best management practices (BMPs) to control erosion and sediment during construction would avoid and/or minimize these effects on aquatic organisms.

Sensitive Natural Communities

The ground disturbance that would occur during implementation of the transmission line upgrades and HDD activities would be the primary effect mechanism for sensitive natural communities. On the basis of the available data from CALVEG and CNDDB, the transmission line upgrades along the east route would result in relatively higher environmental effects on sensitive natural communities than the south route. The east route intersects with more sensitive natural communities and supports a higher acreage of oak woodlands than the south route. Both cable landfall sites support natural communities that provide habitat for special-status species; therefore they are considered sensitive natural communities and would be affected by ground disturbance associated with HDD activities. The area encompassed by natural communities on the South Spit site is larger than that of the

Fields Landing site, which is adjacent to residential development, commercial areas (e.g., marina and recreational vehicle park), and Buhne Drive.

The following environmental measures would be implemented for the avoidance and/or minimization of effects on sensitive natural communities resulting from transmission line upgrades and HDD activities. Additional environmental measures may be required by regulatory agencies during permitting processes.

- Install high-visibility exclusion fencing and/or flagging to protect sensitive biological resources (e.g., sensitive natural communities, wetlands, special-status species habitat) adjacent to work areas.
- Conduct mandatory environmental awareness training for construction personnel.
- Retain a qualified biologist to conduct monitoring during work in or adjacent to sensitive natural communities and special-status species habitat.
- Limit ground disturbance to the minimum area necessary to complete the work (including access routes and staging areas).

Invasive Plant Species

Utility corridors such as the overland transmission routes are identified by Cal-IPC (2012) as at-risk sites for the introduction and spread of invasive terrestrial plants. Construction vehicles and equipment can transport seeds and other propagules, and construction and maintenance activities can introduce or spread invasive plants through project materials (e.g., imported fill) and ground disturbance (Cal-IPC 2012). The numbers of invasive plant species that have been identified along the east and south routes are similar (Calflora 2019).

The environmental measure that would be applied to avoid and minimize the introduction and spread of invasive plant species is the implementation of one or more of the BMPs from Cal-IPC's *Preventing the Spread of Invasive Plants: Best Management Practices For Transportation and Utility Corridors* (Cal-IPC 2012). This measure is consistent with the requirements of Executive Order 13112. Implementing BMPs to minimize the introduction and spread of invasive plants in utility corridors may reduce fire hazards, future maintenance needs and costs, and herbicide use (Cal-IPC 2012). These types of BMPs can also enhance access, safety, and visibility; limit liability for the governing agency or lessee; and protect existing habitat for native plants and wildlife, including threatened and endangered species (Cal-IPC 2012). Examples of general BMPs recommended for utility corridors are provided below (Cal-IPC 2012).

- Minimize soil and vegetation disturbance.
- Provide prevention training to staff and contractors prior to starting work.
- Designate specific areas for cleaning tools, vehicles, equipment, clothing, and gear.
- Clean tools, equipment, and vehicles before transporting materials and prior to entering and leaving worksites.

- Clean clothing, footwear, and gear before leaving infested areas.
- Designate waste disposal areas for invasive plant materials, and contain invasive plant material during transport.

2.3.3 Conclusions

Based on the analyses in 2.3.1 and 2.3.2, there are some general conclusions that can be made about the relative potential environmental interactions for the two offshore sites analyzed and different project scales. First, project scale/size is the primary factor in determining the numbers and degree of impacts on resources of concern. Therefore, the major infrastructure needs (port infrastructure, overland transmission improvements) to support a large-scale project, as well as longer construction windows, increased project footprint, higher number of project components, and greater power export, are anticipated to result in the largest magnitude of effects. Second, the greater distance between the CM site and the port at Humboldt Bay would result in longer transits for vessels during all phases of project development, increasing the risks of marine mammal collision. Third, because of the greater bathymetric span of the CM site, more fish species and habitat types will be affected than at the HB site.

Many of the data gaps and uncertainties will be addressed through site-specific data collection that will occur prior to and during the initial planning and analysis phase after BOEM lease issuance, and will continue as needed during construction and operation. The BOEM requires the following types of studies prior to issuing leases: geological/geotechnical, shallow hazards, archaeological resources, biological resources, sensitive biological resources and habitats, threatened and endangered species, social and economic resources (including visual/aesthetic resources), water quality, and coastal and marine uses. The most substantial information gaps for the proposed action are for benthic invertebrates and habitat, and geological/geotechnical data. These gaps need to be addressed to inform the construction and operations plan, including project layout, finalizing cable routes, and appropriate methods for offshore construction. Additionally, addressing these gaps can provide baseline information to identify potential project effects that will require additional monitoring or mitigation during operations.

Recently, deep sea areas (e.g., continental shelf and slope) off California, Oregon, and Washington, including HB, were evaluated by EXPRESS (Expanding Pacific Research and Exploration of Submerged Systems). EXPRESS is a multi-year, multi-institution cooperative research effort to gather data and information to improve understanding of living marine resources and habitats, and inform ocean energy and mineral resource decisions. The EXPRESS studies collected multibeam bathymetry, backscatter sonar images, photos, videos, and samples that are being synthesized to develop comprehensive digital elevation models, habitat maps, and geologic maps needed to address key issues associated with marine spatial planning, ecosystem assessments, geohazards, and the effects of offshore infrastructure development on sensitive ecosystems (USGS 2020). Some of the information gaps for the proposed action will be addressed when the EXPRESS study results are published.

Information on species presence (e.g., timing, distribution) for birds, fish, and marine mammals is available for northern California; however, the potential risks to species from offshore wind projects are uncertain. For example, there currently are no measurements of avoidance for U.S. West Coast seabirds with rotating turbine blades, or information on whether marine mammals will be attracted to, avoid, or be displaced by offshore wind projects. Monitoring technologies or methods are being developed and validated to evaluate effects such as marine mammal entanglement and seabird collision at offshore wind projects, which may be rare encounters that occur only during harsh marine conditions. The BOEM, CEC, and other agencies are actively supporting research to improve understanding of the risks, develop mitigation approaches, and address many of these uncertainties.

2.4 Statutory and Regulatory Requirements

This section discusses the federal, state, and local regulations and plans that are applicable to the environmental review for the proposed action (Table 16). The permitting sequencing and timelines are listed in Tables 17 and 18 at the end of this section.

2.4.1 Permitting Challenges

Permitting challenges will include: (1) addressing numerous environmental uncertainties, particularly in the marine environment; (2) navigating the permitting process in the absence of precedents for offshore wind projects in California; and (3) having little or no available information on permitting comparable actions due to the lack of offshore industrial projects in northern California. As discussed in Section 2.3.3, there are information gaps that need to be addressed to further environmental review and constructability, which should be resolved during the site characterization and assessment phase. There are also greater uncertainties about offshore wind project interactions with seabirds and marine mammals that may require monitoring and adaptive management; further development of monitoring technology and protocols will be required to better understand these interactions.

The long, linear transmission line upgrade needed to support an 1800 MW offshore wind farm scenario is a challenge due to the multitude of environmental issues that will need to be addressed and are discussed in Section 2.3.2. However, because there are many precedents for transmission line upgrades, there are relatively fewer environmental uncertainties in the terrestrial environment, and standard avoidance, minimization, and mitigation measures, as well as monitoring protocols, have been developed.

Port infrastructure upgrades will likely require additional dredging at the berth facilities at Redwood Marine Terminal 1, and may necessitate major navigation channel improvements or changes in dredging frequency. Any new dredging outside of the existing dredging permitted in Humboldt Bay is likely to be challenging, in part due to listed species such as coho salmon, but also important habitats such as eelgrass.

Table 16. Applicable Regulatory Requirements and Approving Agencies

Environmental Review Requirement	Approving/Lead Agency(ies)
Energy Policy Act of 2005	U.S. Bureau of Ocean Energy Management
National Environmental Policy Act	U.S. Bureau of Ocean Energy Management
Section 401 of the Clean Water Act	U.S. Environmental Protection Agency, North Coast Regional Water Quality Control Board, Central Valley Regional Water Quality Control Board
Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Appropriation Act of 1899	U.S. Army Corps of Engineers; San Francisco and Sacramento Districts
Section 7 of the federal Endangered Species Act	U.S. Fish and Wildlife Service and National Marine Fisheries Service
Magnuson-Stevens Fisheries Conservation and Management Act	National Marine Fisheries Service
Marine Mammal Protection Act	National Marine Fisheries Service
Migratory Bird Treaty Act	U.S. Fish and Wildlife Service
Bald and Golden Eagle Protection Act	U.S. Fish and Wildlife Service
California Environmental Quality Act	California State Lands Commission, California Public Utilities Commission, Humboldt Bay Harbor, Recreation and Conservation District
California Endangered Species Act	California Department of Fish and Wildlife
California Fish and Game Code Section 1600 et seq.	California Department of Fish and Wildlife
California Coastal Act	California Coastal Commission, Humboldt County
Section 307 of the Coastal Zone Management Act	California Coastal Commission
Section 106 of National Historic Preservation Act	California Office of Historic Preservation
National Forest Management Act of 1976	U.S. Forest Service
Approval for Navigation Aids	U.S. Coast Guard
Obstruction Evaluation/Airport Airspace Analysis	Federal Aviation Administration
Federal Land Policy and Management Act of 1976	Bureau of Land Management
California Submerged Lands Act	California State Lands Commission
California Clean Air Act	Air Resources Board
Development Permit	Humboldt Bay Harbor, Recreation and Conservation District

2.4.2 Federal Statutes

2.4.2.1 Energy Policy Act

Subsection 8(p)(1)(C) of the Outer Continental Shelf (OCS) Lands Act (43 USC 1337(p)(1)(3)), which was added by Section 388 of the Energy Policy Act of 2005, gave the Secretary of the Interior the authority to issue leases for marine renewable energy projects on the OCS. This authority has been delegated to BOEM. BOEM's renewable energy leasing process has four distinct phases: (1) planning and analysis, (2) lease issuance, (3) site assessment, and (4) construction and operations.

2.4.2.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) was enacted on January 1, 1970. Under NEPA, significance is used to determine whether an environmental impact statement (EIS), or a lower level of documentation (i.e., Environmental Assessment/Finding of No Significant Impact), will be needed. NEPA requires that an EIS be prepared when the proposed federal action as a whole has the potential to significantly affect the quality of the human environment. The determination of significance is based on context and intensity. Under NEPA, once a decision is made regarding the need for an EIS, it is the magnitude of the effect that is evaluated and no judgment of its individual significance is deemed important for the text. Unlike CEQA, NEPA does not require that a determination of significant effects be stated in the environmental documents and does not require mitigation for those effects.

2.4.2.3 Executive Order 11990: Protection of Wetlands

Executive Order 11990, signed May 24, 1977, directs all federal agencies to refrain from assisting in or giving financial support to proposed actions that encroach on publicly or privately owned wetlands. It also requires that federal agencies support a policy to minimize the destruction, loss, or degradation of wetlands. A proposed action that encroaches on wetlands may not be undertaken unless the applicable federal agency has determined that: (1) there are no practicable alternatives to such construction; (2) the proposed action includes all practicable measures to minimize harm to wetlands that would be affected by its implementation; and (3) the impact will be minor.

2.4.2.4 Executive Order 12962: Recreational Fisheries

Executive Order 12962, signed June 7, 1995, and amended by Executive Order 13474 on September 26, 2008, directs all federal agencies to improve the quantity, function, sustainable productivity, and distribution of the nation's aquatic resources for increased recreational fishing opportunities—to the extent permitted by law and where practicable. This Executive Order requires evaluation and documentation of the effects caused by federally funded, permitted, or authorized actions on aquatic systems, fishing access, and recreational fisheries in NEPA analyses.

2.4.2.5 Executive Order 13112: Prevention and Control of Invasive Species

Executive Order 13112, signed February 3, 1999, directs all federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The Executive Order established the National Invasive Species Council (NISC), which is composed of federal agencies and departments and a supporting Invasive Species Advisory Committee composed of state, local, and private entities. In July 2016, NISC published an updated national invasive species management plan that recommends objectives and measures to implement the Executive Order and to prevent the introduction and spread of invasive species. The Executive Order requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential impacts, and measures to prevent or eradicate them.

2.4.2.6 Clean Water Act

The CWA (33 USC 1344) addresses the issue of managing developments to improve, safeguard, and restore the quality of the nation's waters, including coastal waters, and to protect the natural resources and existing beneficial uses of those waters. For ocean waters, EPA has Section 401 jurisdiction on the Outer Continental Shelf (OCS) and the North Coast RWQCB has jurisdiction in state waters (out to 3 nautical miles). Section 401 of the CWA requires that a Water Quality Certification be obtained from the state (or Territory) for actions that require a federal permit to conduct an activity, construction, or operation that may result in discharge to waters of the United States.

Section 404 of the CWA requires authorization for discharge of dredged or fill material into a wetland or other navigable water of the United States; USACE issues this permit. Authorization under Section 402 of the CWA would be required for ground-disturbing activities if those activities disturb more than 1 acre of land; this permit is also issued by USACE. The east overland transmission route occurs within the jurisdictions of both the San Francisco and Sacramento USACE Districts. The south overland transmission route intersects with the jurisdiction of the San Francisco USACE District.

2.4.2.7 Rivers and Harbors Appropriation Act of 1899

The River and Harbors Appropriation Act of 1899 addresses activities that involve the construction outside established federal lines and excavate from or deposit material in such waters. These activities require permits from the applicable USACE District/s.

2.4.2.8 Coastal Zone Management Act

The Coastal Zone Management Act of 1972 created a partnership between state and federal agencies regarding the management of coastal resources. The Act enables states to implement coastal management programs that establish requirements for activities on coastal lands, and the California Coastal Management Program was federally certified in 1977. This program identifies the California Coastal Commission as the agency responsible for reviewing consistency determinations, which are required for federal activities, development projects, and projects that would require the issuance of federal leases, permits, or licenses.

2.4.2.9 Federal Endangered Species Act

The FESA of 1973, and subsequent amendments, provides regulations for the conservation of endangered and threatened species and the ecosystems on which they depend. The USFWS (with jurisdiction over plants, wildlife, and resident fish) and NMFS (with jurisdiction over anadromous fish and marine fish and mammals) oversee the implementation of the FESA. Section 7 mandates all federal agencies to consult with USFWS and NMFS if they determine that a proposed action or project may affect a listed species or its habitat. Under Section 7, the federal lead agency must obtain incidental take authorization or a letter of concurrence stating that the proposed project is not likely to adversely affect federally listed species.

Section 9 prohibits the take of any fish or wildlife species listed as endangered, including the destruction of habitat that prevents the species' recovery. *Take* is defined as any action or attempt to hunt, harm, harass, pursue, shoot, wound, capture, kill, trap, or collect a species. Section 9 prohibitions also apply to threatened species unless a special rule has been defined with regard to take at the time of listing. Under Section 9, the take prohibition applies only to wildlife and fish species; however, it prohibits the unlawful removal and possession, or malicious damage or destruction, of any endangered plant on federal land. Section 9 prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant species in nonfederal areas in knowing violation of any state law or in the course of criminal trespass.

2.4.2.10 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act requires federal agencies to consult with NMFS on all actions that may adversely affect EFH, which is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity." An area within the designated EFH that is particularly important and/or sensitive is an HAPC. Regional Fishery Management Councils (e.g., PFMC), established under the Magnuson-Stevens Act, are responsible for preparing and amending fishery management plans (FMPs) for each fishery under their authority that requires conservation and management. Any federal action that might have an adverse effect on quality and/or quantity of EFHs is subject to consultation requirements with NMFS. Pursuant to the Magnuson-Stevens Act, EFH in the HB, CM, and the undersea cable routes have been designated for groundfish, salmon, highly migratory species, and coastal pelagic species, as well as providing HAPC for eelgrass, estuary, kelp forests, and rocky reefs.

2.4.2.11 Marine Mammal Protection Act

The MMPA of 1972 prohibits, with certain exceptions, the "take" (defined under statute to include harassment) of marine mammals in the nation's waters and the high seas. In 1986, Congress amended both the MMPA, under the incidental take program, and the FESA to authorize incidental takings of depleted, endangered, or threatened marine mammals, provided the "taking" (defined under statute as actions which are or may be lethal, injurious, or harassing) was small in number and had a negligible impact on marine mammal populations.

Under MMPA Section 101(a)(5)(D), an Incidental Harassment Authorization can be granted by NMFS if it finds that the incidental "take" would have a negligible impact on the species or stock, or would not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses (where applicable). NMFS has defined "negligible impact" as "an impact resulting from the specified activity that cannot be reasonably expected to, and would not be reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." Incidental Harassment Authorizations include permissible methods of taking and requirements for mitigation and monitoring to ensure that takings result in the lowest practicable adverse impacts on affected marine mammal species or stocks.

2.4.2.12 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668–668c) was enacted in 1940 and prohibits the "taking" of bald or golden eagles, including their parts (e.g., feathers), nests, or eggs without a permit from the Secretary of the Interior. This regulation provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof."

2.4.2.13 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 USC 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. Under Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," Federal agencies have been directed to take certain actions to further implement the MBTA. To this end, USFWS has entered into memorandums of understanding (MOUs) with over a dozen agencies, including the Federal Energy Regulatory Commission and the Minerals Management Service (precursor to BOEM). The MOU, signed in June 2009, obligated the two agencies to strengthen migratory bird conservation through enhanced collaboration and to work together to reduce negative impacts of resource development projects on migratory birds. Specifically, it obligates BOEM to integrate migratory bird conservation principles, as well as reasonable and feasible conservation measures and management practices into BOEM approvals, procedures, and practices consistent with the Council on Environmental Quality's regulations, and USFWS and BOEM guidelines and procedures.

2.4.2.14 U.S. Coast Guard Approval for Navigation Aids

The U.S. Coast Guard (USCG) District 11 is responsible for the permitting of all Private Aids to Navigation located in California, Arizona, Nevada, and Utah. District 11 enforces federal laws on the high seas and navigable waters off of California and maintains aids to navigation, such as buoys. The proposed action would require USCG approval for new Private Aids to Navigation (e.g., lighting and reflectors) to be affixed to the floating platforms and navigation marker buoys. A USCG Local Notice to Mariners would also be requested for the deployment of in-water infrastructure and equipment associated with the proposed action, and the project developer would implement any navigational designations prescribed by the USCG.

2.4.2.15 National Historic Preservation Act

A project authorized by BOEM and USACE must comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (54 USC 300101). The NHPA sets forth national policy and procedures regarding cultural resources. Section 106 requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are included in or eligible for inclusion in the National Register of Historic Places (NRHP). To determine whether an undertaking could affect historic properties, cultural resources must be inventoried and evaluated for listing in the NRHP. Although compliance with Section 106 is the responsibility of the lead federal agency (in this case, BOEM), others may undertake the work necessary to comply.

2.4.2.16 Obstruction Evaluation/Airport Airspace Analysis

The Federal Aviation Administration (FAA) oversees Title 14 of the Code of Federal Regulations Part 77: the prime objectives of the FAA are to promote air safety and the efficient use of the navigable airspace. To accomplish this mission, aeronautical studies are conducted based on information provided by proponents on an FAA Form 7460-1, Notice of Proposed Construction or Alteration, for any construction or alteration that is more than 200 ft (61 m) above ground level at its site.

2.4.2.17 National Forest Management Act

The USFS requires a special use permit application to evaluate the requests to use National Forest System lands and to manage those lands to protect natural resources, administer their use, and ensure public health and safety. This information is required to obtain or retain a benefit. The authority for that requirement is provided by the Organic Act of 1897 and the Federal Land Policy and Management Act of 1976, which authorize the Secretary of Agriculture to promulgate rules and regulations for authorizing and managing National Forest System lands. The USFS would use NEPA to determine if the transmission line upgrades require an amendment to the Shasta-Trinity Forest Plan.

2.4.2.18 Federal Land Policy and Management Act of 1976

The Federal Land Policy and Management Act of 1976 (43 U.S.C. §1701 et seq.) – FLPMA, addresses the Bureau of Land Management's responsibilities pertaining to land use and management authorities including right-of-way, on public lands. FLPMA established multiple use, sustained yield, and environmental protection as the guiding principles for public land management. Specifically, BLM must take any action necessary to prevent unnecessary or undue degradation of the lands.

2.4.3 State Statutes

2.4.3.1 California Submerged Lands Act

The State Lands Commission (CSLC) has jurisdiction over all "sovereign lands," or lands held in trust by the State of California, including tidelands and submerged lands 3 mi (5 km) off the coast. The CSLC has jurisdiction to dispose of or lease those lands, but must do so in accordance with California's Common Law Public Trust Doctrine. Permit applications are required for geological/geophysical surveys and leases, permits, or other entitlements for use of State lands require approvals from other public agencies, therefore the CSLC is the lead agency under CEQA.

2.4.3.2 California Environmental Quality Act

CEQA serves as the regulatory framework through which California public agencies assess, disclose, and mitigate significant environmental impacts. Impacts on biological resources are typically considered significant if they would substantially affect a rare or endangered species or the habitat of that species; substantially interfere with the movement of resident or migratory fish or wildlife; or substantially diminish habitat for fish, wildlife, or plants that would affect a population regionally. The CEQA Guidelines identify rare, threatened, and endangered species as those listed under the FESA or CESA, as well as species that meet the criteria of regulatory or local agencies (e.g., CDFW-designated SSC). If a project has the potential to result in significant effects on rare, threatened, or endangered species, the lead agency is required to prepare an Initial Study/Mitigated Negative Declaration (IS/MND) or an Environmental Impact Report (EIR) to fully analyze those impacts. The ultimate determination regarding the type of CEQA documentation is based on an evaluation of all potential project impacts, including impacts on non-biological resources.

2.4.3.3 California Native Plant Protection Act

The California Native Plant Protection Act (CNPPA), which was enacted in 1977, prohibits the importation of rare and endangered plants into California, take of rare and endangered plants, and sale of rare and endangered plants. The CESA defers to the CNPPA, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA. In this case, plants listed as rare under the CNPPA are not protected under the CESA but instead under CEQA.

2.4.3.4 California Endangered Species Act

The CESA (CFGC Section 2050 et seq.) establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that state agencies should not approve projects that jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. For projects that would affect a federally or state listed species, compliance with FESA satisfies the requirements of CESA if CDFW determines that the federal incidental take authorization is consistent with CESA under CFGC Section 2080.1. If a project would result in the take of a species that is only state listed, the project proponent must apply for a Section 2081(b) take permit from CDFW.

2.4.3.5 California Coastal Act

The California Coastal Act of 1976 requires any person proposing to undertake development in the Coastal Zone to obtain a Coastal Development Permit. The Coastal Zone extends inland anywhere from approximately 500 yards (457 m) in developed urban areas to 5 mi (8 km) in undeveloped areas. In addition, it provides for the transfer of permitting authority, with certain limitations reserved for the State, to local governments through adoption and certification of local coastal programs by the California Coastal Commission.

2.4.3.6 California Clean Air Act

The California Clean Air Act, which was adopted in 1988, established a statewide program for air pollution control that requires all air quality districts to endeavor to meet the California Ambient Air Quality Standards by the earliest practical date. The Act is administered by the Air Resources Board (ARB). The responsibilities of the air quality districts include overseeing stationary-source emissions, approving permits, maintaining emission inventories, maintaining air quality stations, overseeing agricultural burning permits, and reviewing the air quality sections of CEQA documents. The North Coast Unified Air Quality Management District (NCUAQMD) attains and maintains air quality conditions in Humboldt County.

2.4.3.7 California Fish and Game Code

Lake or Streambed Alteration (Section 1600 et seq.)

CDFW regulates activities that would interfere with the natural flow of, or substantially alter the channel, bed, or bank of, a lake, river, or stream, including the disturbance of riparian vegetation under CFGC Sections 1600–1616. Project applicants must enter into a Lake or and Streambed Alteration Agreement (LSAA) from CDFW for these activities. The conditions and requirements of an approved LSAA are focused on the protection of the integrity of biological resources and water quality. Specific conditions that CDFW may require include avoiding or minimizing vegetation removal, using standard erosion control measures, limiting the use of heavy equipment, limiting work periods to avoid impacts on fisheries and wildlife resources, and restoring degraded sites or compensating for permanent habitat losses.

Protection of Birds and Raptors (Sections 3503 and 3503.5)

Section 3503 of the CFGC prohibits the killing of birds and destruction of their nests. Section 3503.5 prohibits killing of raptor species and destruction of raptor nests. Typical violations include the destruction of active bird and raptor nests caused by tree removal, and failure of nesting attempts (loss of eggs or young) as a result of disturbance of nesting pairs from nearby human activity.

Fully Protected Species (Sections 3511, 3513, 4700, and 5050)

CFGC Sections 3511, 3513, 4700, and 5050 apply to fully protected wildlife species (birds in Sections 3511 and 3513, mammals in Section 4700, and reptiles and amphibians in Section 5050) and strictly prohibit the take of these species. CDFW cannot issue a take permit for fully protected species, except under narrow conditions for scientific research or the protection of livestock, or if a Natural Community Conservation Plan has been adopted. Specifically, Section 3513 prohibits any take or possession of birds designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations pursuant to the MBTA.

2.4.3.8 Porter-Cologne Water Quality Control Act

The California Water Code addresses the full range of water issues in the state and includes Division 7, known as the Porter-Cologne Water Quality Control Act (California Water Code Sections 13000–16104). Section 13260 requires "any person discharging waste, or proposing to discharge waste, in any region that could affect the waters of the state to file a report of discharge (an application for waste discharge requirements [WDRs])" with the appropriate RWQCB/s. Under this act, each of the nine RWQCBs must prepare and periodically update Water Quality Control Basin Plans (Basin Plans). Each Basin Plan sets forth water quality standards for surface water and groundwater, as well as actions to control non-point and point sources of pollution. Projects that affect waters of the state must meet the WDRs of the applicable RWQCB/s. Pursuant to CWA Section

401, an applicant for a Section 404 permit to conduct any activity that may result in discharge into navigable waters must provide a certification from the RWQCB/s that such discharge will comply with state water quality standards. Section 13050 of this act authorizes the State Water Board and the relevant RWQCB to regulate biological pollutants. The California Water Code generally regulates more substances contained in discharges and defines discharges to receiving waters more broadly than does the CWA. The east overland transmission route intersects with the jurisdictions of the North Coast and Central Valley RWQCBs, and the south overland transmission route occurs within the jurisdiction of the North Coast RWQCB.

2.4.3.9 California Public Resources Code

According to Section 21083.4 of the California Public Resource Code, a county is required "in determining whether CEQA requires an environmental impact report, negative declaration, or mitigated negative declaration, to determine whether a project in its jurisdiction may result in a conversion of oak woodlands that will have a significant effect on the environment, and would require the county, if it determines there may be a significant effect to oak woodlands, to require one or more of specified mitigation alternatives to mitigate the significant effect of the conversion of oak woodlands." If the applicable county governments determine that the transmission line upgrades may cause a substantial effect on oak woodlands in their jurisdictions, they will require mitigation alternatives to mitigate the significant effect of the conversion of oak woodlands.

2.4.4 Local Statutes and Plans

2.4.4.1 Humboldt Bay Harbor, Recreation and Conservation District Act

The Harbor District Act empowers the board of commissioners to grant permits, franchises, and leases in areas including Humboldt Bay. In many cases, the Harbor District is also the lead agency for development projects with regard to compliance with the provisions of CEQA, and routinely works with other permitting agencies on the environmental assessment of proposed projects.

2.4.4.2 Humboldt Bay Area Plan

Humboldt County is updating its local coastal program to augment the coordinated sea level rise planning around Humboldt Bay and address potential effects on coastal-dependent uses; critical public facilities such as roads, wastewater treatment plants and shoreline protection structures; communities, including some of the County's most vulnerable areas (e.g., King Salmon, Fields Landing, and Fairhaven/Finn Town); agricultural land; and environmentally sensitive habitat areas. Depending on the cable landing and construction activities required, and if Humboldt County updates its local coastal program and it becomes certified by the California Coastal Commission, there may only be a need for a coastal development permit from the County and not the commission.

2.4.4.3 Humboldt Bay Eelgrass Comprehensive Management Plan

The Humboldt Bay Eelgrass Comprehensive Management Plan (Merkel & Associates 2017) was collaboratively developed by the Harbor District and its partners as an ecosystem-based management plan for the substantial eelgrass habitat in Humboldt Bay. The goals of the plan are to: (1) ensure that the sum of individual eelgrass restoration and protection actions has the greatest benefit to eelgrass and eelgrass functions; (2) facilitate more efficient regulatory processes for projects in the bay; and (3) provide a long-term eelgrass habitat conservation strategy that allows for sea level rise adaptation, dredging, and economic development in Humboldt Bay.

2.4.4.4 North Coast Unified Air Quality Management District

At the local level, air pollution control or management districts may adopt and enforce ARB control measures. The NCUAQMD attains and maintains air quality conditions in Humboldt County through a variety of means, including enforcement of air quality regulations and promotion of clean air programs. NCUAQMD administers a series of air pollution reduction programs including regulation of open burning, grants, permitting of stationary sources, emission inventories and air quality monitoring, and planning and rule development.

2.4.5 Permitting Sequencing and Timelines

The offshore wind scenarios will have different levels of permitting complexity and timelines, and as such any project moving forward will need early and close coordination with the resource agencies to determine which agencies are the responsible agencies where jurisdictions overlap. In particular, the 1800 MW scenarios involve transmission line improvements over numerous counties and federal lands, requiring determination of the agency, which may be the CPUC with additional Responsible agencies that may include the counties. For all of the offshore scenarios, BOEM would be the lead agency for the OCS lease and potentially the USACE as a cooperating agency for NEPA, and CSLC for state waters and CEQA. The interdependencies between the port improvements in Humboldt Bay, transmission line upgrades, and the 1800 MW scenarios adds an additional complication; it will need to be explored with the regulatory agencies to determine if they should be separately permitted or permitted in combination as one project. Therefore, the schedule for permitting an offshore wind project as identified in Table 17 is idealized (and ambitious) for a project regardless of the scenario, with the schedule for permitting Humboldt Bay and transmission line upgrades addressed in Table 18. Permitting the port infrastructure improvements would need to be conducted early in order to be in place and ready to support development of an offshore wind project. Transmission line improvements would also need to begin permitting early to address the numerous jurisdictions and multiple permitting authorities. Because close collaboration with the permitting agencies will be necessary, the timeline could be shorter, or longer, depending on staff availability and other factors affecting agency approval processes.

Table 17. Offshore Wind Project Permit Timelines and Sequencing

Federal	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
BOEM Leasing[1] Section 388 of the Energy Policy Act of 2005; Subsection 8(p)(3) of the Outer Continental Shelf Lands Act (30 CFR 585)							
Site Assessment Plan (SAP)							
Construction and Operations Plan (COP)							
National Environmental Policy Act (40 CFR 1500–1508)							
Section 401 of the Clean Water Act Application for 401 Water Quality Certification							
Clean Air Act (40 CFR 55) Outer Continental Shelf Air Permit							
Rivers and Harbors Act of 1899 Section 10 (33 USC 403) Individual Permit							
Section 404 of the Clean Water Act (33 USC 1344) Individual Permit							
Section 7 of Endangered Species Act (50 CFR 402) Biological Assessment/ Consultation							
Magnuson-Stevens Fisheries Conservation and Management Act (50 CFR 600) Essential Fish Habitat Consultation, done in conjunction with Section 7 consultation							
Marine Mammal Protection Act (MMPA) (16 USC 1361 et seq.) Incidental Harassment Authorization (annual)							
Migratory Bird Treaty Act (16 USC 703–712) Bird and Bat Conservation Strategy							
Bald and Golden Eagle Protection Act (16 USC 668–668c) Eagle Conservation Plan							
Approval for Navigation Aids (33 CFR 66) Approval of Private Aids to Navigation							
No Hazard Determination to Air Navigation (14 CFR 77) Aviation Obstruction Evaluation							

Federal	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Department of Defense (DOD) Mission Compatibility Evaluation (32 CFR 211) DOD Compatibility Approval							
California State							
Section 106 of National Historic Preservation Act (36 CFR 60, 800) Section 106 Submission/Consultation							
California Endangered Species Act (14 CCR 783.0–787.9) Section 2081 Incidental Take Permit							
Section 1600 et seq. of the California Fish and Game Code Lake or Streambed Alteration Agreement							
California Submerged Lands Act CPRC Section 6000 et seq. and 2 CCR 1900 et seq.) Submerged Lands Lease							
California Environmental Quality Act (CCR 14 15000–15387)							
Section 307 of the Coastal Zone Management Act (15 CFR 930 Subpart C) Consistency Determination Coastal Development Permit							
General Construction Storm Water Permit (Water Quality Order 99-08-DWQ) General Permit							
Local							
Development Permit							
Coastal Development Permit							
California Air Resource Board (17 CCR) Operating Permit							

CCR = California Code of Regulations, CFR = Code of Federal Regulations, CPRC = California Public Resources Code, USC = United States Code

[1]=BOEM issues Lease Award end of Year 2, initiating SAP then COP. Note that this is an ambitious schedule and has not, to date, been achieved by any offshore wind projects in U.S. waters.

Table 18. Port Infrastructure and Transmission Line Improvement Permit Timelines (Permitting Process Initiates Once Project Description is Developed)

Transmission Line Upgrade	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
California Public Utilities Commission/CEQA							
U.S. Forest Service/NEPA							
California Coastal Commission/Coastal Development Permit							
U.S. Army Corps of Engineers/Clean Water Act and Rivers and Harbors Act, in coordination with State Water Quality							
NMFS and USFWS/Section 7 of Endangered Species Act							
NMFS/Magnuson-Stevens Fisheries Conservation and Management Act							
USFWS/Bald and Golden Eagle Protection Act							
SHPO/Section 106 of National Historic Preservation Act							
CDFW/California Endangered Species Act							
NCRWQCB/General Construction Storm Water Permit							
CDFW/Section 1600 et seq. of the California Fish and Game Code							
Port Infrastructure Improvements	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
U.S. Army Corps of Engineers/NEPA							
Humboldt Bay Harbor District/CEQA							
U.S. Army Corps of Engineers/Clean Water Act and Rivers and Harbors Act, in coordination with State Water Quality							
NMFS/USFWS/ Endangered Species Act							
NMFS/Magnuson-Stevens Fisheries Conservation and Management Act							
NMFS/Marine Mammal Protection Act							
USFWS/Bald and Golden Eagle Protection Act							
CDFW/California Endangered Species Act							
CDFW/Section 1600 et seq. of the California Fish and Game Code							
USCG/Approval for Navigation Aids							
SHPO/Section 106 of National Historic Preservation Act							
CCC/Section 307 of the Coastal Zone Management Act							

Port Infrastructure Improvements	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
NCRWQCB/General Construction Storm Water Permit							
Harbor District/Development Permit							
Humboldt County/Coastal Development Permit							
NCUAQMD/California Air Resource Board (17 CCR) Operating Permit							

Offshore Wind Project: Years 1–2: This period is for the BOEM process from initial planning to lease award. Once the lease is awarded, planning and studies associated with site assessment followed by development of construction and operations plans. During this time, discussions with the regulatory agencies should be initiated to make sure that regulatory issues are properly addressed through studies and project development. Once the Construction and Operations Plan is complete, BOEM initiates the public process (NEPA) which triggers initiation of most of the environmental resource permitting activities (Years 5–7). Permit sequencing should minimize time delays but requires very close coordination with the state and federal agencies, in particular, early coordination between BOEM and CSLC (the two lead agencies for the purposes of leasing), to determine if there are efficiencies in developing a joint NEPA/CEQA document, or if it is even feasible to do so. Sequencing for the State permits requires that the CSLC CEQA document will need to be certified before CDFW can conduct its CESA consultation, which also needs to occur before the CCC and local agencies will approve a coastal development permit. As lead agency, CSLC must develop a CEQA document that addresses the responsible agency's (e.g., CDFW, CCC, local agencies) relevant statutes sufficiently. Similarly, for the Federal permitting process, the 401 water quality certification is typically the last permit in the process, and requires that the FESA consultation as well as state permits are approved or likely to be approved before the Water Board can do their certification. The Water Board can start their certification process if they know the federal and state agencies are moving forward with their approval process.

Port Infrastructure and Transmission Line Improvements: Similar to the offshore wind project, port infrastructure and transmission line improvements require a lead agency or agencies. For the transmission line improvements, the CPUC and USFS could be lead agencies for NEPA/CEQA. This would trigger a public process that initiates resource permitting actions. Improvements to port infrastructure would include the Harbor District and USACE as likely lead agencies, especially for changes to dredging frequency and duration, and if new channel dredging is required it would extend the timeline potentially by years for the NEPA/CEQA process and other permitting.

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