5.2 Marine Biological Resources

5.2.1 Introduction

This section describes the existing marine biological resources of the study area, and evaluates whether the development of the proposed desalination plant and related facilities would result in adverse effects to marine biological resources. Specifically, the evaluation focuses on construction and operation of the offshore portions of the proposed project, and whether it would result in substantial adverse effects to special-status or other marine species or regulatory designated habitats and areas due to operational impingement, or entrainment of aquatic organisms, or due to marine water quality impacts during project construction and operation.

The project-specific construction, design, and operational details of the marine components of the project referred to in this section are based on **Section 4.0, Project Description**, which is supported by: **Appendix I, Seawater Intake Facility Conceptual Design Report scwd² Regional Seawater Desalination Project** (Intake Conceptual Design Report); **Appendix H, scwd² Seawater Desalination Intake Technical Feasibility Study**; and **Appendix F, scwd² Seawater Desalination Program Offshore Geophysical Study**. The description of the existing setting and evaluation of impacts is based on **Appendix G, City of Santa Cruz Water Department & Soquel Creek Water District scwd² Desalination Program Open Ocean Intake Effects Study** (Open Ocean Intake Effects Study); as well as the marine water quality analysis conducted in **Section 5.1, Hydrology and Water Quality** and its supporting studies, including: **Appendix D, scwd² Final Seawater Reverse Osmosis Desalination Pilot Test Program Report and Appendices**; **Appendix E, Proposed scwd² Desalination Project Watershed Sanitary Survey**; and **Appendix J, Dilution Analysis for Brine Disposal via Ocean Outfall (**Dilution Analysis). The specific information about the marine resources in the Monterey Bay National Marine Sanctuary (MBNMS) is primarily from the *Monterey Bay National Marine Sanctuary Site Characterization* report (MBNMS Site Characterization, 1996a) and the Monterey Bay National Marine Sanctuary: Sanctuary Integrated Monitoring Network (SIMoN). Additional information in this section is derived from Section 5.2, Marine Resources of the *Integrated Water Plan Program Environmental Impact Report* (IWP Program EIR) (City, 2005a), as well as from other references, as cited throughout this section[1].

Public and agency comments related to marine biological resources were received during the public scoping period in response to the Notice of Preparation, and are summarized below.

- Evaluate the effects of the combined discharge on marine resources.

[1] Referenced documents in this EIR are available for review at the City of Santa Cruz Water Department offices at 212 Locust Street, Suite D, Santa Cruz, California 95060, Monday through Thursday 8:00 a.m. to Noon and 1:00 p.m. to 5:00 p.m, except holidays. Likewise, these documents are available for review at the Soquel Creek Water District offices at 5180 Soquel Drive, Soquel, CA 95073, Monday through Friday 8:00 a.m. to Noon and 1:00 p.m. to 5:00 p.m, except holidays.

- Evaluate construction and operational effects of the proposed project on special-status species.
- Evaluate the effects of the project on marine resources from noise and disturbance during construction.
- Clearly distinguish between the environmental effects associated with construction of the intake and those associated with operation and maintenance.
- Evaluate the effects of the project on impingement and entrainment of marine life from a screened, open-ocean intake and include analysis of screen slot size.

To the extent that issues identified in public comments involve potentially significant effects on the environment according to the California Environmental Quality Act (CEQA), and/or are raised by responsible and trustee agencies, they are identified and addressed in this EIR. For a complete list of public comments received during the public scoping period, refer to **Appendix A, Scoping Report City of Santa Cruz and Soquel Creek Water District (scwd²) Regional Seawater Desalination Project.**

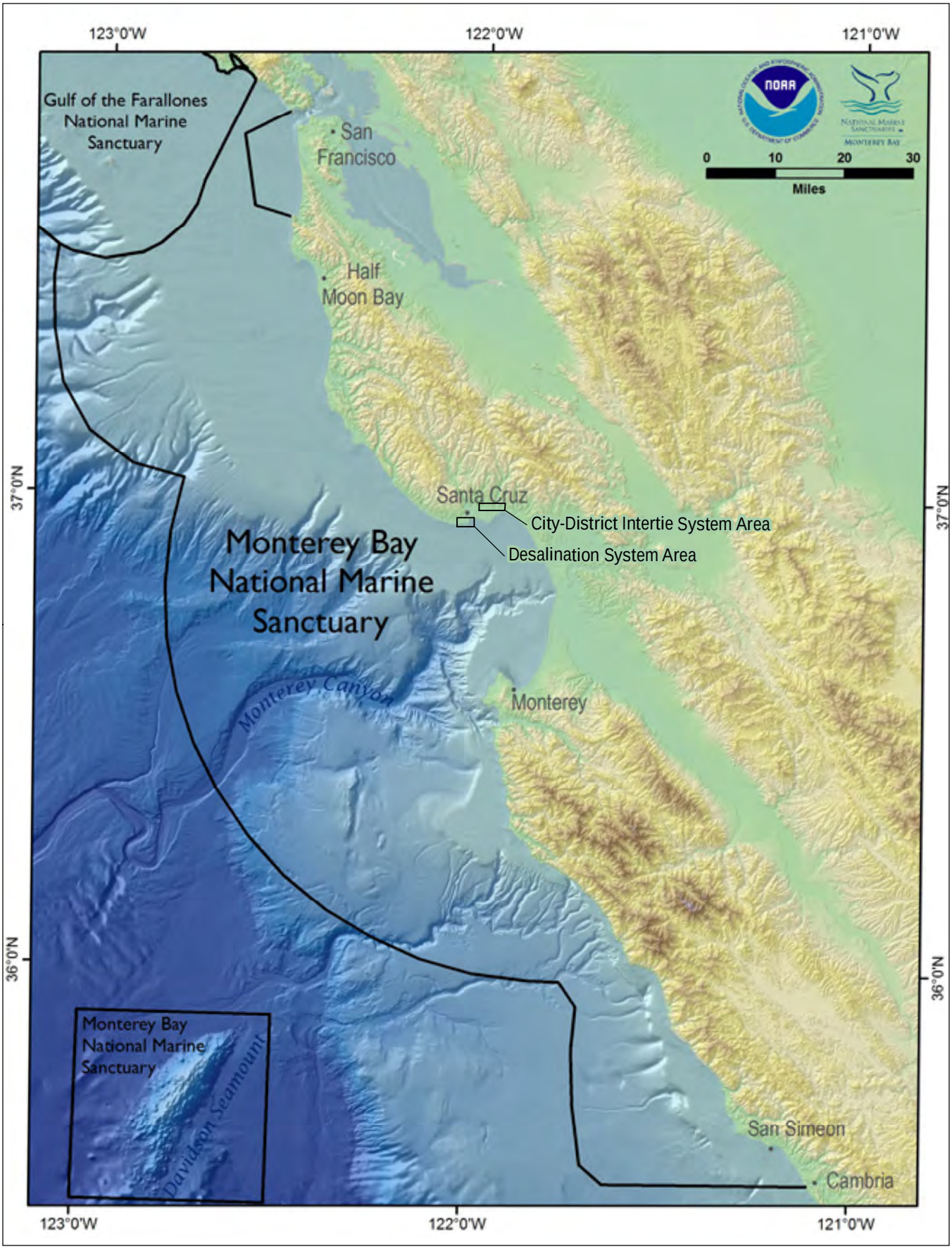
5.2.2 Environmental Setting

Regional Setting

The intake features and discharge improvements of the proposed project would be located offshore in or immediately adjacent to the MBNMS (see **Figure 5.2-1, Monterey Bay National Marine Sanctuary Boundary**). The area was designated a national marine sanctuary in 1992, and includes 276 miles of shoreline and 6,094 square miles of ocean. Characterized by a deep, submarine canyon and coastal upwelling, the MBNMS is a highly diverse and productive region off the coast of Central California. At its deepest point, the MBNMS extends to a depth of 12,713 feet (MBNMS, 2011). During early spring to late summer, upwelling causes nutrient-rich water to rise to the surface. A diverse suite of sea birds, fish, and marine mammals are drawn to these nutrient-rich waters. The location of the MBNMS in a transition zone between warm and cool waters also contributes to the high biological diversity in the MBNMS (City, 2005a).

Study Area Setting

The marine biological study area for the proposed project includes the marine portions of the overall study area, and extends from approximately the mouth of the San Lorenzo River, west to approximately the shoreline near the University of California, Santa Cruz Marine Science Campus (McCallister Drive), and south into Monterey Bay to approximately the 100-foot depth contour (see **Figure 5.2-2, Potential Pump Stations and Intake Locations**). Monterey Bay and associated marine habitats are well documented by the National Ocean and Atmospheric Administration (NOAA), affiliated federal and state agencies, and academic research. In particular, the SIMoN was used to identify and describe the various habitats in the study area. Additional sources of information include the MBNMS Site Characterization Project, and various academic studies referred to herein.



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City of Santa Cruz and Soquel Creek Water District
scwd² Regional Seawater Desalination Project

Figure 5.2-1. Monterey Bay National Marine Sanctuary Boundary

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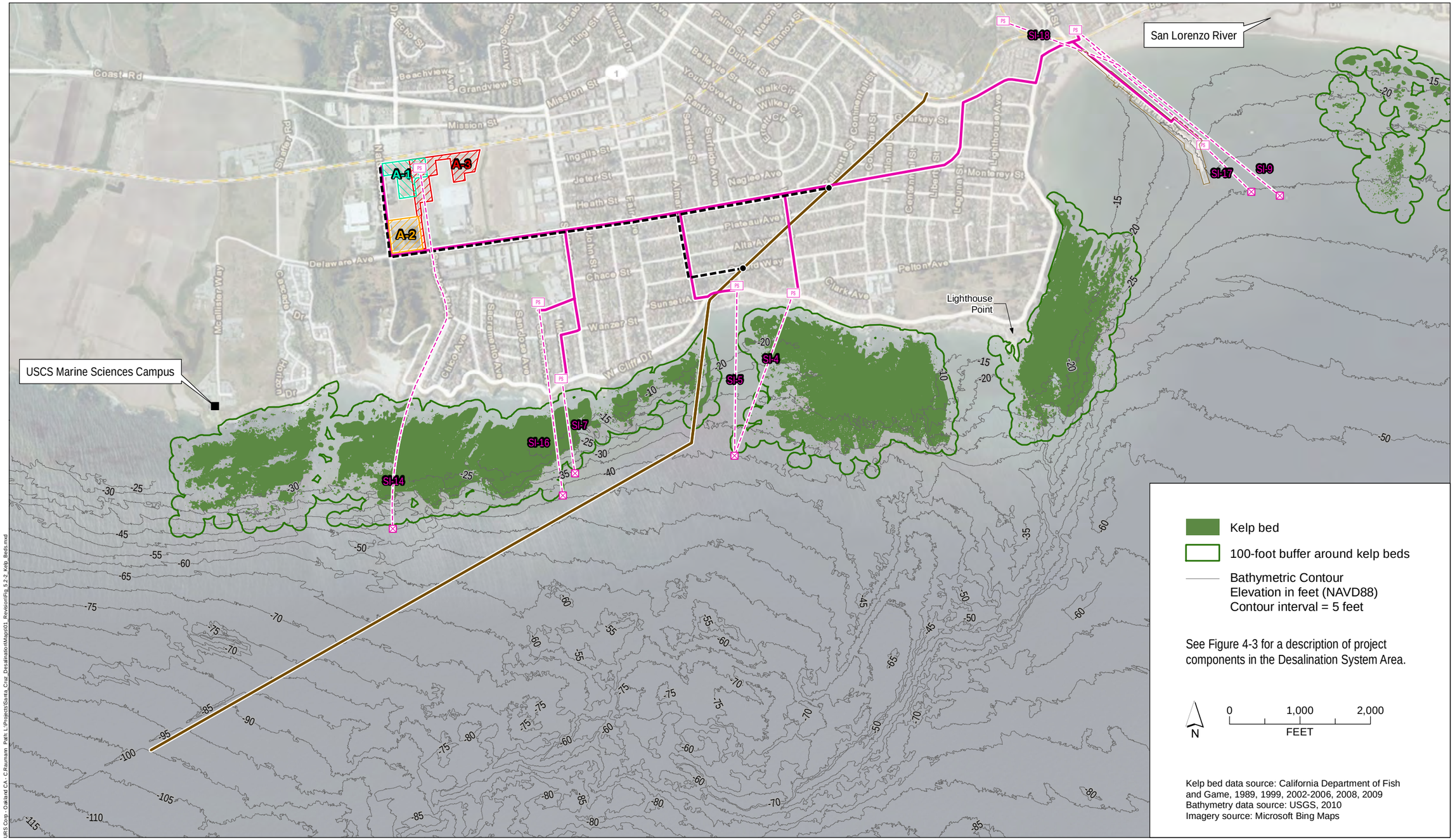

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City of Santa Cruz and Soquel Creek Water District
scwd² Regional Seawater Desalination Project

Figure 5.2-2
Kelp Beds

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The habitat types, common species, and potential special-status species that may occur in the study area are described below.

Habitat Types

The marine habitats in the study area are diverse, consisting of various intertidal, kelp forest, and open-water habitats. Bottom substrates range from predominantly soft, sandy sediments in the eastern portion of the study area, to bedrock outcrops, ledges, and boulders to the west. The type of substrate is a major factor in determining species assemblages in a given area.

Sandy Substrates

Sandy beaches in the study area are habitat for a large variety of isopods, sand hoppers, bivalves, mole crabs (*Emerita analoga*), and other crustaceans, and several species of microscopic invertebrates. Diversity in this intertidal zone is generally low, because organisms are subject to daily tidal fluctuations causing varying wet and dry conditions, and fluctuations in temperature and salinity. Shorebirds such as the black oyster catcher (*Haematopus bachmani*) and gulls use these areas for foraging.

Farther offshore, soft-bottom subtidal areas are characterized by benthic (bottom dwelling) organisms typical of the open-coast soft-bottomed community off much of the California coast. Common species include polychaete worms (e.g., *Apoprionospio* sp., *Mediomastus* sp.), anemones, and oligochaete and nematode worms (City, 2005a). Biological diversity is generally greater in the subtidal area, where wave action and currents are moderate, and temperature and salinity fluctuate less than in the intertidal area.

Sandy substrate habitat is found in the eastern portion of the study area, and offshore areas (beyond the rocky reefs) in the western part of the study area where sand overlies bedrock. A proposed intake structure in the eastern portion of the study area (intake alternative sites SI-9, SI-17, and SI-18) would be in sandy sediment habitat.

Rocky Substrates

Rocky habitat is found in the near-shore intertidal and subtidal zones in the western portion of the study area. Common species found in the rocky intertidal zone include the ochre sea star (*Pisaster ochraceus*), purple sea urchin (*Strongylocentrotus purpuratus*), California mussel (*Mytilus californianus*), barnacles (*Chthamalus dalli*, *C. fissus*, and *Balanus glandula*), snails, limpets, chitons, and anemones (*Anthropleura* spp.), and various species of algae (*Endocladia muricata*, *Mastocarpus* spp. and *Cladohpora* sp.).

In subtidal areas with rocky substrates, just beyond the breaking surf and extending seaward to depths of about 30 feet, is the kelp forest (see **Figure 5.2-2**). Kelp forest habitat is an important source of food and refugia for several marine species. The kelp forest is composed of the giant kelp (*Macrocystis pyrifera*), bull whip kelp (*Nerocystis luetkeana*), and other red and brown algae. At the bottom of the kelp forest are mats of coralline algae (SIMoN, 2011a; MBNMS,

1996b; Graham, et al., 2008). The kelp holdfast (the area where the kelp attaches to the rocky surface) and coralline algae mats form microhabitats for a number of species (Andrews, 1945; Foster and Schiel, 1985; MBNMS, 1996b; SIMoN, 2011a). Common species found in these microhabitats include polychaete worms, amphipods, decapods, gastropods, and ophiuroids. Rocky areas outside of the holdfasts are habitat for sponges, tunicates, anemones, hydroids, bryozoans, and sea urchins (MBNMS, 1996b; Foster and Schiel, 1985).

Other species that are associated with the kelp forests include black rockfish (*Sebastes melanops*), boccacio (*S. paucipinus*), and other rockfish, including juveniles, which may rear in the kelp forest. Fish species recorded in kelp forest habitat off Terrace Point are shown in **Table 5.2-1, Fish Species Recorded in Kelp Forest off Terrace Point.** Harbor seals (*Phoca vitulina*) and the California sea lion (*Zalophus californianus*) prey on the fish species in the kelp forest (Foster and Schiel, 1985; MBNMS, 1996b). Sea otters (*Enhydra lutris*) feed on invertebrates, such as the sea urchin (*Strongylocentrotus purpuratus* and *S. franciscanus*) that can be found in the kelp (SIMoN, 2011a). In areas where the kelp canopies have been removed, there is a correlating decrease in fish diversity and abundance (SIMoN, 2011a).

A proposed intake structure in the western portion of the study area (intake alternative sites SI-4, SI-5, SI-7, SI-14, and SI-16) would be offshore and outside the high-relief rocky kelp forest habitat. Although these sites are at various locations along the shore, they are all in similar habitats of sand, boulders, and bedrock sea floor (see **Figure 5.2-3, Sediment Characteristics within the Western Area**).

Open Water

The open water, or pelagic zone, encompasses the entire water column extending from the surface to the bottom substrate. Many species are associated with open-water habitats over both rocky and sandy substrates.

Plankton. Plankton are generally microscopic plants and animals, free-floating in the open water. Plankton represent the lower levels of the food chain and are important to many marine species, including benthic organisms, fish, and mammals. Plankton can be divided into three major components: phytoplankton, zooplankton, and ichthyoplankton.

Phytoplankton are simple, often microscopic, plants that represent the base of the marine food web. Phytoplankton observed in the study area include diatoms (*Dinophysis* sp. and *Alexandrium* sp.) (HABMAP, 2011). Red tide events, caused by the aggregation of the phytoplankton *Prorocentrum*, *Ceratium,* and *Gonyaulax,* sometimes occur in the study area (MBNMS, 1996c; Jessup et al., 2009).

Zooplankton consist of microscopic and macroscopic animals that either free-float or feebly swim in open water. Common zooplankton in the study area include crustacean larvae, copepods, euphausiids, ctenophores, hydrozoan medusa, and siphonophores (MBNMS, 1996c). In

Monterey Bay, krill (*euphausiids*) are an important food source for large marine species such as squids, salmon, whales, and sea birds (MBNMS, 1996c).

Ichthyoplankton are the eggs and larval forms of marine fishes, such as rockfish species and white croaker. Seasonal abundance and distribution of individual ichthyoplankton species are dependent on the reproductive cycles of the adult fish species and their circulation in Monterey Bay.

Table 5.2-1. Fish Species Recorded in Kelp Forest Transects off Terrace Point, Santa Cruz County

Scientific Name	Common Name
Atherinopsis californiensis	Jacksmelt
Aulorhynchus flavidus	Tubesnout
Brachyisyius frenatus	Kelp surfperch
Citharichthys stigmaeus	Speckled sanddab
Cymatogaster aggregate	Shiner surfperch
Embiotoca jacksoni	Black surfperch
Embiotoca lateralis	Striped surfperch
Hexagrammos decagrammus	Kelp greenling
Hexagrammos lagocephalus	Rock greenling
Hyperprosopon ellipticum	Silver surfperch
Hypsurus caryi	Rainbow surfperch
Lepidogobius Lepidus	Bay goby
Ophiodon elongatus	Lingcod
Oxyjulis californica	Senorita
Oxylebius pictus	Painted greenling
Paralichthys californicus	California halibut
Phanerodon furcatus	White surfperch
Rhacohilus toxotes	Rubberlip surfperch
Rhacochilus vacca	Pile perch
Rhinogobiops nicholsi	Blackeye goby
Sebastes atrovirens	Kelp rockfish
Sebastes atrovirens/ S. caranatus/ S. chrysomelas (yoy)	Kelp/gopher/black-and-yellow rockfish
Sebastes caurinus	Copper rockfish
Sebastes chrysomelas	Black-and-yellow rockfish
Sebastes melanops	Black rockfish
Sebastes miniatus	Vermilion rockfish
Sebastes mystinus	Blue rockfish
Sebastes paucispinis	Boccacio
Sebastes pinniger	Canary rockfish
Seabastes serranoides/ S. flavidus/ S. melanops (yoy)	Olive/yellowtail/black rockfish
Scorpaenichthys marmoratus	Cabezon
Syngnathus spp.	Pipefish
Zalembius rosaceus	Pink surfperch

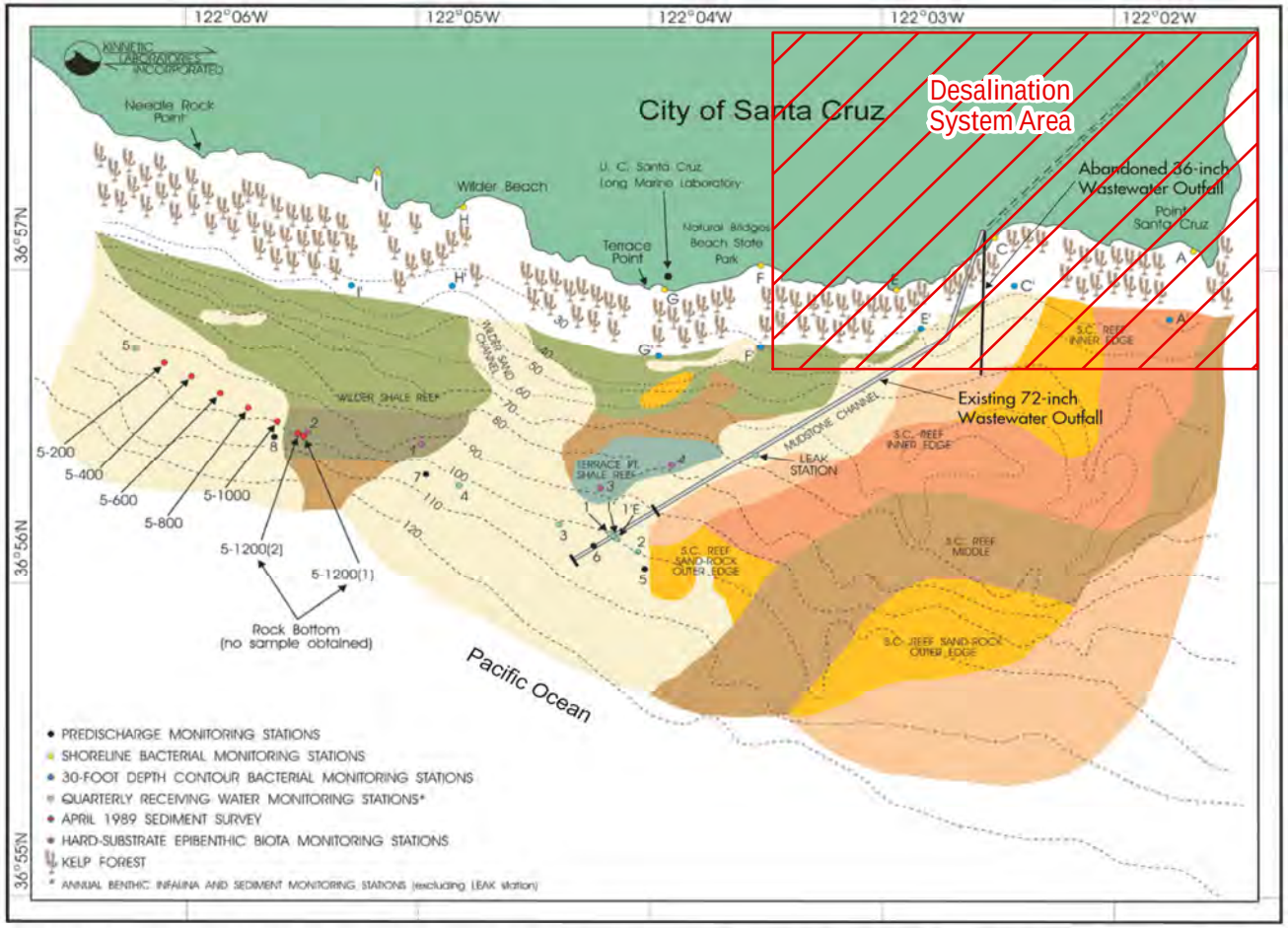
As part of the Open Ocean Intake Effects Study (**Appendix G)** conducted for this project, ichthyoplankton samples were collected from water in the study area Between April 2009 and May 2010, samples were taken once a month at the locations shown on **Figure 5.2-4, Open Ocean Intake Study Sampling Sites**. Forty-five separate taxonomic groups were represented in the samples. The dominant species present was white croaker (51.6 percent). Along with white croaker, unidentified yolk sac larvae (9.3 percent), northern anchovy (5.8 percent), *Clevelandoa, Ilypnus, Quietula* gobies (5.1 percent), sanddabs (2.7 percent), unidentified smelts (2.6 percent), unidentified ronquils (2.3 percent) and smoothhead sculpins (2.3 percent) comprised just over 80 percent of the total catch. A time analysis of the data showed an increase in ichthyoplankton density between November and March. At Station SWE, a total of 658 cancrid crabs and caridean shrimp was collected, of which 55 percent were caridean shrimp. During the 13-month sampling period, no endangered, threatened, or other special-status species were identified in the source water samples (**Appendix G**).

Invertebrates. A variety of marine invertebrates occur within the study area. Their distribution differs according to habitat type. A detailed discussion of marine invertebrates occurring in the study area can be found above in the Sandy Substrates and Rocky Substrates subsections.

Fish. Fish commonly found in open water in the study area are the market squid (*Loligo opalescens*), anchovies (*Engraulis mordax*), sardines (*Sardinops sagax*), and adults of several species of anadromous fish such as the Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead.

Monterey Bay has been an important commercial fishery for albacore, rockfish species, herring, white croaker, sharks, salmon, and market squids. In recent years in Santa Cruz County, the most lucrative fisheries are for Dungeness crabs, Chinook salmon, sablefish, albacore, and California halibut.

Birds. Due in part to its nutrient-rich waters, Monterey Bay is an important stop-over point for migratory birds from New Zealand, Chile, Hawaii, and Alaska. Currently, there are 94 known species of native and non-native seabirds that are known to occur regularly in Monterey Bay. Along the continental shelf, the dominant species are sooty shearwaters (*Puffinus griseus*), western grebes (*Aechmophorus occidentalis*), Pacific loons (*Gavia pacifica*), brown pelicans (*Pelecanus occidentalis*), and western gulls (*Larus occidentalis*). During summer to fall, black-footed albatross (*Phoebastria nigripes*), ashy storm-petrel (*Oceanodroma homochroa*), and Guadalupe murrelet (*Synthliboramphus hypoleucus*) and Scripps's murrelet (*Synthliboramphus scrippsi*) (formerly known collectively as Xantus' murrelet) can be found foraging over deeper waters of Monterey Bay (MBNMS, 1996a; SIMoN, 2011b). Due to the wide distribution of these species in Monterey Bay, they could potentially forage in the study area. Several species of shore birds, such as the surf and white-winged scoters, as well as marbled murrelets and brown pelicans, are known to occur in Santa Cruz County and could potentially forage in the study area. There are no nesting locations for these shore birds in the marine study area. See **Section 5.4, Terrestrial Biological Resources** for information about nesting.



Bottom Characteristics Legend

- Sediment - Sand with a general absence of boulders or rock. Sea floor is smooth except for sand wave feature.
- Low Density of Boulders (5-20%) 1-4 feet in diameter on sea floor. Large areas of sandy bottom probably less than 2 feet thick.
- Moderate Density of Boulders (20-60%) 1-4 feet in diameter and isolated rock exposures on the sea floor. Local sand pockets are probably 1 foot thick or less.
- High Density of Boulders and Rock Exposures (Over 60%) with Bottom Relief 2-6 feet. Occasional localized san pockets probably less than 1 foot thick.
- Rock - sea floor generally flat with occasional boulders 1-3 feet in diameter. May have thin veneer of sediments overlying a more irregular rock surface than bottom features indicate.
- Rock - discontinuous rock ledges 1-4 feet high and 10-100 feet wide. General trend of ledges is west to northwest. Localized thin sediment pockets less than 1 foot thick.
- Rock - continuous ledges 2-4 feet high, 60-90 feet wide, and traceable for 100 to over 500 feet. Localized thin sediment pockets less than 1 foot thick. (Boundaries of this zone approximated.)
- Rock - resistant ridge up to 24 feet bottom relief. Rock surface is rough and irregular.

NOTE: Location of Santa Cruz predischarge monitoring stations (5, 6, 7, and 8), out fall shoreline bacterial monitoring stations (A, C, E, F, G, H, and I), 30-foot depth contour bacterial monitoring (A', C', E', F', G', H', and I'), quarterly receiving water monitoring stations (1, 2, 3, 4, 5, and LEAK), benthic infauna and sediment stations locations (1, 2, 3, 4, and 5), April 1989 sediment survey (Stations 5-200 through 5-1200(2)), and hard-substrate epibenthic biota monitoring stations (Wilder Reef: *1* and *2*; and Terrace Point Reef: *3* and *4*).

Source: Kinnetic Laboratories, Inc., 2003 in EDAW, 2005. City of Santa Cruz Water Department Integrated Water Plan, Environmental Impact Report

Figure 5.2-3
Bottom Characteristics Near the Desalination System Area

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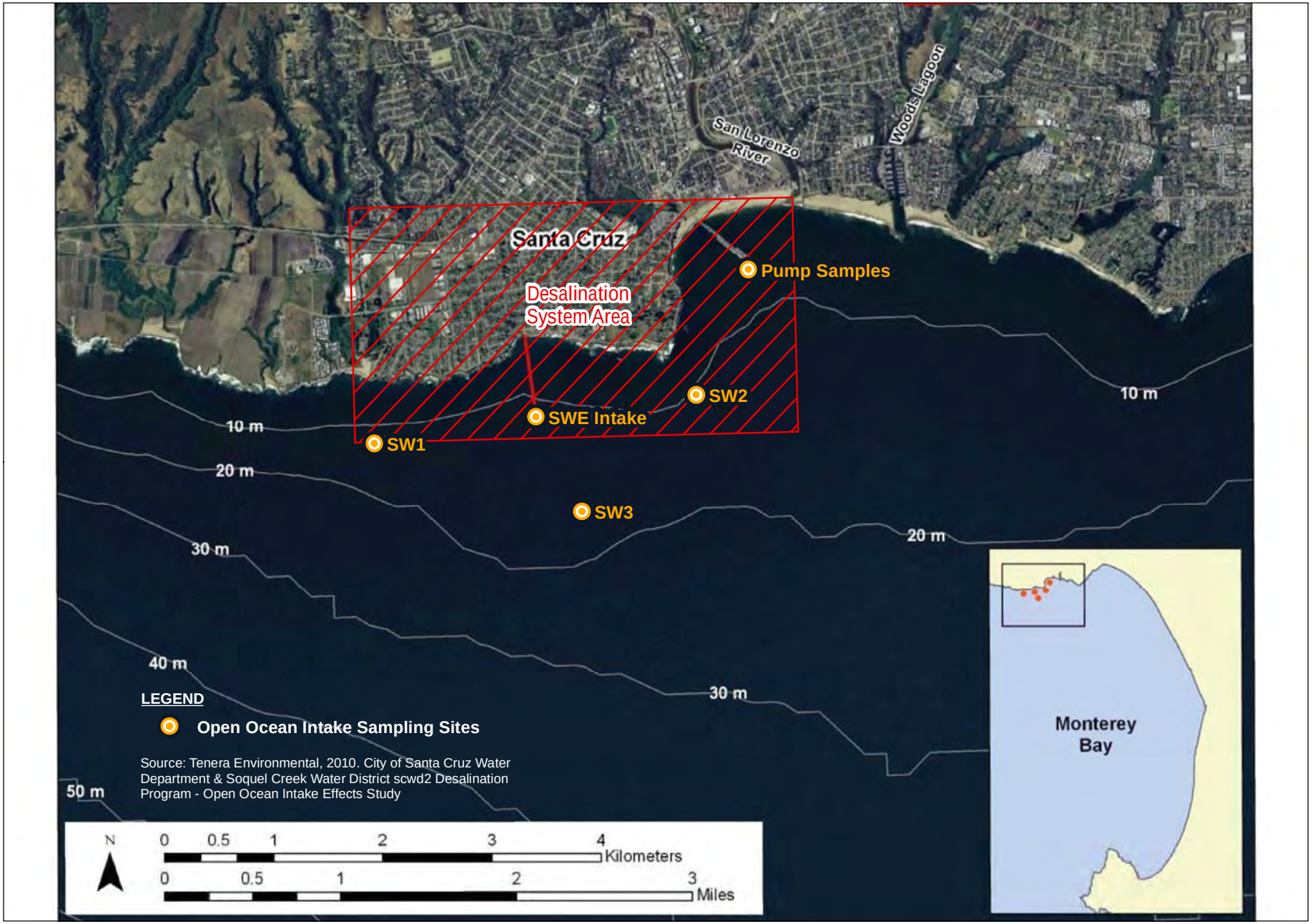

City of Santa Cruz and Soquel Creek Water District
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Figure 5.2-4
Open Ocean Intake Study Sampling Sites

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Marine Mammals. Monterey Bay supports several marine mammal species that include the Pacific harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianis*), Steller sea lion (*Eumetopius jubatus*), Guadalupe fur seal (*Arctocephalus townsendii*), northern elephant seal (*Mirounga angustirostris*), gray whale (*Eschrichtius robustus*), blue whale (*Balaentoptera musculus musculus*), humpback whale (*Megaptera noveangliae*), killer whale (*Orcinus orca*), southern sea otter (*Enhydra lutris nereis*) (SIMoN, 2011c), and a variety of different dolphin and porpoise species.. The northern elephant seal moves throughout Monterey Bay during the migration to and from their breeding grounds.

In the MBNMS, Año Nuevo is the largest elephant-seal rookery near the study area (MBNMS, 1996d; SIMoN, 2011c). Sea lions and fur seals are observed in Monterey Bay during the spring as they migrate south towards their breeding grounds. During late summer, sea lions and fur seals feed in Monterey Bay to help sustain themselves during their migration towards northern feeding grounds. The California sea lion and the Pacific harbor seal are the most commonly observed marine mammals in the study area (City, 2005a).

Special-Status Species

The designation of a special-status species is determined by municipal, county, State, and/or Federal regulations. These species often have declining populations, are unique to the local area, and/or have limited or restricted distribution in their known range.Special-status species that occur, or have the potential to occur, in the study area were identified from several sources, including the following: the California Natural Diversity Data Base (CNDDB) (CDFG, 2011b), the U.S. Fish and Wildlife Service (USFWS) Sacramento Office's Endangered and Threatened Species list (USFWS, 2010a), and the USFWS online species databases (queried for the Santa Cruz, Soquel, and Davenport U.S. Geological Survey [USGS] 7.5-minute quadrangle).The resulting species list gathered from these sources is shown in **Table 5.2-2, Federal and State Special-Status Species Potentially Occurring in the Marine Study Area,** along with a general description of suitable habitat for each species, and whether it is likely to occur in the marine study area. Species with a high potential to occur in the marine study area, and that would most likely be affected by the proposed project, are discussed in more detail below.

Species that are listed under the Federal and/or State Endangered Species Acts (ESAs) that have a high potential to occur in the study area include coho and Chinook salmon, steelhead, green sturgeon, black abalone, and southern sea otter. Other special-status species with a high potential to occur are California sea lions and Pacific harbor seals, protected under the Marine Mammal Protection Act (MMPA). Other species shown in **Table 5.2-2** may occasionally occur in the area. For example, the birds listed in **Table 5.2-2** may pass through the study area to forage, but do not nest in the study area. With the exception of gray whales, which may pass within sight of the shore during their migration, other whale species listed in the table would typically be found much farther offshore beyond the study area. Designated critical habitat for the green sturgeon and black abalone is present in the study area. See **Section 5.2.3, Regulatory Framework**, for information about the federal and state ESAs.

Table 5.2-2. Federal and State Special-Status Species Potentially Occurring In the Marine Study Area

Common Name	Scientific Name	Status		Supporting Habitat	Likelihood of Occurrence in the Study Area
		Federal	State		
Mammals					
Guadalupe fur seal	*Arctocephalus townsedii*	T/MMPA	T	Rocky coasts and associated caves. Ranges from Point Reyes National Seashore, California to Puerto Guerrero, near the Mexico/Guatemala border. Commonly found from the Channel Islands, California to Cedros Island, Baja California, Mexico.	Low: Foraging habitat is present in the study area.
Sei whale	*Balaenoptera borealis*	E/MMPA	None	Pacific Ocean marine waters.	Low: Foraging and migration habitat is present in the study area.
Blue whale	*Balaenoptera musculus*	E/MMPA	None	Pacific Ocean marine waters.	Low: Foraging and migration habitat is present in the study area.
Finback (=fin) whale	*Balaenoptera physalus*	E/MMPA	None	Pacific Ocean marine waters.	Low: Foraging and migration habitat is present in the study area.
Southern sea otter	*Enhydra lutris nereis*	T/MMPA	None	Pacific Ocean nearshore marine waters.	High: Known to occur in the study area.
Gray whale	*Eschrichtius robustus*	D/MMPA	None	Pacific Ocean marine waters.	Moderate: Foraging and migration habitat is present in the study area.
Right whale	*Eubalaena (=Balaena) glacialis*	E/MMPA	FP	Near-shore in shallow waters, large bays.	Low: Foraging and migration habitat is present in the study area.
Steller (=northern) sea lion	*Eumetopias jubatus*	T/MMPA	None	Isolated shoreline.	Low: Foraging habitat is present in the study area.
Humpback whale	*Megaptera novaeangliae*	E/MMPA	None	Pacific Ocean marine waters.	Moderate: Foraging and migration habitat is present in the study area.
Killer whale	*Orcinus orca*	E/MMPA	None	Pacific Ocean marine waters.	Moderate: Foraging and migration habitat is present in the study area.
Harbor seal	*Phoca vitulina*	MMPA	None	Shallow water; in and near mouths of rivers; sand bars.	High: Known to occur in the study area.
Sperm whale	*Physeter catodon (= macrocephalus)*	E/MMPA	None	Pacific Ocean near-shore marine waters.	Low: Foraging and migration habitat is present in the study area.
California sea lion	*Zalophus californicus californianus*	MMPA	None	Shallow water; on offshore rocks, sand bars, bays.	High: Known to occur in the study area.

Table 5.2-2. Federal and State Special-Status Species Potentially Occurring In the Marine Study Area

Common Name	Scientific Name	Status		Supporting Habitat	Likelihood of Occurrence in the Study Area
		Federal	State		
Birds					
Western Snowy Plover	*Charadrius alexandrinus nivosus*	T	None	Sandy coastal beaches, salt pans, coastal dredges spoils sites, dry salt ponds, salt pond levees.	Low: Foraging and migration habitat is present in the study area.
Short-tailed albatross	*Diomedea albatrus*	T	None	Breeds on remote island with little to no low vegetation, and forages in the nutrient-rich upwelling areas.	Low: Foraging and migration habitat is present in the study area.
Brown pelican	*Pelecanus occidentalis*	D	D, FP	Nests on coastal islands, lacking ground predators; roost on piers and other man-made structures.	Low: Foraging and migration habitat is present in the study area.
California clapper rail	*Rallus longirostric obsoletus*	E	E, FP	Salt marshes dominated by pickleweed and cord grass.	Low: Foraging habitat is present in the study area, but no nesting habitat.
Marbled Murrelet	*Brachyramphus marmoratus*	T	E	Forage in calm, shallow, coastal waters and bays, but breed inland, up to 45 miles from shore: Use old-growth forests for nesting.	Low: Foraging habitat is present in the study area, but no nesting habitat.
Critical Habitat, Marbled Murrelet					None: Study area is outside the designated critical habitat.
California least tern	*Sterna antillarum (=sterna, =albifrons) browni*	E	E, FP	Flat, open areas along the coast near inshore estuaries, river mouths, or shallows, sandy ground with little or no vegetation, bays, freshwater ponds, channels, lakes.	Low: Foraging habitat is present in the study area, but no nesting habitat.
Fish					
Tidewater goby	*Eucyclogobius newberryi*	E	SSC	Upper end of lagoons in salinities less than 10 parts per thousand.	None: No suitable habitat present in study area.
Critical Habitat, Tidewater goby					None: Study area is outside the designated critical habitat.
Green Sturgeon Southern DPS	*Acipenser medirostris*	T	SSC	This population spawns in the Sacramento River system. After leaving natal waters, juveniles and adults inhabit estuaries and near-shore marine waters.	High: Adults may migrate and/or forage in the study area.
Green Sturgeon Southern DPS critical habitat				Monterey Bay up to a depth a 110 feet.	Present in the study area

Table 5.2-2. Federal and State Special-Status Species Potentially Occurring In the Marine Study Area

Common Name	Scientific Name	Status		Supporting Habitat	Likelihood of Occurrence in the Study Area
		Federal	State		
Central California Coast Coho salmon ESU	*Oncorhynchus kisutch*	T	E	Between Punta Gordo and San Lorenzo River.	High: Adults and juveniles may migrate and/or forage in study area.
Central Coastal California steelhead DPS	*Oncorhynchus mykiss*	T	None	Delta, Suisun Bay and associated marshes, and San Francisco Bay west to the Golden Gate bridge are designated as suitable habitat.	High: Adults and juveniles may migrate and/or forage in the study area.
Central Valley steelhead DPS	*Oncorhynchus mykiss*	T	None	Includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman National Fish Hatchery, and Feather River Hatchery steelhead hatchery programs.	High: Adults may migrate and/or forage in the study area.
South-Central California Coast steelhead DPS	*Oncorhynchus mykiss*	T	SSC	Includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams from the Pajaro River (inclusive) to, but not including, the Santa Maria River, California.	High: Adults and juveniles may migrate and/or forage in the study area.
Central Valley Fall and Late Fall Run Chinook ESU	*Oncorhynchus tshawytscha*	SSC	SSC	Includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin river basins and their tributaries, east of Carquinez Strait, California.	High: Adults and juveniles may migrate and/or forage in the study area.
Sacramento River winter run Chinook salmon ESU	*Oncorhynchus tshawytscha*	E	E	Includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs: winter-run Chinook from the Livingston Stone National Fish Hatchery, and winter-run Chinook in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory.	High: Adults may migrate and/or forage in the study area.

Table 5.2-2. Federal and State Special-Status Species Potentially Occurring In the Marine Study Area

Common Name	Scientific Name	Status		Supporting Habitat	Likelihood of Occurrence in the Study Area
		Federal	State		
Central Valley spring-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	T	T	Includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River, as well as the Feather River Hatchery spring-run Chinook program.	High: Adults may migrate and/or forage in the study area.
California Coastal Chinook salmon ESU	*Oncorhynchus tshawytscha*	T	None	Includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River to the Russian River, California, as well as seven artificial propagation programs: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs.	High: Adults may migrate and/or forage in the study area.
Invertebrates					
Black abalone	*Haliotes cracherodii*	E	None	Rocky, low intertidal zone up to 6 meters deep.	Medium: May be present in the low intertidal zone and kelp forest in the study area.
Black abalone critical habitat				The study area is at the southern end of Specific Area 7, Pescadero State Beach, San Mateo County to Natural Bridges State Marine Reserve, Santa Cruz County. The critical habitat in this area includes the rocky intertidal and subtidal habitats from the mean high water line to a depth of -19.7 feet MLLW line, as well as the coastal marine waters encompassed by these areas (Federal Register, 2011).	Present in the study area.
White abalone	*Haliotes sorenseni*	E	None	Open low- or high-relief rock or bolder areas interspersed with sand channels. Most abundant 80 to 100 feet deep.	None: Outside of the geographical range.
Reptiles					
Green sea turtle	*Chelonia mydas*	T	None	Open Ocean.	Low: May migrate and/or forage in the study area.
Leatherback sea turtle	*Dermochelys coriacea*	E	None	Open Ocean.	Low: May migrate and/or forage in the study area.

Table 5.2-2. Federal and State Special-Status Species Potentially Occurring In the Marine Study Area

Common Name	Scientific Name	Status		Supporting Habitat	Likelihood of Occurrence in the Study Area
		Federal	State		
Pacific Ridley sea turtle	*Lepidochelys olivacea*	T	None	Open Ocean.	Low: May migrate and/or forage in the study area.
Loggerhead sea turtle	*Caretta caretta*	T	None	Open Ocean.	Low: May migrate and/or forage in the study area.

Federal Status Codes:
E = Endangered. Species in danger of extinction throughout all or a significant portion of its range.
T = Threatened. Species likely to become endangered in the foreseeable future.
D = Delisted
SSC = Species of Special Concern
MMPA = Marine Mammal Protection Act
Acronyms:
ESU = Evolutionary Significant Unit
DPS = Distinct Population Segment

California Status Codes:
E = Endangered. Species whose continued existence in California is in jeopardy.
T = Threatened. Species likely to become endangered in the foreseeable future.
D = Delisted
FP = Fully Protected
SSC = Species of Special Concern

Federal- and State-Listed Threatened and Endangered Species

Coho Salmon. The Central California Coast Coho Salmon Evolutionary Significant Unit (ESU) occurs from Punta Gorda in Northern California, south to—and including—the San Lorenzo River in central California (Weitkamp et al., 1995). Although individuals of this species have been identified during surveys conducted in the San Lorenzo River watershed, a self-sustaining run of wild coho has been presumed to be extirpated from the San Lorenzo River since the drought of the late 1980s (Hagar Environmental Science, 2012). Given the presence of individuals in San Lorenzo River, they have the potential to occur in the marine study area. Coho generally return to their natal streams between November and December. This species exhibits a simple 3-year anadromous lifecycle (Federal Register, 1996), rearing in freshwater for up to 15 months before migrating to the ocean. Coho salmon typically spend two growing seasons in the ocean before returning to their natal streams to spawn (Federal Register, 1996).

Chinook Salmon. Chinook salmon historically ranged from the Ventura River in California to Point Hope, Alaska, on the eastern edge of the Pacific; and in the western portion of the Pacific Ocean from Hokkaido, Japan, to the Anadyr River in Russia (Healey, 1991). Chinook salmon have been categorized into 17 ESUs. Each ESU is considered a distinct race, and has been given its own management status. Factors used in determining ESUs include spatial, temporal, and genetic isolation, maturation rates, and other life history traits.

Four Chinook salmon ESUs have potential to migrate through and forage in Monterey Bay: California Coastal, Sacramento River Winter-Run, Central Valley Spring-Run, and Central Valley Fall/Late Fall-Run. The California Coastal ESU, a federally listed threatened species, spawns in rivers and streams south of the Klamath River to the Russian River. The Sacramento River Winter-Run ESU, a federally and state-listed endangered species, spawns in the upper Sacramento River below Keswick Dam. The Central Valley Fall/Late Fall-Run ESU, a federally and state-listed species of special concern, spawns in the Sacramento and San Joaquin river basins (Myers et al., 1998). The Central Valley Spring-Run ESU, a federally and state--listed threatened species, spawn in the Sacramento River Basin.

Steelhead. Steelhead are the anadromous form of rainbow trout, spending some time in both freshwater and saltwater. Older juvenile and adult life stages occur in the ocean until the adults ascend the freshwater streams where they were reared, if possible, to spawn. Steelhead typically enter fresh water in August, with a peak in late September through October, although the timing of migration depends on annual hydrological conditions. Once flows are high enough, they enter the tributaries for spawning (Moyle, 2002).

Along the Pacific Coast, the steelhead has been divided into distinct population segments (DPSs) based upon genetic similarities and watershed boundaries. Three of these DPS are known to occur in the San Lorenzo River and Liddell, Laguna, and Majors creeks (Hagar Environmental Science, 2012), and have the potential to occur in the marine study area. The Central Coastal California steelhead DPS, a federally listed threatened species, occurs in river basins from the Russian River to Aptos Creek. The Central Valley steelhead DPS, a federally listed threatened

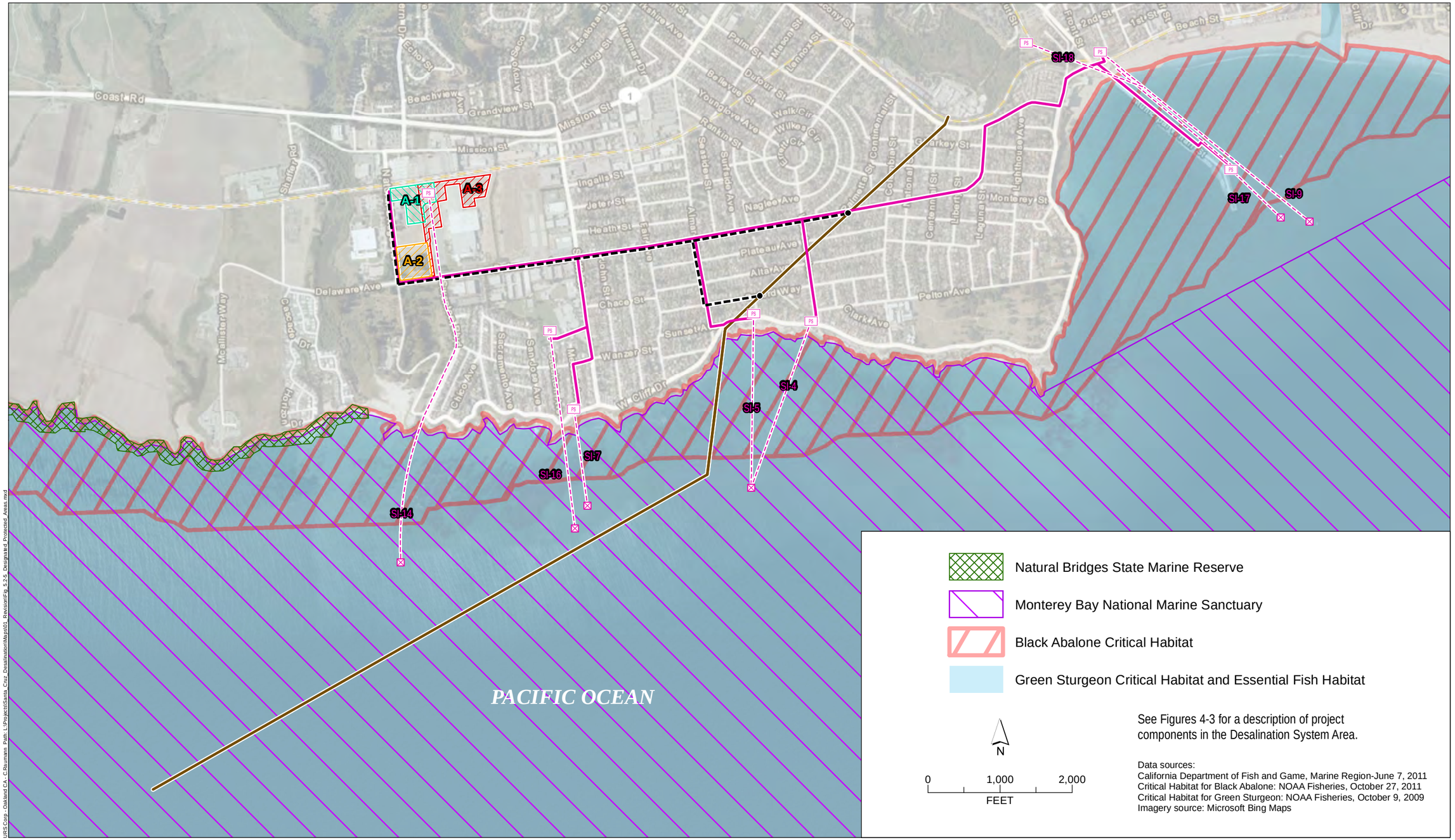
species, occurs in the Sacramento and San Joaquin rivers and their tributaries. The South-Central California Coast steelhead DPS, a federally listed threatened species and a state-listed species of special concern, spawns in some coastal California drainages from the Pajaro River southward.

Green Sturgeon. Green sturgeon southern DPS are federally listed as threatened, and are a state-listed species of special concern. Green sturgeon are anadromous fish that spend most of their lives in saltwater, and return to spawn in freshwater. Green sturgeon rely on streams, rivers, and estuarine habitat, as well as marine waters, during their lifecycle. They spawn in the lower reaches of large rivers with swift currents and large cobble. Juveniles remain in the estuaries for a short time and migrate to the ocean as they grow larger. Sturgeon often feed on invertebrates and small fish (Adams et al., 2002).

On October 9, 2009, the National Marine Fisheries Service (NMFS) issued a final designation of critical habitat for green sturgeon (74 Code of Federal Regulations [CFR] 52300-52351). Under this ruling, the entire Monterey Bay up to a depth of 110 feet is designated as critical habitat, including the project area (Federal Register, 2009). The critical habitat for this species is shown on **Figure 5.2-5, Designated Habitat Areas, National Marine Sanctuaries, and State Marine Reserves**.

Black Abalone. Black abalone are federally listed as endangered. The black abalone is a relatively large, shelled gastropod mollusk that can reach a maximum size of about 8 inches. It is one of seven species of abalone that occur in California, and it is the only species that occurs primarily in shallow water depths no deeper than 15 to 20 feet. It occurs along the shoreline in intertidal habitats where it is found on the faces, overhangs, and cracks of rocks. Black abalone have a planktonic larval and benthic adult life stage. After spawning, planktonic larvae are suspended for 3 to 10 days before settling on benthic substrate. After settlement, black abalone begin metamorphosis into their adult, benthic life form (Federal Register, 2011).

In the mid-1980s, black abalone were discovered in the Channel Islands with severely shrunken body masses (Tissot, 1990; Haaker et al., 1992; Richards and Davis, 1993; Tissot, 1995). The condition was termed withering syndrome (Haaker et al., 1992). Subsequent monitoring of black abalone populations at numerous locations showed dramatic declines in most populations south of Monterey County (Altstatt et al., 1996; Raimondi et al., 2002; Butler et al., 2009) due to this syndrome. On June 23, 1999, black abalone was added to the list of Candidate Species by the (Federal Register 64 33466), in the context of consideration for federal protected status pursuant to the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.) as amended. The black abalone was transferred to the NMFS List of Species of Concern on April 15, 2004 (Federal Register 69, 19975). NMFS initiated a formal status review in June 2007 as mandated by the ESA. As a result of the status review, a proposal to list black abalone as endangered, a solicitation for public comment on the proposed rule, and solicitation for additional information regarding black abalone status and habitat needs were published in the Federal Register on January 11, 2008 (Federal Register 73, 1986). A final rule formally designating black abalone as an endangered species was published on January 14, 2009 (Federal Register 74, 1937).



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City of Santa Cruz and Soquel Creek Water District
scwd² Regional Seawater Desalination Project

Figure 5.2-5
Designated Protected Areas

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On October 27, 2011, the NMFS issued a final designation of critical habitat for black abalone (76 CFR 66806-66844). Under this ruling, 20 specific areas along the coast of California are designated critical habitat. A portion of the study area is at the southern end of Specific Area 7, Pescadero State Beach, San Mateo County to Natural Bridges State Marine Reserve, Santa Cruz County (see **Figure 5.2-5**). The critical habitat in this area includes the rocky intertidal and subtidal habitats from the mean high water line to a depth of -19.7 feet mean lower low water line, as well as the coastal marine waters encompassed by these areas (Federal Register, 2011). Individuals have been found locally at sites such as Natural Bridges and Terrace Point.

Southern Sea Otter. The southern sea otter is a federally threatened population and is protected by the MMPA of 1972. Approximately 16,000 to 18,000 sea otters were formerly distributed along the California coastline. After extensive harvesting in the 18th and 19th centuries, less than a hundred sea otters remained off the isolated coastline of Big Sur, California. After years of protection, the population increased to 500 to 600 individuals by 1950; and thereafter, increased by approximately 5 percent annually until 1976, when the increase slowed (Estes, 1990). Approximately 2,700 individuals exist in the southern sea otter range, and they have expanded their range north of Santa Cruz (to about Half Moon Bay) (USFWS, in draft). Sea otters are observed regularly in the marine study area off of West Cliff Drive and the Municipal Wharf.

Other Special-Status Species

California Sea Lion. The California sea lion is protected under the MMPA. California sea lions breed in Southern California and along the Channel Islands. On occasion, sea lions will pup on Año Nuevo Island (MBNMS, 1996d). After the breeding season, males migrate up the Pacific Coast and into Monterey Bay. The largest populations of sea lions are on Año Nuevo. In Santa Cruz, sea lions often haul out (come ashore to rest) at the Santa Cruz Municipal Wharf and on Seal Rock, which is directly across from the Mark Abbot Memorial Lighthouse, in the marine study area.

Pacific Harbor Seal. The harbor seal is protected under the MMPA. Harbor seals are nonmigratory, and can be found along shorelines and in estuaries throughout North America. Pacific harbor seals use Monterey Bay year-round, where they engage in limited seasonal movements associated with hauling out, foraging, and breeding activities (SIMoN, 2011c). Harbor seals forage in shallow, intertidal waters on a variety of fish, crustaceans, and a few cephalopods (e.g., octopus). They also consume benthic organisms and schooling fishes.

Harbor seals haul out in groups ranging in size from a few individuals to several hundred. Habitats used as haul-out sites include tidal rocks, bayflats, sandbars, and sandy beaches (Zeiner et al., 1990).

Gray Whale. Gray whales are protected by the MMPA. In 1994, the eastern north Pacific gray population was delisted due to the recovery of its existing population to levels near the estimated original population size (NOAA, 2011a). Population counts of gray whales migrating south along the central California coast have been conducted by shore-based observers at Granite

Canyon in most years since 1967. Based on counts made during the 1997/1998, 2000/2001, and 2001/2002 southbound migrations, the population is estimated at about 18,000 to 30,000 animals (NOAA, 2011a).

Gray whales migrate between summer feeding grounds in the Bering and Chukchi seas, between Alaska and Russia, and winter calving areas in Baja California, Mexico (Marine Mammal Commission, 2003). Gray whales move through Monterey Bay while migrating between summer feeding and winter calving areas. They migrate north from mid-February through May, usually within 3 miles of shore. Most adult and juvenile whales pass Monterey on their way to Alaska by mid-April. Females heading north with their new calves pass Monterey in April and May. The population migrates south in the fall. During the southern migration, the whales tend to stay much farther offshore than during the northern migration, when they are regularly observed from West Cliff Drive. They are benthic feeders that swim along the bottom on their sides while scooping up sediment containing benthic invertebrates—primarily amphipods. The sediment and benthic amphipods are filtered through their baleen plates (NOAA, 2011a).

5.2.3 Regulatory Framework

The proposed project would be subject to applicable regulations pertaining to special-status species, other protected species and habitats, and water quality. Regulations pertaining to marine biology in the project area that are relevant to the analysis of project impacts are detailed below. See also **Section 5.4, Land Use, Planning, and Recreation** for evaluation of potential conflicts with relevant land use plans, policies, and regulations of agencies that have jurisdiction over the proposed project. For example, the California Coastal Act and the National Marine Sanctuaries Act are addressed in **Section 5.4**.

Special-Status Species

Federal Endangered Species Act

The Federal Endangered Species Act (federal ESA) (16 United States Code [USC] 1531-1544) provides protection for endangered and threatened species. An “endangered” species is a species in danger of extinction throughout all or a significant portion of its range. A “threatened” species is one that is likely to become “endangered” in the foreseeable future without further protection. Other special-status species include “proposed” and “candidate” species, and “species of concern.” Proposed species are those that have been officially proposed (in the Federal Register) for listing as threatened or endangered. Candidate species are those for which enough information is on file to propose listing as endangered or threatened. A “delisted” species is one whose population has reached its recovery goal and is no longer in jeopardy.

The federal ESA requires that at the same time the decision is made to list a species, the secretary of the interior must develop a recovery plan for the species; and, with certain exceptions, designate the critical habitat of the species. Critical habitat consists of "the specific areas within the geographical area occupied by the species, at the time it is listed … on which are

found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." Federal actions that may adversely affect Critical Habitat require consultation under the federal ESA.

The federal ESA is administered by USFWS and NMFS. In general, NMFS is responsible for protection of federally-listed marine species and anadromous fishes, while other species are under USFWS jurisdiction.

Section 9 of the federal ESA prohibits the "take" of listed species. Taking is defined to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (federal ESA, Section 3[19]). Under Federal regulations, take is defined further to include habitat modification or degradation where it actually results, or is reasonably expected to result, in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Projects that would result in "take" of any federally listed threatened or endangered species are required to obtain authorization from the USFWS or NMFS through either Section 10(a) (incidental take permit) or Section 7 (interagency consultation), depending on whether the federal government is involved in permitting or funding the project. The Section 10(a) process allows a person to obtain the right to engage in "incidental take" of listed species or their habitat with respect to non-federal activities. Section 7 requires a federal agency contemplating an action that may affect a listed species to undertake formal consultation with USFWS or NMFS. The latter two agencies must then determine whether the proposed action will jeopardize the listed species, or destroy or adversely modify designated critical habitat.

California Endangered Species Act

Similar to the federal ESA, the California Endangered Species Act (California ESA) (California Fish and Game Code 2050-2116), authorizes the California Fish and Game Commission to designate, protect, and regulate the taking of special-status species in the State of California. The California ESA defines "endangered" species as those whose continued existence in California is jeopardized. State-listed "threatened" species are those not presently threatened with extinction, but which may become endangered if their environments change or deteriorate. Any proposed projects that may adversely impact state-listed threatened or endangered species must formally consult with the California Department of Fish and Wildlife (CDFW).

Section 2080 of the California Fish and Game Code prohibits the taking of state-listed plants and animals. The California ESA prohibits the "taking" of listed species except as otherwise provided in state law, where take is defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." Under California Fish and Game Code Section 2081, CDFW may "authorize, by permit, the take of endangered species, threatened species, and candidate species if...the take is incidental to an otherwise lawful activity" and if certain other requirements are met.

State agencies, moreover, have additional obligations. Each state lead agency was formerly required to consult with CDFW to ensure that any action it undertakes is not likely to jeopardize the continued existence of any endangered or threatened species, or result in destruction or adverse modification of essential habitat. This requirement expired on January 1, 1999; however, the original legislation creating it had a sunset date of the end of 1998. Even so, every state agency remains subject to a statutory duty "to seek to conserve endangered species and threatened species." In addition, all state agencies remain subject to the command that they "should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy." However, "in the event specific economic, social, or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided" (Fish and Game Code, Sections 2053, 2054).

In addition to listed species, the CDFW also maintains a list of "Species of Special Concern," most of which are species whose breeding populations in California may face extirpation (local extinction). To avoid the future need to list these species as endangered or threatened, the CDFW recommends consideration of these species, which do not as yet have any legal status, during analysis of the impacts of proposed projects.

Other Protected Species and Habitats

Fully Protected Species

The California Legislature has designated "fully protected" or "protected" species as those which, with limited exceptions, may not be taken or possessed under any circumstances (Fish and Game Code Sections 3511, 4700, 5050, 5515). Species designated as fully protected or protected may or may not be listed as endangered or threatened. The classification of fully protected was the State of California's initial effort in the 1960s to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists for fish, amphibians and reptiles, birds, and mammals were created at this time. Most fully protected species were later listed as threatened or endangered species under more recent endangered species laws and regulations. Fully Protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take, except as a "covered species" pursuant to a Natural Community Conservation Plan (NCCP) developed under the Natural Community Conservation Planning Act (NCCPA; Fish and Game Code Section 2800 et seq.); and no take permits can be issued for these species except pursuant to an NCCP, or for scientific research purposes, or for relocation to protect livestock.

Fully protected species are listed in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the Fish and Game Code, and protected amphibians and reptiles are listed in Chapter 5, Sections 41 and 42.

Magnuson-Stevens Fisheries Act

The original act was passed in 1976 (16 USC 1801-1882), and its primary purposes were conservation and management of U.S. fishery resources, development of U.S. domestic fisheries, and phasing out foreign fishing activities in federal waters, the 200-mile limit extending from the edge of state waters. This area became known as the Exclusive Economic Zone (EEZ), and the Magnuson Act achieved its goal of eliminating foreign fisheries and enhancing domestic fisheries in the EEZ.

The Amended Magnuson-Stevens Fishery Conservation and Management Act of 1996, also known as the Sustainable Fisheries Act (Public Law 104-297), requires all federal agencies to consult with the Secretary of Commerce on proposed projects authorized, funded, or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH). The main purpose of the EFH provisions of the Sustainable Fisheries Act is to avoid loss of fisheries due to disturbance and degradation of the fisheries habitat.

Monterey Bay is designated as EFH by the Pacific Fisheries Management Council to protect and enhance habitat for coastal marine fish, and macroinvertebrate species that support commercial fisheries. Managed EFH in the study area are addressed by the *Pacific Groundfish Management Plan* and the *Pacific Coast Salmon Plan* (NOAA, 2011b). Managed fish found in the study area include, but are not limited to, salmonid species, rockfish, roundfish, and flatfish (PFMC, 2008).

Habitat Areas of Particular Concern (HAPC) are a sub-set of EFH that have been designated based on the following (PFMC, 2005):

- The importance of the ecological function provided by the habitat;
- The extent to which the habitat is sensitive to human-induced environmental degradation;
- Whether, and to what extent, development activities are or will be stressing the habitat type; and
- Rarity of the habitat type.

The Rocky Reefs HAPC are nearshore or offshore rocky subtidal areas composed of hard substrate material such as boulders, bedrock, and gravel. According to the Pacific Fishery Management Council, these areas include the “waters, substrates and other biogenic features associated with hard substrate (e.g., bedrock, boulders, cobbles, gravel) to MHHW [mean higher high water].” The rocky subtidal area in the study area are designated Rocky Reefs HAPC (NOAA, 2011b).

Marine Life Protection Act

The Marine Life Protection Act of 1999 (California Fish and Game Code 2850-2863) requires the State of California to reevaluate and redesign the State’s existing system of marine protected areas. The designation of each marine protected area would be done on a regional basis using the

best available sciences. Each area is given one of three designations that define the allowable uses in the area. When finished, these protected areas would function as one comprehensive network.

The designated marine protected area closest to the study area is Natural Bridges State Marine Reserve. The protected area extends from Natural Bridges north, and the southernmost portion of the Reserve is just inside the study area (see **Figure 5.2-5**). This area has been designated as a "no take" area for recreational and commercial take. The jurisdictional boundary extends 200 feet seaward and includes the intertidal areas. No project activities are proposed in or near the boundaries of the Reserve.

Marine Mammal Protection Act

The MMPA (16 USC 1361-1421h), adopted in 1972, makes it unlawful to take or import any marine mammals and/or their products. Under Section 101(a)(5)(D) of this act, an incidental harassment permit may be issued for activities other than commercial fishing that may impact small numbers of marine mammals. An incidental harassment permit covers activities that extend for periods of not more than 1 year, and that will have a negligible impact on the impacted species. Amendments to this act in 1994 statutorily defined two levels of harassment. Level A harassment is defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild. Level B harassment is defined as harassment having potential to disturb marine mammals by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

Water Quality

California Ocean Plan

The California State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCB) have been delegated the responsibility for administering permitted discharge into the coastal marine waters in California under the federal Clean Water Act. The SWRCB prepares and adopts the Quality Control Plan for Waters of California (Ocean Plan), which establishes water quality standards that apply to ocean waters within the State of California's jurisdiction. RWQCBs adopt Water Quality Control Plans in their respective regions and regulate individual wastewater discharges through issuance of NPDES (National Pollutant Discharge Elimination System) permits. NPDES permits must implement all applicable Water Quality Control Plan water quality standards, including those in the Ocean Plan when applicable. A complete discussion of the Ocean Plan relative to water quality objectives of the receiving waters is provided in **Section 5.1**.

As noted in **Section 5.1**, the Ocean Plan relates to the marine biology environment because the beneficial uses identified in the Ocean Plan include biological considerations, such as: marine habitat; fish migration; fish spawning; shellfish harvesting; commercial and sport fishing; and mariculture. The SWRCB is considering amendments to the Ocean Plan which would

specifically address brine disposal and seawater desalination, with the stated purpose being to address permitting uncertainties, and to provide guidance to the RWQCBs in issuing permits for seawater desalination projects. The process for developing the proposed amendments includes specific considerations of the effects of elevated salinities from brine disposal, as well as the effects of intakes on the marine environment.

NPDES Permits

As noted in **Section 5.1**, the proposed project would discharge brine concentrate via the existing City of Santa Cruz wastewater outfall, which is regulated by the *NPDES Waste Discharge Requirements for the City of Santa Cruz Wastewater Treatment Plant* (WWTF Discharge Permit) (Order No. R3-2010-43, NPDES No. CA 0048194), issued by the Central Coast RWQCB (RWQCB, 2010). Effluent limitations established for the WWTF apply to discharges measured in the outfall pipe prior to mixing with ambient water. The constituents listed with effluent limitations in the permit are consistent with Ocean Plan water quality objectives recognizing the initial dilution of treated effluent at the point of discharge of 139:1 (seawater to effluent).

Clean Water Act Sections 404 and 401

Under Section 404 of the Clean Water Act (33 USC 1251-1376), the U.S. Army Corps of Engineers (USACE) regulates the disposal of dredged and fill materials into “waters of the United States,” which can include intrastate lakes, rivers, streams (including intermittent streams), ocean, bayflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, and wetlands adjacent to any water of the U.S. (33 CFR 328). In areas subject to tidal influence, Section 404 jurisdiction extends to the high tide line or boundary of any adjacent wetlands. Because a 404 permit will be required for the proposed project under the Clean Water Act, a Water Quality Certification under Section 401 of the Clean Water Act will also be required. **Section 5.1** includes a more detailed discussion on Section 401 of the Clean Water Act.

Rivers and Harbors Act Section 10

The USACE also regulates navigable waters under Section 10 of the Rivers and Harbors Act (33 USC 403). This Act prohibits the creation of any obstruction or alteration in a "navigable water of the United States" unless authorized by Congress or a Department of the Army permit. Navigable waters are defined as “those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce” (33 CFR 322.2). Because ocean water offshore of Santa Cruz is defined as navigable waters, a permit from the USACE would be required for the project.

Fish and Wildlife Coordination Act

The original act of March 10, 1934 (16 USC 661-667e), authorized the Secretaries of Agriculture and Commerce to assist and cooperate with federal and state agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife.

The amendments to this act in 1946 required consultation with the USFWS, NMFS, and State agencies responsible for fish and wildlife resources for all proposed federal undertakings, and non-federal actions needing a federal permit or license that would impound, divert, deepen, or otherwise control or modify a stream or water body, and to make mitigation and enhancement recommendations to the involved federal agency.

Summary of Regulatory Status of Habitats in the Study Area

Marine resources in the study area are regulated by a suite of federal and state regulations, as described above. Specific marine areas and habitats are identified and protected under these regulations, and are summarized below (see **Figure 5.2-5**).

- **Monterey Bay National Marine Sanctuary.** Much of the study area is within the boundaries of the MBNMS, one of thirteen National Marine Sanctuaries in the United States, which was designated in accordance with the National Marine Sanctuaries Act.
- **Essential Fish Habitat.** Under the Magnuson-Stevens Fisheries Act, the study area is in designated EFH that is overseen by the Pacific Fisheries Management Council. Managed fish found in the study area include, but are not limited to, salmonid species, rockfish, roundfish, and flatfish.
- **Habitat Areas of Particular Concern.** Additionally, the Magnuson-Stevens Fisheries Act identifies the offshore rocky areas as Rocky Reefs HAPC, a subset of EFH, as described previously. This area includes “waters, substrates and other biogenic features associated with hard substrate (e.g., bedrock, boulders, cobble, gravel) to mean higher high water (MHHW).”
- **Critical Habitat.** Portions of the study area are in designated critical habitat for the green sturgeon and black abalone.
- **State Marine Reserve.** Although there are no areas of special concern as designated under the California Marine Life Protection Act, there is a designated state marine reserve: Natural Bridges State Marine Reserve. The protected area extends from Natural Bridges north, and the southernmost portion of the Reserve is just inside the study area.

5.2.4 Impacts and Mitigation Measures

This section contains the evaluation of potential environmental impacts associated with the proposed project related to marine biological resources. The section identifies the standards of

significance used in evaluating the potential environmental effects, the methods used in conducting the analysis, and a detailed evaluation of impacts for the proposed project and any potential future expansion.

Standards of Significance

Based on CEQA Guidelines Section 15065; Appendix G of the CEQA Guidelines; applicable agency plans, policies, and/or guidelines; and agency and professional standards; the proposed project would cause a significant impact related to marine biological resources if it would:

Entrainment and Impingement

2a. Have a substantial adverse effect, either directly or through habitat modifications, on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW, USFWS, or NMFS;

2b. Substantially reduce the habitat of a fish or wildlife species;

2c. Cause a fish or wildlife population to drop below self-sustaining levels;

2d. Threaten to eliminate a plant or animal community;

2e. Substantially reduce the number or restrict the range of an endangered, rare or threatened species;

Brine Discharge

2f. Result in discharge to the ocean receiving waters that would result in substantially increased salinity concentration levels and/or temperature, which could have adverse effects on marine organisms, as described in standards 2a through 2e above;

Construction and Maintenance

2g. Have a substantial adverse effect on marine organisms, as described in standards 2a through 2e, from construction and/or maintenance in ocean waters through direct disturbance, removal, filling, hydrological interruption, discharge, or other means (e.g., underwater and airborne noise);

Other Considerations

2h. Have a substantial adverse effect on critical habitat, essential fish habitat (EFH), or other sensitive marine habitats designated by CDFW, USFWS, or NMFS; or

2i. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Analysis Methodology

The above standards of significance are assessed as the basis for determining the significance of impacts related to marine biological resources. If necessary, mitigation measures are proposed to reduce significant impacts to less than significant. See **Section 5.1** for information about marine water quality impacts of the proposed project. See **Section 5.3, Terrestrial Biological Resources**, for information about terrestrial biological resource impacts of the proposed project. The approach to the analysis of marine biological resources impacts is further described below.

Special-Status Species

Potential impacts to special-status marine species in the study area are evaluated based on a review of the available literature regarding the status, and known distribution of species in the study area, including the following:

- USFWS List of Endangered and Threatened Species that may occur in or be affected by projects in the Davenport and Santa Cruz USGS quadrangles.
- CNDDB query results for the USGS 7.5-minute quadrangles for the Davenport and Santa Cruz quadrangles.
- Critical Habitat information for green sturgeon and black abalone, from NMFS and the Federal Register, as previously cited.
- City of Santa Cruz Water Department & Soquel Creek Water District scwd2 Desalination Program Open Ocean Intake Effects Study (**Appendix G)**.
- IWP Program EIR.
- *Monterey Bay National Marine Sanctuary Site Characterization Report.*
- MBNMS: SIMoN.
- Species-specific information available in various references, as previously cited.

Once all data sources were reviewed, a final list of special-status species with potential to occur in the vicinity of the study area was compiled, and each of the species was evaluated for presence or absence in the area, as well as presence of suitable habitat and how the species might use the habitat (see **Table 5.2-2**). The potential for project impacts on special-status species was then evaluated, as it relates to entrainment and impingement, brine discharge, and construction and maintenance, as further described below.

Entrainment and Impingement

Both entrainment and impingement of organisms can occur with seawater intake systems. Entrainment occurs when small marine organisms, such as larval fish or plankton, pass through the slots of an intake screen and are drawn into the treatment facilities. Impingement occurs

when organisms are trapped against the intake screen and are unable to escape due to the force of the flowing water.

The Open Ocean Intake Effects Study (**Appendix G**) was conducted over a 13-month period to assess the potential effects of entrainment and impingement from a screened, open-water intake. A Technical Working Group (TWG) was formed to review and approve the study plan before sampling began, and to provide review throughout the study. The TWG was comprised of representatives of involved federal and state regulatory agencies and the academic community. The objectives of the study were to:

1. "Establish a baseline characterization of larval fish, fish eggs, caridean shrimps and cancrid crab species by sampling the species composition, abundance and variability in the open ocean near the proposed intake."

2. "Model the potential impacts in local fish, caridean shrimp and cancrid crab populations caused by the loss of entrained organisms.

Field data were collected in accordance with methodology developed by California Cooperative Oceanic and Fisheries Investigation. Samples were taken at four offshore locations (see **Figure 5.2-4**). A dual frame (bongo) with mesh plankton nets was used to collect plankton samples in the source water in the study area. To account for day/night variation in the water column, each sampling period consisted of one daytime and one nighttime plankton tow. Two plankton tows at Station SWE and one at Stations SW1, SW2, and SW3 (see **Figure 5.2-4**) were taken during each period. Simultaneous samples of organisms entrained in a test-scale intake system (located at the end of the Santa Cruz Municipal Wharf) were also conducted to estimate the proportional loss of organisms in the source waters, based on operation of the proposed 2.5-million-gallon-per-day (mgd) plant. To evaluate impacts from potential impingement, video cameras were used to monitor fish and invertebrate interactions with the test-scale intake screens during operation.

Because there is no specific guidance in CEQA or other applicable or controlling regulations regarding entrainment and impingement effects of seawater desalination plants, the significance threshold used in this analysis is derived from CEQA Guidelines 15065(a)(1). That section states "[a] lead agency shall find that a project may have a significant effect on the environment and thereby require an EIR to be prepared for the project where there is substantial evidence, in light of the whole record, that...[t]he project has the potential to: substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; [or]...substantially reduce the number or restrict the range of an endangered, rare or threatened species." CEQA Guidelines Section 15065 clarifies that findings of significance are not required if a project results in any reduction in habitat or population of a species, but only when habitat would be "substantially reduced" by a project or when a project would cause population levels of a species to "drop below self-sustaining levels."

Therefore, the standard applied to the project is whether the project-related impingement and entrainment impacts would substantially reduce populations of affected species, such that the sustainability of those populations could not be maintained. Affected species are those species determined to be potentially affected based on the intake studies; including, but not limited to, special-status species. Standards of significance 2a and 2b embody the above information.

Brine Discharge

The brine from the desalination plant would be directed via new piping to the City's Wastewater Treatment Facility (WWTF) outfall, where it would be blended with the WWTF effluent and returned to the Monterey Bay. The Dilution Analysis (**Appendix J)** was conducted to determine the design and specifications of discharge facilities and procedures in order to maintain the dilution requirements of the City's National Pollutant Discharge Elimination System (NPDES) discharge permit (CA 0048194) for the WWTF. Specifically, the study examined how the brine discharge must be modulated to achieve the City's NPDES permit minimum dilution ratio (seawater to effluent) of 139:1. Most importantly, the studies determined how the combined brine/effluent discharge should be designed and operated so that the combined discharge would not exceed ambient salinity of the receiving waters. The commitment to maintain existing dilution requirements and ambient salinity levels at the point of discharge is incorporated into the project definition, provided in **Section 4** (see **Table 4-12**), and environmental design features for brine, below. Given that the proposed project would not increase salinity in ocean receiving waters beyond ambient salinity levels, numeric thresholds of significance related to acute and chronic toxicity from salinity are not needed to evaluate the significance of the brine discharge effects on marine organisms. Results from **Section 5.1** (see Impact 5.1-3), are referenced in this section to assess the marine water quality impacts of the proposed project on marine life.

Construction and Maintenance

Water Quality

Results from **Section 5.1** (see Impact 5.1-2), were referenced to assess whether marine organisms would be impacted by potential temporary changes in water quality due to construction of the project, and/or due to periodic intake maintenance. Construction effects on water quality include increases in turbidity during construction dredging and intake maintenance.

Underwater and Airborne Noise

The potential impact of construction noise on marine life is evaluated in this section. There are differences in how underwater sound and airborne sound are defined and measured. Decibel (dB) levels describing underwater sound and airborne sound have different reference pressures (or definitions), which causes them to have different dB values for the same sound pressure. Also, airborne sounds are often filtered to account for the response of the human ear to sound (A-weighted), but underwater sounds are typically reported as overall, unfiltered values (linear

values). Furthermore, the fact that air and water have different physical characteristics, such as density, affects the relative intensity of sounds in water and in air.

Applicable underwater noise criteria for fish and marine mammals, as described below, are used in the analysis because they provide a basis for determining whether various project offshore construction activities could result in disturbance or injury to these organisms. Applicable airborne noise criteria for marine mammals are also provided below for use in evaluating airborne construction noise. Once the potential for disturbance or injury has been determined, the significance of the impacts are evaluated based on the standard of significance above for construction.

Applicable Underwater Criteria for Fish. On July 8, 2008, the Fisheries Hydroacoustic Working Group (FHWG), whose members include NMFS' Southwest and Northwest Divisions, California, Washington, and Oregon departments of transportation, the CDFW, and the U.S. Federal Highway Administration, issued an agreement for the establishment of interim threshold criteria to determine the effects of high-intensity sound on fish (FHWG, 2008). Although these criteria are not formal regulatory standards, they are generally accepted as viable criteria for underwater noise effects on fish.

Table 5.2-3, Underwater Noise Thresholds for Fish, shows the criteria that were established after extensive review of the most recent analyses of the effect of underwater noise on fish. The FHWG has determined that noise at or above the 206 dB peak level can cause barotrauma to auditory tissues, the swim bladder, or other sensitive organs. Barotrauma is damage to body tissue due to changes in pressure between fish and their surrounding environment. Additionally, accumulated sound energy levels (SEL) above 187 dB for large fish and 183 dB for larval fish (less than 2 grams body weight) have been determined to be potentially detrimental to fish. Although injury does not occur, noise levels above the accumulated SEL may cause temporary hearing-threshold shifts. Although no threatened or endangered fish of less than 2 grams body weight would be present in the study area, larvae of fish species managed under the Magnuson-Stevens Act may be present. Therefore, the 183 dB SEL threshold was used for this analysis. Behavioral effects are not covered under these criteria, but could occur at these levels or lower. Behavioral effects may include fleeing and the temporary cessation of feeding or spawning behaviors.

Table 5.2-3. Underwater Noise Thresholds for Fish (Impulse Sounds)

	Peak Noise (dB)	Accumulated Noise (SEL) (dB)
Fish under 2 grams in weight	>206	>183
Fish over 2 grams in weight	>206	>187

Acronyms:
dB = decibels
SEL = sound energy levels

Applicable Criteria for Marine Mammals (Underwater Noise). Levels of harassment for marine mammals are defined in the Marine Mammal Protection Act of 1972. Level A harassment is defined as "[A]ny act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "[A]ny act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering." Any activities that may result in harassment of marine mammals under these guidelines would require an Incidental Harassment Authorization from NMFS.

NMFS criteria for marine mammals define exposure to underwater sound pressure level from impulse sounds at or above 160 dB root mean squared (RMS[2]) as constituting harassment to marine mammals (Federal Register Notice, Vol. 70 pp. 1871-1875). NMFS also distinguishes between impulse sound, such as that from impact pile driving, and continuous sounds, such as that from vibratory pile driving. **Table 5.2-4, NMFS Level A and B Harassment Thresholds for Marine Mammals**, shows the current Level A (injury) and Level B (disturbance) threshold levels for cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions).

Table 5.2-4. NMFS Level A and B Harassment Thresholds for Marine Mammals

	Level A (dB RMS)	Level B (dB RMS)
Impulse Sounds		
Pinnipeds (seals, sea lions)	>190	160 – 190
Cetaceans (whales)	>180	160 – 180
Continuous Sound		
Pinnipeds (seals, sea lions)	>190	120 – 190
Cetaceans (whales)	>180	120 – 180

Acronyms:
dB = decibels
NMFS = National Marine Fisheries Service
RMS = root mean squared

Applicable Criteria for Marine Mammals (Airborne Noise). The Level B (disturbance) threshold for harbor seals is 90 dB RMS and 100 dB RMS for all other pinnipeds (e.g., sea lions) (NMFS, 2011). Airborne operational noise would not exceed established airborne noise thresholds for marine mammals.

[2] RMS measures the average noise energy measured over a 35-millisecond period. Note that this is a different type of measurement than the peak sound or SEL used to measure impacts to fish.

Impacts and Mitigation

This section provides a detailed evaluation of marine biological resources impacts associated with the proposed project. The analyses addresses entrainment and impingement impacts (standards 2a through 2e), brine discharge impacts (standard 2f), construction water quality impacts (standard 2g), underwater construction noise impacts (standard 2g), impacts to designated marine habitats (standard 2h), and impacts related to wildlife movement (standard 2i).

The impacts to marine biological resources associated with each individual project component are summarized in **Table 5.2-5, Summary of Potential Marine Biological Resources Impacts**, and are categorized as "not applicable," "no impact," "less than significant impact," "less than significant impact with mitigation," or "significant and unavoidable impact. The detailed analysis of marine biological resources impacts and mitigation measures follows this table.

Table 5.2-5. Summary of Potential Marine Biology Impacts

Impacts	LEVEL OF SIGNIFICANCE												
	Seawater Intake Site Alternatives								Plant Site Alternatives			Project Overall	Possible Future Expansion
	SI-4	SI-5	SI-7	SI-9	SI-14	SI-16	SI-17	SI-18	A-1	A-2	A-3		
5.2-1: Entrainment/ Impingement	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	--	--	--	LTS	LTS
5.2-2: Brine Discharge Water Quality	--	--	--	--	--	--	--	--	--	--	--	LTS	LTS
5.2-3: Construction & Maintenance Water Quality	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	--	--	--	LTS	LTS
5.2-4: Underwater & Airborne Construction Noise	LTSM	LTSM	LTSM	LTS	LTSM	LTSM	LTSM	LTS	--	--	--	LTS/LTSM*	LTS
5.2-5: Fill/Placement of Intake Structures	LTSM	LTSM	LTSM	LTS	LTSM	LTSM	LTS	LTS	--	--	--	LTS/LTSM*	LTS/LTSM*
5.2-6: Movement of Fish or Wildlife	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	--	--	--	LTS	LTS

Acronyms:
SU = Significant and Unavoidable Impact
LTSM = Less Than Significant Impact With Mitigation
LTS = Less Than Significant Impact
NI = No Impact
-- = Not applicable
* Impact significance of project overall will depend on the site alternative selected

ENTRAINMENT AND IMPINGEMENT

Impact 5.2-1: Operation of the proposed seawater intake system could potentially affect special-status or other marine species through entrainment or impingement, but the effect would not be substantial.

Significance: Less than significant

Mitigation Measures: None required

Proposed Project

Listed and other species-status species most likely to occur in the marine environment of the study area include adult and juvenile salmonids (coho, Chinook, steelhead), green sturgeon, black abalone, southern sea otter, Pacific harbor seal, and California sea lion. The southern sea otter, Pacific harbor seal, and California sea lion are protected under the MMPA.

Operation of an open-ocean intake at any of the seawater intake alternative locations could result in entrainment or impingement affecting small marine organisms such as adult, juvenile, and larval fish, as well as late-stage invertebrate larvae, as further described below. The discussion of the effects on small marine organisms includes both special-status and common species. Larger species such as marine mammals would not be affected by operation of the intake system because of their size and mobility.

Entrainment

As indicated previously, entrainment analyses were performed as part of the 13-month Open Ocean Intake Effects Study (**Appendix G**). The potential entrainment impacts were assessed using the Empirical Transport Model (ETM), as recommended and approved by the California Energy Commission, CCC, Regional Water Quality Control Boards, and other regulatory and resource agencies (Steinbeck et al., 2007). This model assesses the proportional losses of larvae in the source water using an estimate of the ratio of the number of larvae likely to be withdrawn from the proposed project, to the number available (i.e., at risk of entrainment) in the Monterey Bay source waters (based on data collected during the 13-month sampling period). The source water area and volume are estimated based on local currents and life-cycle stages of the different larvae found in the area. The linear extent of the source water body is estimated as the distance an average-age larva of each entrained species would be transported by currents to the intake screen, during the period of the species' larval life stage, while the larvae are still small enough to be entrained.

To produce 2.5 mgd of treated product water reliably, the seawater intake system would be designed to provide a maximum flow of 7 mgd of raw seawater. The ETM calculations account for this intake design capacity. The results do not take into account any potential reduction in

entrainment that could be achieved by using a screen or screens on the intake, which as discussed below, would be a design feature of the proposed project. The modeling conducted therefore represents a conservative or "worst-case" scenario. Results of the ETM modeling are summarized in **Table 5.2-6, Estimated Percent Incremental Mortality for Common Fish and Invertebrates,** and further described below. An in-depth discussion of the methodology and results can be found in **Appendix G**.

Table 5.2-6, Estimated Percent Incremental Mortality for Common Fish and Invertebrates Without Screens.

Species	Common Name	Proportional Mortality[1] (P_M) (%) (calculated for 7 mgd flow)
Fish Larvae		
Clevelandoa, Ilypnus, Quietula goby complex	Gobies	0.063
Genyonemus lineatus	White croaker	0.053
Engraulis mordax	Northern anchovy	0.047
Ciharichthys spp.	Sanddabs	0.033
Artedius spp.	Sculpins	0.029
Paralichthys Californicus	California halibut	0.027
Sebastes spp.	rockfishes	0.010
Target Invertebrates		
Caridean shrimps (post-larval)	Caridean shrimp	0.022
Cancridae (megalops)	Cancer crab megalops	0.022

Source: Appendix G, City of Santa Cruz Water Department & Soquel Creek Water District scwd² Desalination Program Open Ocean Intake Effects Study.
Notes:
1. Proportional Mortality (P_M) is the percentage of the larvae in the source water at risk of entrainment that are actually entrained and killed. It is assumed that 100 percent of entrained organisms would be killed.
Acronyms:
mgd = million gallons per day

Common Species. ETM estimates of average annual mortality due to entrainment ranged from 0.010 percent to 0.063 percent of the source water population (**Table 5.2-6**). The greatest effects were on common species, including gobies (associated with sand-bottom habitats), white croaker (an open-water species associated with sand-bottom habitats), and anchovies (an open-water species). The analysis shows that even for those species with the highest estimated entrainment, less than 6/100ths of 1 percent of their source water populations would be at risk of entrainment. Larvae of sculpins and rockfishes, which are characteristic of nearshore rock and kelp bed habitats, were less abundant than the species associated with sand-bottom or open-water habitats. The proportional entrainment for these rocky shoreline species was calculated as less than 3/100ths of 1 percent of their populations in the source water area. The target invertebrate groups

(caridean shrimps and cancrid crabs) sampled during the study had similarly low values of modeled proportional mortality.

To put this in perspective, the numbers of larvae projected by the study to be at risk of entrainment annually for a species such as white croaker (the most abundant species collected in the study), would represent the lifetime reproductive capacity of a single female fish. This would be an extremely small fraction of the reproductive output of the overall source water population, and represents far less mortality than that resulting from other natural and anthropogenic sources, such as commercial or recreational fishing. As an example, the average estimated annual catch of white croaker from all sources in central California from 2005–2009 was 28,565 fish per year, as discussed in **Appendix G**.

It should also be noted that the results presented above are for an unscreened intake. Annualized screen-test results demonstrated that the tested screen, with a 0.08-inch (2 millimeter [mm]) slot opening, resulted in 20 percent reduction in total annual larval fish entrainment[3]. Therefore, the actual entrainment values for the project as proposed are 20 percent below the reported figures.

The proposed project would not deplete fish stocks and would not result in a substantial decrease in populations that could be detected over natural variability, and therefore would not cause any common marine species to drop below self-sustaining levels and/or be otherwise eliminated. Therefore, entrainment impacts on common species would be less than significant.

Special-Status Fish Species. During the 13-month sampling period, no larvae of special-status fish species (coho, steelhead, Chinook, or green sturgeon) were entrained. These fish spawn in fresh water in streams and rivers outside of the marine portion of the study area, and are generally of a larger size when they migrate downstream. Because these species do not breed in the study area, they would not exist in larval forms at or near the intake locations, and would therefore not be subject to entrainment. Adults and juveniles of these species would be excluded from the intake system by the intake screen(s), which would function as a barrier. Therefore, no entrainment impacts on special-status fish species would occur.

Federally Endangered Black Abalone. The Open Ocean Intake Effects Study (**Appendix G**) was not designed to address black abalone larvae or similarly sized invertebrate larvae. The 0.013-inch mesh plankton net used in the sampling was too large to collect such larvae. The use of a smaller-sized mesh net would not have been viable for the study, because it would have become easily clogged, which would limit sample collection. Black abalone was not identified as a target species for study in the Open Ocean Intake Effects Study by the TWG formed to review and approve the study plan before sampling began, and to review the results. Additionally, the

[3] A smaller slot size, such as 1 mm, would reduce entrainment of larvae with heads smaller than 2 mm, but larger than 1 mm. However, the fraction of larvae that would be screened out with a smaller screen are already 1/10,000th or less of the source water populations, resulting in a negligible benefit from a smaller screen size (Appendix G).

larval forms are not sufficiently developed to positively identify them as black abalone. Therefore, the information provided below is based on a review of the literature available on the distribution and abundance of the species in relationship to the marine study area for the proposed project.

Four locations north of the City of Santa Cruz to Half Moon Bay, roughly between West Waddell Creek State Wilderness and Pescadero State Beach, are monitored for abalone abundances by researchers from the University of California, Santa Cruz. A recent summary of the data from these sites shows declines at all four locations, with no evidence of recent recruitment of small juveniles (Bell et al., 2012). The reductions were attributed to poaching and not to withering syndrome, described in **Section 5.2.2, Environmental Setting**.

The few locations from Davenport north to San Francisco with black abalone are likely the northern extent of populations with densities high enough to allow successful reproduction. Having a minimum population density in an area is important, because abalone have separate sexes that release eggs and sperm into the surrounding water, where fertilization occurs. The turbulent environment along the shoreline requires that the two sexes are in close proximity to increase the likelihood of detecting cues to ensure synchronous spawning, and to ensure that fertilization occurs. Studies reviewed in Butler et al. (2009) show recruitment failure in abalone populations where densities of adults fall below 0.75-1.1 per square meter (approximately 3,000 to 4,500 per acre). The need to maintain critical densities for reproduction is likely a primary reason why black abalone are usually found in aggregations even when populations drop to low levels.

Although the larvae of abalone are planktonic and drift in the water column for a few days before settling out, evidence from studies on black abalone and related species all indicate very limited dispersal that rarely exceeds a few kilometers (about 1.25 miles) (Butler et al., 2009). Therefore, it would not be expected that large numbers of larvae would be transported down-coast from areas north of Davenport that continue to support viable populations of black abalone. Although black abalone have been found during surveys in areas closer to the project site (e.g., Natural Bridges and Terrace Point), these data show occurrences of only one or two individuals. These abalone were all larger specimens that, while likely sexually mature, were not in high enough densities to ensure successful reproduction (i.e., densities were below 0.75-1.1 per square meter). This pattern of isolated records of single black abalone likely represent individuals that were transported as larvae over longer distances, and settled into an area where they may be present for many years, but with very little chance of ever successfully reproducing. Although transport of larvae over long distances can occur, these are isolated events that do not conform to the normal distribution patterns. None of the proposed open-ocean intake structure locations would be within critical habitat for black abalone (see **Figure 5.2-5**); however, the alternative structure locations are in proximity to critical habitat (within approximately 250 to 500 feet depending on the intake alternative). The critical habitat Area 7 is described as occurring within the intertidal and sub-tidal zones between Pescadero State Beach and Natural Bridges State Beach (Federal

Register, 2011), but the area actually extends through the study area for the project and east to Moran Lake.

As a result of the apparent absence of any large populations near the marine study area for the proposed project and the limited dispersal potential of larvae produced from populations north of the project area, the proposed open-ocean intake for the desalination facility has low potential to affect black abalone and would not be expected to substantially affect black abalone populations. Therefore, entrainment impacts on black abalone would be less than significant.

Indirect Entrainment Effects. For the same reasons that entrainment impacts would not be significant in terms of effects on the individual species, ecosystem effects that may indirectly result from removal of larvae would also not be significant. Specifically, the small fraction of larval losses would not appreciably reduce food stocks for prey species, including fully protected species such as California least tern, and California brown pelican, and therefore indirect impacts on such species would not be significant.

Impingement

CDFW and NMFS have developed design criteria for barrier fish screens designed to reduce entrainment and protect fish from being impinged (held to the screen from the velocity of the incoming water) (NMFS, 1997; CDFW, 2013). The requirements of the state and federal agencies are largely similar, and contain requirements for intake structure placement, intake velocity, and screen sizes. The CDFW requirements are summarized below for tidal waters applicable to the proposed project:

- Intake Structure Placement – The preferred location for the diversion intake structure shall be offshore, in deep water, to minimize fish contact with the diversion.
- Through-Screen Velocity – For self-cleaning screens in tidal waters, the specific through-screen velocity is determined for each installation, based on the species and life stage of fish being protected, but cannot exceed 0.33 foot per second (ft/sec) without a written variance from CDFW. For non–self-cleaning screens, approach velocities must be one-fourth that for self-cleaning screens; and the screen must be cleaned before the through-screen velocity exceeds 0.33 ft/sec.
- Screen Opening – The proposed project would use a slotted wedgewire screen. According to the CDFW requirements, slotted openings must not exceed 2.38 millimeters (3/32 inches [0.09 inches]) in width.

These requirements reduce fish exposure to the screen surfaces, and prevent adult and juvenile fish from passing through the screen. The relatively low velocities at the screen allow fish to escape without being impinged on the screen face. The intake screen for the proposed intake would be designed to meet the CDFW and NMFS design and operating requirements, as described in **Section 4** (**Table 4-12**) and summarized below (see Environmental Design Features).

As part of the Open Ocean Intake Effects Study, the test-scale intake system was fitted with a wedgewire screen with a 0.08-inch slot opening, and operated at a maximum through-screen velocity of 0.33 ft/sec (**Appendix G**). Underwater video cameras and lights were used to observe and record the interaction of marine organisms with the operating screened intake. Fifteen impingement surveys were conducted that spanned approximately 50 hours, and both daytime and nighttime conditions. The studies were conducted between April 2009 and April 2010. Out of 262 recorded interactions with fishes, 71 fish (27 percent) came into contact with the screen. All of the fish were able to successfully free themselves after touching the screen; none were impinged on the screen. Observed invertebrate interactions consisted of swimming shrimp bumping into the screen, or amphipods crawling over the screen. As a result of the impingement surveys, the proposed seawater intake with an intake velocity of 0.33 ft/sec would eliminate impingement of marine organisms in current and wave conditions at the proposed intake locations. Therefore, impingement would not cause marine species to drop below self-sustaining levels and the impact would be less than significant.

Impact Summary

Overall, operation of the proposed seawater intake system would not cause marine populations to drop below self-sustaining levels or otherwise eliminate such species, because entrainment from the proposed project's intake would not result in a substantial decrease in marine populations that could be detected over natural variability. Also, impingement of organisms would be eliminated with the low intake velocity and screen design proposed. Further, the operation of the proposed seawater intake system would not substantially affect any special-status fish species, because the Open Ocean Intake Effects Study demonstrated that larval forms of special-status fish species would not be subject to entrainment (**Appendix G**). Additionally, adults and juveniles would be excluded from the intake system by the intake screen(s), as would larger organisms, such as marine mammals. Therefore, no impacts to marine mammals that would be regulated under the MMPA would result from impingement. The operation of the proposed seawater intake system would also not have a substantial adverse effect on black abalone due to the apparent absence of any large populations near the marine study area, and the limited dispersal potential of larvae produced from populations north of the project area. Given the above, the proposed seawater intake system would also not substantially reduce the number of restrict the range of an endangered, rare or threatened species. As a result, the impact of entrainment and impingement from operation of the seawater intake system would be less than significant and no mitigation is required.

Potential Future Expansion

Entrainment

Expansion of the plant to produce 4.5 mgd would roughly double the amount of raw seawater drawn in at the seawater intake, and thus roughly double the amount of entrainment. This would still be an extremely small portion of the source water population of affected species, and would be considered less than significant for the same reasons described above for the proposed project.

Impingement

Expansion to a 4.5-mgd plant would involve adding wedgewire intake screens to the open-ocean intake structure. The additional screens would be of the same basic design as the proposed project, and would meet the regulatory guidelines for screen design to reduce impingement. The additional screens would add surface area and allow for an increased amount of water to be drawn in, while still maintaining the low intake velocities. Given the results of the test-scale intake system, additional screens to maintain an intake velocity of 0.33 ft/sec also would not be expected to result in impingement. Accordingly, impacts from impingement would be considered less than significant.

Environmental Design Features

The environmental design features (**Table 4-12**) of the proposed project related to entrainment and impingement include the following:

- Provide intake screens with 0.08-inch (2-mm) slot size.
- Provide low through-screen velocity of less than or equal to 0.33 ft/sec.

Mitigation Measures

None required.

BRINE DISCHARGE WATER QUALITY

Impact 5.2-2: The discharge of brine could adversely affect marine life if salinity concentration levels and/or temperature are substantially increased, which is not anticipated to occur with the proposed project.

Significance: Less than significant

Mitigation Measures: None required

Proposed Project

For the proposed project, brine would be discharged along with the freshwater WWTF discharge, using the same discharge outfall and diffuser as the WWTF. Thus, the brine would be diluted by the lower-density/-salinity WWTF effluent in the discharge pipe. **Section 5.1** (Impact 5.1-3) describes the predicted effects of discharging the combined desalination plant brine and the WWTF discharge to Monterey Bay. This impact concludes that with the implementation of environmental design features for brine (see below), the combined brine/WWTF discharge from the operation of the proposed project would not violate the Ocean Plan water quality objectives

for the protection of marine aquatic life or the minimum initial dilution limitations in the WWTF NPDES permit of 139:1. Further, with this dilution maintained there would be adequate WWTF effluent in the outfall pipe to ensure that the combined effluent never exceeds average ambient receiving-water salinity of approximately 33.7 parts per thousand. Given that salinities at the discharge point would not be elevated and would be no greater than ambient, the combined discharge would not be harmful to marine life.

The water quality analysis in **Section 5.1** assumed that the desalination process would not cause an increase in temperature of the brine. In other words, the brine would have the same temperature as the source water. Even if there is a minor increase in temperature due to the desalination process, the temperature of the combined discharge would not exceed the existing range of temperatures found in the WWTF discharge. Elevated temperatures can cause degradation of cold-water biological communities not adapted to warmer temperatures. The State Thermal Plan, described in **Section 5.1**, prohibits the discharge of waters that are more than 20 degrees Fahrenheit (°F) warmer than the natural receiving waters, and the discharge cannot raise the temperature of the receiving waters more than 4°F. The proposed project would not exceed these limits, and no adverse biological effects due to thermal discharges would be expected.

Given that the proposed project, with the implementation of the environmental design features below, would not result in discharge to the ocean receiving waters that would substantially increase salinity concentration levels and/or temperature, the impacts of brine discharge on marine organisms would be less than significant. Impacts from the brine discharge are considered less than significant, because the brine discharge would not substantially alter water quality or temperature, and would therefore not substantially affect special-status species, substantially reduce the habitat of a fish or wildlife species, or cause a fish or wildlife population to drop below self-sustaining levels.

Potential Future Expansion

Any potential future expansion of the proposed project would also involve the implementation of the environmental design features noted below. This would require the construction and use of additional brine storage structure(s) in order to control the rate and volume of brine discharge from a larger plant such that dilution requirements of the WWTF permit and ambient salinity could be maintained. With the implementation of the environmental design features, the impact on marine organisms would be less than significant, as described above for the proposed project.

Environmental Design Features

The environmental design features (**Table 4-12**) of the proposed project related to brine discharge include the following:

- Brine from the desalination plant will be blended with WWTF effluent. Automatic control of blending ratio of brine flow to WWTF effluent flow will be provided to meet

minimum initial dilution requirement of the existing NPDES permit and to ensure that the combined effluent will not exceed the salinity of ambient receiving water.

- On-site storage of brine will be provided such that the rate of disposal can be controlled.
- New valves over existing ports on the WWTF outfall diffuser will be provided to spread effluent flow.

Mitigation Measures

None required.

CONSTRUCTION & MAINTENANCE WATER QUALITY	
Impact 5.2-3:	Construction and maintenance of the proposed seawater intake system and improvements to the WWTF outfall could potentially affect special-status marine species or other marine species through temporary disturbance during construction and maintenance discharges.
Significance:	Less than Significant
Mitigation Measures:	While not required, Mitigation Measures 5.1-2a and 5.1-2b (**Section 5.1**) would also apply.

Proposed Project

Offshore construction activities and on-going intake maintenance would result in temporary marine water quality changes that could affect marine populations. The effects of offshore construction activities and intake maintenance on marine water quality are evaluated in detail in **Section 5.1** (see Impact 5.1-2). This information is summarized below as the basis for evaluating the potential impacts of temporary water quality changes on marine populations.

Construction

A portion of the seawater intake system, including the intake structure and intake pipelines, would be located in Monterey Bay. Potential marine water quality effects during construction could be caused by the potential inadvertent release of drilling fluids during tunneling for the intake pipeline, and disturbance of sediments on the seafloor during the installation of the seawater intake structure, as further described below.

Inadvertent Release of Drilling Fluids during Tunneling. Installing the intake pipeline would involve tunneling from the intake pump station out under the seafloor, which involves the use of special lubricating drilling fluids. Drilling fluids are generally a naturally based product:

bentonite clay and water. There is some potential that an inadvertent release of drilling fluids could occur during tunneling, which could have localized water quality effects if discharged into Monterey Bay. Mitigation Measure 5.1-2a would require the preparation and implementation of a drilling-fluids management plan specifically for the marine environment that would include a pre-construction geologic study to identify soil and bedrock conditions on the ocean floor; maintaining materials and equipment on site and/or on the off-shore barge for the cleanup of any leak; having inspectors/divers regularly monitoring the work site during tunneling to detect leaks; and procedures to follow if a leak occurs. With the implementation of this mitigation, any temporary potentially significant water quality impacts associated with the potential for the release of drilling fluids during tunneling under the seafloor would be reduced to less than significant. See **Section 5.1** for a more detailed analysis.

Disturbance of Bottom Sediments. Disturbance of bottom sediments during construction has the potential to temporarily affect water quality near and down-current of the construction site. At intake alternative sites SI-4, SI-5, SI-7, SI-14, and SI-16, located in rocky-bottom habitats, tunneling underground would be done from land to approximately 100 feet offshore from the edge of kelp beds, to avoid sensitive kelp bed habitats[4]. At the intake location, sandy sediments would be dredged to expose the bedrock above the intake. The bedrock would be excavated to the terminus of the dual-intake tunnels (underwater noise impacts from this excavation are addressed below in Impact 5.2-4). At intake alternative sites SI-9, SI-17, and SI-18, located in sandy habitats, underground tunneling would be done to a point just past the surf zone. An approximately 4,800-foot-long trench would be dredged using a clamshell bucket, from the terminus of the tunnel to the intake location.

Each prefabricated intake screen assembly would be lowered to the bottom, moored, and connected to an intake tunnel. The activities would be conducted from a barge or work platform, using cranes to lower the structure. Active work on the ocean floor would last approximately 3 months for SI-4, SI-5, SI-7, SI-14, and SI-16, and approximately 5 months for SI-9, SI-17, and SI-18, and could result in an increase in turbidity in the vicinity of the construction site.

The physical disturbance of benthic habitat would likely cause both listed and non-listed species of fish, foraging seabirds, and marine mammals to avoid the immediate construction area and areas of increased turbidity during dredging and rock excavation. Sediment in the water column generated during dredging and rock excavation would not be expected to be substantial given the temporary nature of the construction disturbance and given that sediments are predominantly sandy and sand particles tend to settle quickly and do not generate large or long-lasting sediment plumes. Given that marine organisms would be expected to avoid the immediate construction area and that turbidity would be temporary and limited to the immediate construction zone, offshore construction activities would not have a substantial adverse effect on special-status

[4] The 100-foot distance from the edge of the kelp bed was established for design purposes during the Intake Conceptual Design Report (Appendix I). The location and setback from the kelp beds would be further refined during design, and as a result of regulatory permitting.

species that occur or have the potential to occur in the project area. Such activities would also not result in a substantial reduction in the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, or threaten to eliminate such a population. Therefore the impact is less than significant. However, Mitigation Measure 5.1-2b in **Section 5.1** would help reduce sediment generation during offshore dredging and rock excavation.

Installation of valves on the WWTF outfall diffuser, a component of the brine conveyance and discharge system, would have minimal impact to marine organisms because the WWTF outfall diffuser is elevated off the bottom and valves could be installed by divers resulting in minimal disturbance to habitat. Disturbance during this activity could cause fish to temporarily avoid the underwater work area, and birds to temporarily avoid the immediate vicinity of any surface vessel supporting this work. The impact of such activities would be less than significant, for similar reasons to those described above for dredging and rock excavation.

Intake Maintenance

Once the seawater intake is operating, marine organisms adapted to hard substrate, such as barnacles, would begin to attach and grow on the inside of the intake pipes. If left unchecked, this growth would begin to clog the pipe and reduce the efficiency of the intake system. Periodic cleaning of the intake system would be required to remove this growth. As described in **Section 4**, the interior of the intake pipe would be cleaned with a "pig," an automated cylindrical cleaning device. The "pig" would be launched at the pump station moving offshore toward the intake screens, pushing any natural buildup of marine sediments, minerals, and organisms out the end of the pipe. The proposed project would have a dual-intake system, so that when maintenance of one intake is being conducted, the other intake pipeline could be in operation.

The material discharged during intake maintenance would consist of natural sediments and organic material that enters the pipeline from the ocean. This discharged material could temporarily increase turbidity in the immediate vicinity of the intake screens. The temporary discharge of this material during pigging operations would not be expected to substantially affect special-status or other marine species, due to the temporary and localized nature of the effect on marine water quality.

Given that biological material could be in the discharge, there is the possibility that fish would be attracted to the intake location during such maintenance activities. If fish are temporarily attracted to the intake screen location during cleaning, they would not be at greater risk of impingement on the adjacent screen. Impingement impacts would be less than significant, based on the intake screen design and proposed operation as described under Impact 5.2-1. Entrainment impacts, also identified as less than significant in Impact 5.2-1, would not be likely to increase during cleaning, because larval fish are weak swimmers, and their numbers in the area would not be expected to increase even if the discharge is attractive to fish. Therefore, the impact of cleaning the intake pipelines would be less than significant.

Potential Future Expansion

Construction

The intake piping installed for the proposed 2.5-mgd project would have the capacity to support a potential future expansion of the project to 4.5 mgd, if expansion is ever pursued. No new intake pipelines would need to be installed; thus, no new tunneling, dredging, and/or rock excavation would be required.

Any potential future expansion of the proposed project to 4.5 mgd would involve adding two wedgewire screen assemblies of the same or similar design as the proposed project. The base of the intake assembly installed on the seafloor for the proposed projects' intake screens would accommodate the additional screens; thus, construction would consist only of attaching the additional screens. No substantial bottom disturbance would occur. Fish, seabirds, and marine mammals could avoid the area during the screen installation, but this work would occur over a very short period of time (e.g., a few days). The effects of general construction activity related to installation of additional screens would be less than significant, for similar reasons as those described above for the proposed project.

Intake Maintenance

Impacts from intake maintenance for an expanded desalination system would also be less than significant, for similar reasons to those described above for the proposed project, since no additional pipelines would be installed and cleaning frequency of the two existing pipelines would not increase under expanded operational conditions.

Mitigation Measures

None required; however, Mitigation Measures 5.1-2a and 5.1-2b (see **Section 5.1**) would also apply, and would reduce temporary water quality effects during offshore construction.

UNDERWATER AND AIRBORNE CONSTRUCTION NOISE

Impact 5.2-4:	Construction of the proposed seawater intake system and improvements to the WWTF outfall could potentially affect special-status or other marine mammal or fish species through construction-related underwater and airborne noise.
Significance before Mitigation:	Potentially Significant
Mitigation:	See Mitigation Measure 5.2-4
Significance after Mitigation:	Less than significant

Proposed Project

The proposed project would result in underwater construction noise and airborne construction and operational noise in and near the marine environment. This impact focuses on the impacts of underwater and airborne construction noise, as airborne operational noise would not exceed established airborne noise thresholds for marine mammals, as described in Analysis Methodology above.

Underwater noise and acoustic pressure resulting from construction activities could affect aquatic resources by causing behavioral avoidance of the construction area and/or potential injury to special-status and/or marine sensitive species. The following construction activities have the potential to produce increased underwater and airborne noise that could adversely affect fish and marine mammals:

- Impact pile driving associated with installation of the pump station for intake alternative SI-17. This would involve driving 25 concrete piles, each with a diameter of approximately 24 inches.
- Excavation of bedrock for installation of intake alternatives in areas with bedrock substrate (intake alternative sites SI-4, SI-5, SI-7, SI-14, and SI-16).

Other construction activities, such as tunneling under the seafloor to install the intake pipelines, would not adversely affect fish or marine mammals, as these activities are not expected to exceed the NMFS criteria for injury or harassment. The effects of impact pile driving and rock excavation are evaluated below.

Applicable Criteria for Fish and Marine Mammals

As indicated above in Analysis Methodology, established underwater noise thresholds for fish and marine mammals (see **Table 5.2-3** and **Table 5.2-4**) are used in the evaluation of impacts related to underwater construction noise, because they provide a basis for determining whether various project offshore construction activities could result in injury and/or disturbance to these

organisms. The potential for injury and/or disturbance is identified below based on a comparison of construction noise levels to these underwater noise thresholds. The significance of the impacts under standard 2d are then evaluated based on the potential for disturbance or injury. **Table 5.2-7, Underwater Noise Levels Due to Pile Driving and Rock Excavation,** provides the underwater noise levels for construction activities in comparison to the thresholds.

As indicated above in Analysis Methodology, the Level B (disturbance) threshold for airborne noise for harbor seals is 90 dB RMS and 100 dB RMS for all other pinnipeds (e.g., sea lions).

Underwater and Airborne Construction Noise from Pump Station at SI-17

Sound levels for driving concrete piles for the pump station at SI-17 are expected to be no greater than 174 dB RMS for marine mammal species at a distance of 33 feet from the pile (see **Table 5.2-7**), based on underwater sound measurements from a number of projects (Caltrans, 2009). The noise energy dissipates as it spreads from the pile at a rate of roughly 4.5 dB per doubling of distance (Caltrans, 2009); and levels are expected to drop below 160 dB within about 220 feet from the pile-driving activities. Driving concrete piles would not exceed levels that would cause injury to special-status or other marine mammals. Marine mammals could be exposed to levels exceeding the Level B harassment guidelines in areas near the pile-driving activities, thus requiring an Incidental Harassment Authorization.

Similarly, sound levels for driving concrete piles at the same location are expected to be no greater than 185 dB peak for fish species at a distance of 33 feet from the pile (see **Table 5.2-7**). Special-status and other fish in the same area may be exposed to sound levels above the 183 dB SEL threshold, which may result in temporary effects to hearing capacity, but is not expected to cause physical injury or mortality.

Table 5.2-7. Underwater Noise Levels Due to Piling Driving and Rock Excavation

Construction Activity	Peak Noise Level (dB)	Average Noise Level (dB RMS)	Applicable Underwater Noise Thresholds for Fish (Impulse Sound)		Applicable NMFS Harassment Thresholds for Marine Mammals (Impulse Sound)	
			Peak Noise (dB)	Accumulated Noise (SEL) (dB)	Level A – Injury (dB RMS)	Level B – Disturbance (dB RMS)
Pile Driving (SI-17)	185	174	>206	>183	>180 (whales) >190 (seals/sea lions)	160-180 (whales) 160-190 (seals/sea lions)
Rock Excavation						
Drilling	180	166				
Sawing	180	166				
Impact Hammer	206	182				
Trimming Excavation	180	165				
Clamshell Dredging	167	150-160				

Acronyms:
dB = decibels NMFS = National Marine Fisheries Service RMS = root mean squared

Pile driving may result in airborne noise levels that exceed NMFS thresholds for Level B harassment. The crossbeams beneath the Municipal Wharf are used, primarily by California sea lions, as a haul-out location. Sea lions hauled-out near the pile driving activities may be exposed to airborne noise levels exceeding 100 dB in a radius of about 200 feet from the pile being driven. This could result in behavioral disturbance to the marine mammals and would be addressed in the Incidental Harassment Authorization.

Underwater Construction Noise from Intakes at SI-4, SI-5, SI-7, SI-14, and SI-16

One or more of the following construction methods would be used to break up bedrock prior to excavation for installation of an open-ocean intake at these alternative intake locations:

- Drilling – A large-diameter boring drill would be used to break up the bedrock. Little information on underwater noise values for such methods is available. Based on the best information available, underwater noise levels generated would be similar to that of a rotary cutter suction dredge, or about 180 dB peak noise; and 166 dB RMS continuous noise (SVT Engineering Consultants, 2010).

- Sawing – A large, wide-bladed hydraulic saw would be employed to cut up the bedrock. As with the drilling method, little information on noise levels is available. Underwater noise levels generated are assumed to be similar to those of a rotary-cutter suction dredge, or about 180 dB peak noise; and 166 dB RMS (SVT Engineering Consultants, 2010).

- Impact Hammer – A hydraulic hammer (similar to a jackhammer) would be used to break up the bedrock. Noise measurements of approximately 180 dB peak with an approximated RMS value of 160 dB from diver-operated rock breakers have been recorded (QinetiQ, 2009). Other measurements from an underwater bridge pier demolition with a hammer hoe have been recorded, with peak values of 206 dB, and an RMS value of approximately 182 dB (Thill, 2011). The bridge pier demolition was conducted in a hollow steel-pipe cofferdam filled with water, which provided excellent noise transmission to the water column from a relatively small surface, potentially increasing the underwater noise effects. Based on the above information, noise levels from the impact hammer method could produce levels near the 206 dB peak threshold for fish, and the 180 dB RMS criterion for whales, but would likely fall between the values for a diver-operated rock breaker (160 dB); and the RMS value for a bridge pier demolition (182 dB).

All methods would also employ divers with pneumatic hand tools to trim the excavation to the final shape. At most, such tools would generate noise levels of approximately 180 dB peak, and 165 dB RMS (QinetiQ, 2009).

Regardless of which method is used, a clamshell dredge would be used to remove broken rock from the excavation. Clamshell dredges may produce occasional peak noise of 167 dB, and RMS

values in the 150 to 160 dB range (Richardson et al., 1995). None of the underwater noise generated from use of the clamshell dredge is expected to exceed criteria for fish or marine mammals.

With any of the above methods, noise levels above injury thresholds for fish or marine mammals would not be expected to occur. All of the above methods are expected to produce noise above the harassment levels for marine mammals, and exceed the 183 dB SEL threshold for fish. These increased underwater noise levels would occur intermittently during an approximately 1- to 3-week period during construction of the intake structure at any of these locations.

Impact Summary

Underwater construction activities—including pile driving and bedrock excavation—would have the potential to generate underwater noise. This noise is generally expected to be below the Level A threshold, and thus would not result in injury to special-status and other marine mammals. Noise levels could be above the Level B thresholds for underwater and in some cases airborne noise, and could have disturbance effects on marine mammal behavior, such as avoidance of the construction area, masking of natural sounds, or temporary hearing impairment, and thus may require an Incidental Harassment Authorization. Likewise, underwater sound levels are not expected to be above the injury threshold for fish, but would be above levels that could temporarily affect the hearing capacity of fish, and cause behavioral responses such as fleeing.

To ensure that underwater construction noise does not reach injury levels for marine mammals and fish, Mitigation Measure 5.2-4 would be implemented. This measure requires the implementation of a hydroacoustic, fish, and marine mammal monitoring plan that will include specific measures to avoid exposure to underwater sound levels that would cause injury. The plan would require: (A) measuring underwater noise to determine if it exceeds the thresholds; (B) if the thresholds are exceeded, bubble curtains would be used that can reduce underwater noise by up to 10 dB under ideal conditions (relatively shallow water, low currents); and (C) if the thresholds are exceeded, an exclusion zone for marine mammals would be established, and underwater construction would not commence if marine mammals are present in the exclusion zone.

With the implementation of monitoring and avoidance measures under Mitigation Measure 5.2-4, injury to special-status and other marine mammal and fish species would not occur. Given that injury would not occur, underwater noise generated during construction would not substantially affect or reduce the number or restrict the range of a special-status species; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; or threaten to eliminate a plant or animal community. With the implementation of Mitigation Measure 5.2-4, impacts would be reduced to less than significant.

Potential Future Expansion

Any future expansion would only require installation of two additional intake screens on the proposed projects' existing intake assembly. No underwater excavation of bedrock or pile driving would occur. This activity would not be expected to create underwater noise that would exceed current injury thresholds for marine mammals and fish. Therefore, impacts related to underwater construction noise would be less than significant. Given the nature of expected underwater construction activities and associated noise levels, Mitigation Measure 5.2-4 would not be required.

Mitigation Measures

Mitigation Measure 5.2-4:

This mitigation measure applies to underwater noise generated by offshore construction activities involving rock excavation (SI-4, SI-5, SI-7, SI-14, and SI-16) and pile driving (SI-17). The City and District shall prepare and implement a hydroacoustic, fish, and marine mammal monitoring plan. This plan shall be developed and implemented in consultation with NMFS. The plan shall include specific measures to minimize exposure of marine mammals and fish to high sound levels. Avoidance and minimization measures that shall be implemented include the following:

Fish:

- Underwater noise shall be measured during pile-driving and underwater rock excavation activities to verify that sound levels do not exceed injury thresholds for fish (206 dB peak).
- If an activity produces underwater sound levels that exceed the injury threshold for fish, sound levels will be reduced through noise-control measures, such as the installation of NMFS-approved attenuation devices (bubble curtains). If bubble curtains are established, a biologist will clear the work area of fish prior to starting pile driving or rock excavations, and will monitor the work area for incursions.

Marine Mammals:

- Marine mammal observations shall be conducted to determine use of the area by marine mammals before pile driving or rock excavation begins. Observations could be conducted from a boat, adjacent cliffs, or the wharf, depending on the intake location.
- An underwater "exclusion zone"—defined as the distance where underwater sound levels exceed180 dB if whales are present, and 190 dB if seals and sea lions are present—will be established. An initial exclusion zone of 100 feet for underwater work activities will be established. This distance exceeds the expected distances from the work where underwater sound levels are likely to exceed NMFS criteria. This will be refined based on hydroacoustic measurements in the field and in consultation with NMFS.

- Marine mammal monitoring of the exclusion zone will be conducted prior to commencement of pile driving and underwater excavation activities.
- Pile-driving activities will not commence until marine mammals are not sighted in the exclusion zone for 15 minutes. This would avoid exposing marine mammals to sound levels in excess of the Level A criteria.
- Underwater noise will be measured with a hydrophone during pile-driving and underwater rock excavation activities to verify sound levels and adjust the size of the exclusion zone as necessary.
- During pile driving at SI-17, airborne noise measurements will also be made to determine if Level B airborne thresholds are exceeded. Behaviors of marine mammals hauled-out beneath the Municipal Wharf will be noted.
- Data collected during the hydroacostic, fish and marine mammal monitoring will be reported to NMFS in a post-construction monitoring report (usually required to be completed between 60 and 90 days after construction is complete). Observations and data will be reported more frequently, if required by NMFS.

FILL/PLACEMENT OF INTAKE STRUCTURES

Impact 5.2-5:	Construction of the proposed seawater intake system could substantially affect rocky bottom kelp forest habitats, a HAPC classification, but would not substantially affect other marine habitats designated by regulatory agencies (e.g., "waters of the U.S., EFH, designated critical habitat), as a result of fill, placement of intake structures, and associated disturbance of benthic habitat.
Significance before Mitigation:	Potentially Significant
Mitigation Measure:	See Mitigation Measure 5.2-5
Significance after Mitigation:	Less than significant

Proposed Project

Benthic habitat would be temporarily disturbed during construction; and at the intake sites, some benthic habitat would be permanently lost. At alternative intake sites SI-9, SI-17, and SI-18, located in sandy habitats, tunneling would be done to a point just past the surf zone. A trench would be dredged, using a clamshell bucket, from the terminus of the tunnel to the intake location. Dredged materials would be placed next to the trench (sidecast) and would be used to backfill the trench after installation of the intake pipeline. Approximately 19,000 cubic yards of

material over an area of approximately 1.7 acres would be dredged for the intake pipelines at these locations. Dredging and installation of the pipes are expected to take approximately 4 months.

At alternative intake sites in the western portion of the study area (SI-4, SI-5, SI-7, SI-14, and SI-16), tunneling would be done to approximately 100 feet offshore from the kelp beds. At the location of the intake, sandy sediments would be dredged from the surface to expose the bedrock at the intake location. The bedrock would be excavated to the terminus of the tunnel. The area of bedrock excavation would be about 10 by 25 feet (250 square feet). Disturbance to the benthic habitat for these intake alternatives is expected to last about 2 months.

Benthic organisms would be lost due to direct removal and burial in adjacent areas during dredging. Sidecasting of sediments in areas adjacent to the dredging operations would bury fauna, or clog feeding and respiration structures, resulting in the loss of organisms in adjacent areas. Following dredging, disturbed areas are recolonized, usually beginning with opportunistic species (Newell et al., 1998). These species are typically characterized by rapid growth and reproduction. Marine benthic invertebrates usually colonize disturbed sedimentary habitats via pelagic larvae that settle from the water column. Studies conducted to investigate the effects of dredging and burial of benthic fauna have found that recolonization and recovery of the disturbed area begins almost immediately upon cessation of the disturbance. Studies have reported that areas disturbed by dredging activities are usually recolonized quickly (within 1 month to 1 year), with original levels of biomass and abundance developing within 1 to 3 years (Newell et al., 1998). For example, Oliver et al. (1977) reported that the recovery of benthic infaunal[5] communities disturbed by dredging and dredged material disposal in the Monterey Bay area varied from approximately 1 to 3 years, depending on the level of disturbance.

Fill in Waters of the U.S. Placement of the intake structures would be considered fill in waters of the U.S. under Section 404 of the Clean Water Act. Placement of fill would require a permit from the USACE. Temporary fill would occur at the dredging and rock excavation sites; and permanent fill (loss of benthic habitat) would occur at: (1) the pump station site for SI-17 due to placement of permanent piles; and (2) from foundations at the open-ocean intake assemblies. The concrete slab foundations that anchor the open-ocean intake screens may accumulate sediment over time that could be become habitat for benthic infauna; however, for purposes of this document, habitat loss is assumed to be permanent; therefore, these areas have been classified as permanent fill. Permanent fill would range from 0.011 acre to 0.013 acre, depending on intake type and location. **Table 5.2-8, Temporary and Permanent Fill in Waters of the U.S. for Each Intake Alternative Location,** summarizes temporary and permanent fill for various intake components. The use of tunneling under the seafloor, an environmental design feature of the proposed project, would reduce fill.

[5] Infauna are organisms living in the sediment, such as polychaete worms.

Table 5.2-8. Temporary and Permanent Fill in Waters of the U.S. for Each Intake Alternative Location

Intake Location Alternative	Temporary Fill		Permanent Fill	
	Square Feet	Acres	Square Feet	Acres
SI-4, SI-5, SI-7, SI-14, SI-16	2, 500	0.06	480	0.011
SI-9 and SI-18	45,000	1.03	480	0.011
SI-17	40,000	0.92	480	0.011

Effects to Designated Critical Habitat. Portions of the marine study area are in or near critical habitat for two listed species: green sturgeon, and black abalone (see **Figure 5.2-5**). All of the alternative intake locations occur in critical habitat for the green sturgeon. However, none of the sites are located in critical habitat for the black abalone; therefore, critical habitat for this species is not further described below.

In order for habitat to qualify as critical habitat, it must contain certain characteristics, known as Primary Constituent Elements (PCEs). PCEs are those physical and biological features of a landscape that a species needs to survive and reproduce. The PCEs associated with the green sturgeon critical habitat for nearshore coastal marine areas include the following:

- **Migratory corridor**. A migratory pathway necessary for the safe and timely passage of green sturgeon fish within the marine and between estuarine and marine habitats.
- **Water quality.** Nearshore marine waters with adequate dissolved oxygen levels and acceptably low levels of contaminants such that normal behavior, growth, and viability of subadult and adult green sturgeon are not disrupted.
- **Food resource.** Abundant prey items for subadults and adults, which may include benthic invertebrates and fishes.

Designated critical habitat for the green sturgeon would be temporarily disturbed during construction activities (as well as intake maintenance). However, these disturbances would not limit the green sturgeons' ability to move through the study area. Although a small area of benthic habitat and benthic organisms will be permanently lost, the impact is small in relation to the remaining benthic area in the marine study area, and would not result in a measurable decline of the green sturgeon's prey base. As discussed in Impact 5.2-2, salinity levels of the combined desalination plant and WWTF effluent discharge would be at ambient conditions. Although maintenance of the intake pipeline would result in a minor and temporary increase in turbidity and discharge of natural sediments and organic material, the disturbance would be localized, and not alter the overall water quality in the marine study area. The short-term disturbance associated with construction and maintenance activities would not substantially affect the PCEs associated with the green sturgeon critical habitat in nearshore marine coastal areas.

Effects to Essential Fish Habitat (EFH) / Habitat Areas of Particular Concern (HAPC). As discussed in **Section 5.2.3**, the study area and surrounding water is considered EFH for a number of species managed under the Magnuson-Stevens Act. The Rocky Reefs HAPC, a sub-set of EFH, is located in the rocky intertidal zone of the marine study area.

Placement of an intake would result in the permanent loss of a small area of benthic habitat in waters classified as EFH. Because placement of the intakes would not occur within the rocky intertidal zone, the Rocky Reefs HAPC would not be impacted. Additionally, this loss would be small in comparison to the remaining EFH available in the marine study area, and would not diminish the ecological function of the surrounding EFH. Placement of the intake at alternative intake sites SI-4, SI-5, SI-7, SI-14, and SI-16 would avoid rocky kelp forest habitat, based on the requirements of environmental design feature incorporated into the project that requires siting the intake structure outside of this habitat. No intakes would be placed in the Rocky Reefs HAPC. Although the Intake Conceptual Design Report (**Appendix I**) anticipates setting back from these areas by about 100 feet from hard-bottom kelp forest habitat, pre-construction surveys would be conducted to ensure these habitats are avoided under Mitigation Measure 5.2-5. Additionally, anchors placed in the rocky kelp forest habitat during construction could scrape benthic organisms, and kelp and other algae, from the bottom. The implementation of Mitigation Measure 5.2-5 would ensure that the placement of the screen assembly and construction equipment, including anchors, avoids rocky-bottom habitat, thus eliminating this impact. Therefore, construction activities would not substantially affect EFH and the Rocky Reef HAPC located in the marine study area with the implementation of this mitigation measure.

Impact Summary

Benthic habitat would be temporarily disturbed during construction; and at the intake sites, some benthic habitat would be permanently lost. However, benthic organisms are abundant, and although they are a food source for other organisms, the small, mostly temporary losses from the project would not limit food resources for other organisms. Although designated critical habitat for the green sturgeon would be temporarily disturbed, the associated PCEs would not be substantially modified. In addition, these disturbances would not limit the green sturgeons' ability to move, or cause a substantial decline in their prey base. Appropriate placement of the screen assembly and anchoring of work vessels during construction, as per Mitigation Measure 5.2-5, would avoid rocky habitats such as kelp forest, and would eliminate impacts to this habitat type. Designated EFH would not be substantially altered. Therefore, the construction activities would not substantially affect critical habitat, EFH, or other sensitive marine habitats designated by CDFW, USFWS, or NMFS. As a result, impacts from construction would be less than significant with the implementation of the above noted mitigation measure.

Potential Future Expansion

Potential future expansion in plant capacity would not involve excavation in the marine environment, only attachment of additional intake screens to the proposed projects' existing intake assembly. Additional fill would not be expected. Implementation of Mitigation Measure

5.2-5 would ensure that during the installation of additional screens, anchoring does not disturb kelp forest habitat. Therefore, impacts would remain less than significant.

Environmental Design Features

The environmental design feature (**Table 4-12**) of the proposed project related to the placement of the seawater intake structure includes the following:

- The seawater intake structure will be setback 100 feet from the edge of rocky kelp forest habitat.

Mitigation Measures

Mitigation Measure 5.2.5

This mitigation measure applies to any intake site located on rocky bottom habitat (SI-4, SI-5, SI-7, SI-14, and SI-16). The City and District shall site the intake structure outside of the Rocky Reefs HAPC and kelp forest habitat, such that the structure avoids these habitat areas. The precise location shall be based on existing kelp forest mapping (see **Figure 5.2-2**) and a pre-construction survey of the selected intake location, which is required to identify the precise site for the proposed seawater intake structure, given the dynamic nature of the kelp forest habitat. Additionally, all construction vessels shall use moorings placed in the areas identified during the pre-construction surveys as free of kelp forest habitat.

INTERFERENCE WITH MOVEMENT OF FISH OR WILDLIFE	
Impact 5.2-6:	The project would not interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
Significance:	Less than significant
Mitigation Measures:	None required

Proposed Project

The intake structure in Monterey Bay would not impede the movement of fish, such as coho salmon, migrating to upstream spawning sites, or marine mammals migrating along the shore. The open-ocean intake screen structures would consist of two T-shaped screen assemblies, approximately 3 feet in diameter and 12 feet long, mounted to vertical risers from the intake pipeline, and seated on a concrete slab. The intake structure would be approximately 10 feet in height above the seafloor.

This relatively low-relief feature would not impede the movement of fish or marine mammals. As discussed under Impacts 5.2-3 and 5.2-4, fish, seabirds and marine mammals could avoid the intake construction area during construction activities. This impact would be temporary; and, given the relatively small size of the construction area, would not substantially impede movement of these species. The impact would be less than significant.

Potential Future Expansion

Potential future expansion of the project would likely add two wedgewire intake screen assemblies to the concrete slab described for the proposed project. These would be similar in size to those for the proposed project. Addition of these screens would not require additional dredging or excavation, and they would be installed relatively quickly. These additional screens would not interfere substantially with the movement of wildlife or use of native wildlife nursery sites, and the impact would be less than significant.

Mitigation Measures

None required.