

Appendix I Encina Power Station Marine Biological
Resources Survey to Support the Project to
Abandon or Remove the Marine Oil Terminal
Facilities, Prepared by Merkel & Associates, Inc.

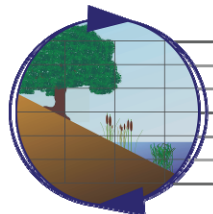
Encina Power Station Marine Biological Resources Survey to Support the Project to Abandon or Remove the Marine Oil Terminal Facilities

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Merkel & Associates, Inc.

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INTRODUCTION

Merkel and Associates, Inc. (M&A) was retained by NRG Cabrillo Power Operations, Inc. to conduct a marine biological survey in the vicinity of the Encina Power Station (EPS) in support of the project to abandon or remove the offshore marine terminal (MOT) facilities. Previous marine biological studies have been conducted in support of various efforts for the EPS, summarized in Padre Associates, Inc. (2013), and the information provides a general characterization of the marine habitats in the vicinity of the EPS.

The objective of this study was not to develop a comprehensive biological inventory, but to provide greater detail as to the distribution and location of potentially sensitive habitats (e.g., vegetated rocky substrate, kelp beds), as well as to note any biological assemblages associated with these abandoned features such as anchors, chain, or other materials. Per the Site Assessment Report (Padre Associates, Inc. 2013), the results from this study will assist the EPS in avoiding potential impacts to these habitats during the decommissioning process. This report discusses the methods and equipment used for the habitat mapping survey and characterizes the seafloor habitats in the project area. In addition, based on the findings, recommendations are provided to assist in avoiding potential impacts to sensitive habitats in the project area.

BACKGROUND

The EPS was constructed in 1953 as an oil burning, steam generating electric power generation plant. In order to transfer bunker fuel oil between ocean vessels and shore-side storage facilities at the EPS, an MOT was also constructed in 1953. The power plant converted to the use of natural gas as a fuel source in the 1980s, but the offshore terminal was retained to provide an alternative fuel source as required by the California Independent System Operator (Cal ISO). This requirement is no longer in place (effective January 1, 2009), and the need to maintain the offshore terminal has ceased.

The MOT is on land leased by the California State Lands Commission (CSLC) referenced as Lease PRC 791.1 (Figure 1) and consists of a 7-point mooring and a single 20-inch diameter submarine pipeline to the shore facility. Minimum draft at the mooring is 80 feet (ft) at the anchor drop, 70 ft at the bow, and 55 ft at the stern. The mooring is 3,500 ft from shore. Vessel types designed for are 850 ft in length and 47 ft maximum draft for a 6 ft under keel minimum. Mooring vessel load is designed for 100,000 ton dead weight tanker vessel or 25,000 ton dead weight barge. Product transferred was California residual oil, Alaskan low sulfur high pour point oil, Indonesian low sulfur high pour point oil, diesel oil, and water.

A yellow buoy historically marked the end of the 225-ft long submarine hose comprised of four 30-ft lengths of 16-inch diameter hose and three 35-ft lengths of 12-inch diameter hose. A yellow plastic spar buoy historically marked the end of the 20-inch wrapped, tarred, and cement-coated submarine

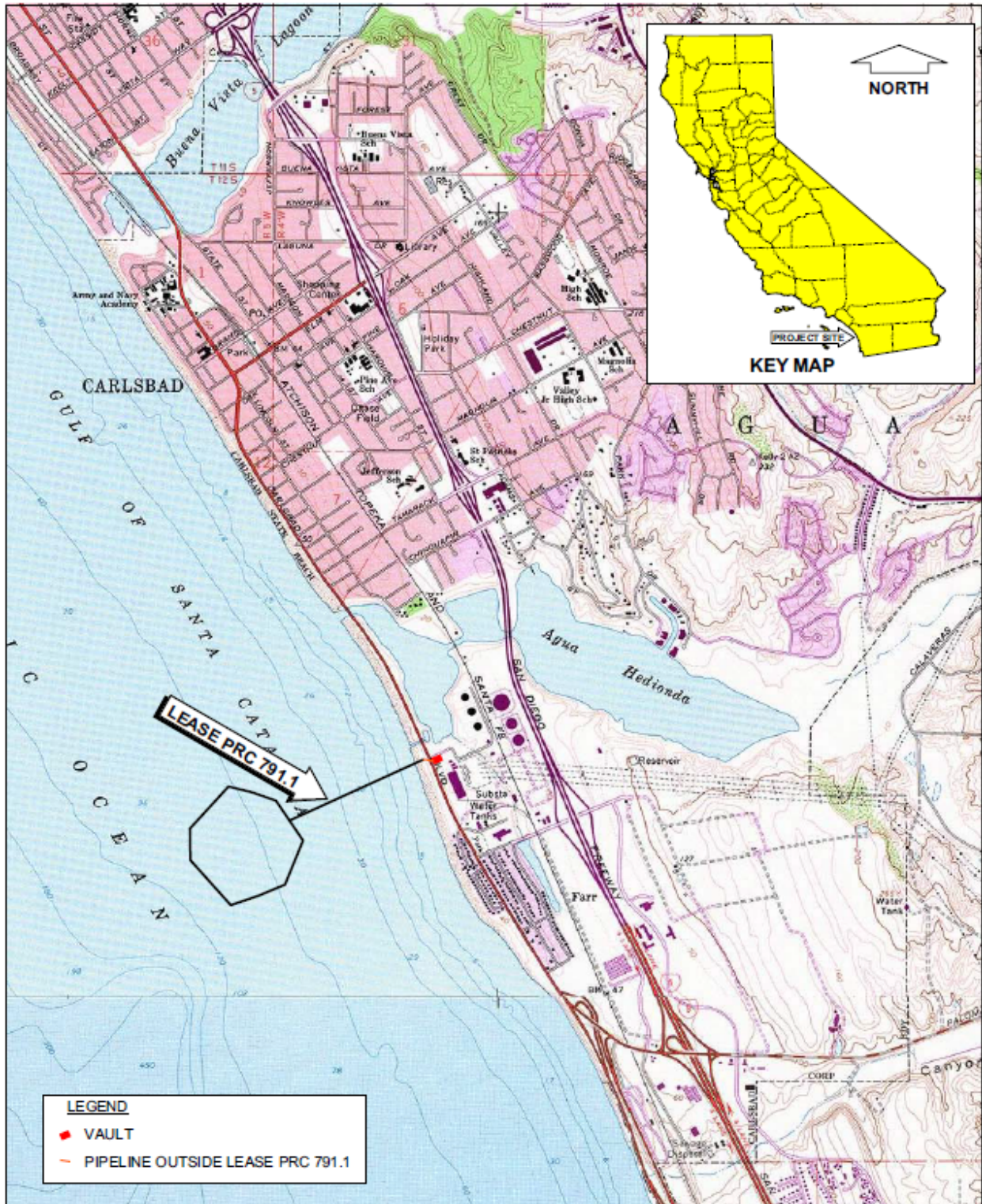


Figure 1. Project lease area PRC 791.1

pipeline leading to the shore facility. The submarine pipeline runs ashore approximately 350 ft to the north of the power station structure as viewed from the mooring. The seaward end of the submarine hose was fitted with a 12-inch butterfly valve and was connected to the hose buoy by a 1-inch chain with a breaking strength of 48,000 pounds. The marine terminal was further defined by a yellow light bell buoy with a yellow flashing light located approximately 400 yards west of the pipeline buoy. The mooring buoys were held in place with a 220-inch long 30,000-lb. light weight type anchor set in the sea floor attached to nominal 1-1/2 inch steel chain. The onshore portion of the pipeline at the beach is covered with a substantial amount of rip-rap (Figure 2). The pipeline crosses under Carlsbad Boulevard and can be accessed via an open vault structure within the power plant.

The MOT was placed in caretaker status in 2010, and Lease PRC 791.1 was extended in 2011. Condition 8 of Lease PRC 791.1 requires preparation of an Abandonment Plan/Project Execution Plan. All equipment was removed during the caretaker transition except for equipment too onerous to demolish. MOT equipment still in place are the seven anchors, connecting chain, marker buoy marking the end of the submarine concrete pipeline, and submarine concrete pipeline. The concrete pipe was flushed with potable water and pigged to below 15 milliliter/liter hydrocarbons. The ocean end of the concrete pipe was flanged with a fitting for later sampling. The pipeline is presently filled with potable water and a preservative (Nalco 1120 corrosion inhibitor) to prevent corrosion of the metal liner. The shoreline first valve was removed and pipe blank flanged. The shoreline first valve bypass valve was also blank flanged.

METHODS AND MATERIALS

Habitat mapping was performed by collecting data with an interferometric wide-swath sonar system operating at 468 kHz from a 22-ft research vessel. The sonar was set to scan out to 35 meters (m) on both the starboard and port channels for a 70-m wide swath, at a resolution of 3.5 centimeters (cm). Parallel survey track lines were navigated until the entire survey footprint was covered (Figure 3). Adjacent track lines overlapped such that the area directly beneath the sonar head (Nadir gap) was filled with valid data. Geographic positioning was provided via a dual-antenna GPS/compass receiver with better than 60-cm accuracy. The collected data were spatially corrected for vessel heave, pitch, and roll via an integrated ship's motion sensor.

Following completion of the field survey, the digital sonar traces (backscatter data) were joined together into a single mosaic and geographically registered using the recorded navigational data. The backscatter data are the visual representation of the intensity of the acoustic energy reflected back to the sonar unit from the bottom. Hard objects (e.g., rock) or soft objects containing air filled voids (e.g., kelp pneumatocysts) reflect sound waves with a greater intensity relative to soft bottom (e.g., mud and sand). The angle of the surveyed object relative to the sound wave propagation also determines the intensity of the returned sound signal. Rocky outcroppings with greater complexity (e.g., increased relief) and sand waves have greater variation in terms of high signal intensity mixed with low signal intensity from areas that lie in the acoustic shadows of the reef or on planes facing away from the transducer where reflected energy is principally away from the transducer heads.

The registered sonar mosaic was overlaid on an aerial image of the survey sites and reviewed for accuracy. Habitat types were then digitized by a geographic information systems (GIS) specialist who inspects the sonar mosaic and delineates the habitat boundaries. Areas were delineated where interpretive differences in the intensity and patterns of the backscatter data were noted. The GIS specialist responsible for the mapping then determined areas where ground-truthing of features was

necessary to identify the habitat types that were within the survey boundaries. In addition, areas of particular interest to describing the various habitats were selected as inspection targets by the project biologist. A remotely operated vehicle (ROV) was navigated through the ground-truthing areas and was used to investigate selected targets in order to assist in describing the resources in the survey area. The survey was conducted by M&A on February 14, 2013, with additional ROV survey work being conducted on February 18, 2013.



Figure 2. Onshore portion of pipeline (from Padre Associates, Inc. 2013)

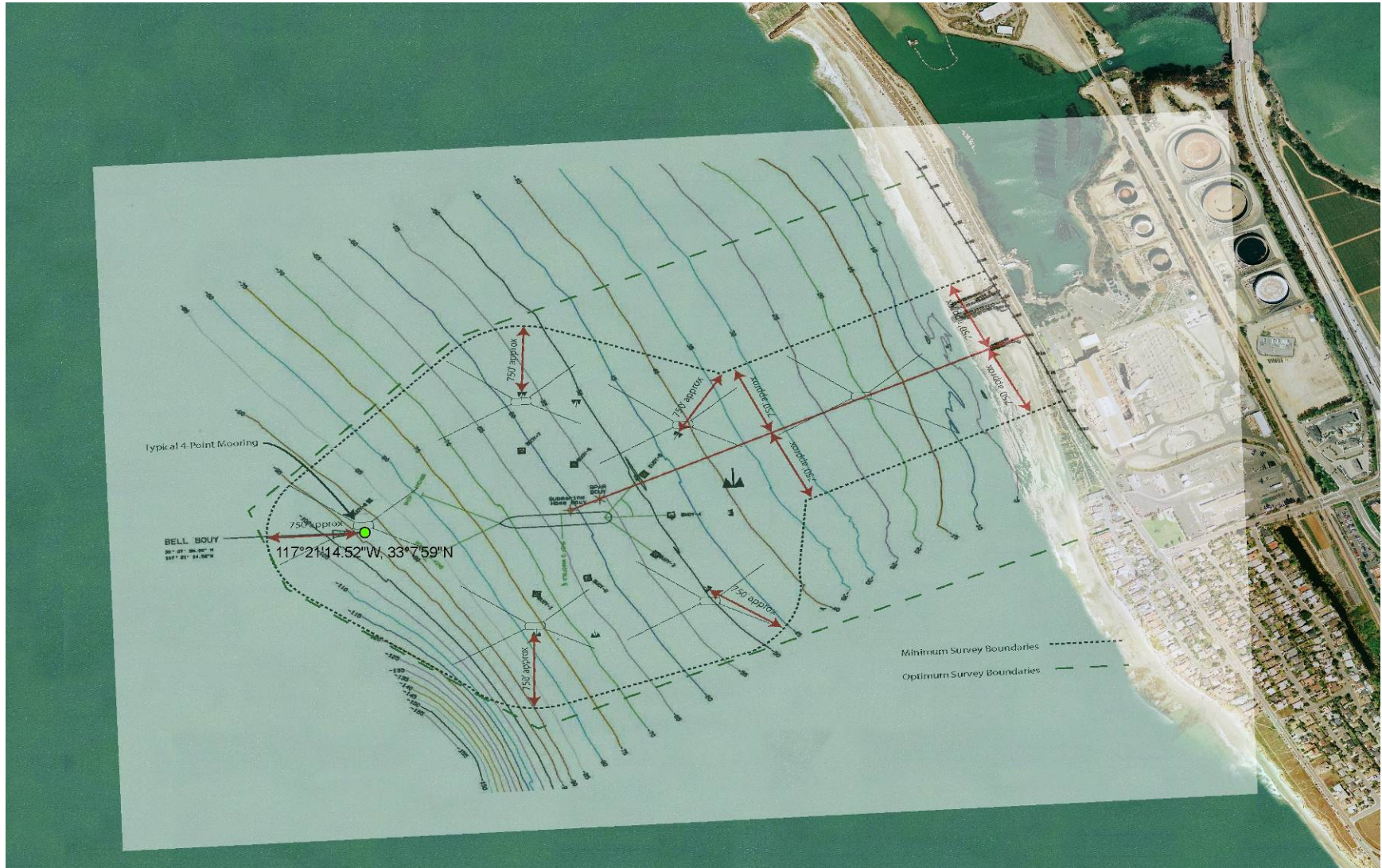


Figure 3. Encina Power Station marine biological resources survey area with conceptual barge anchoring plan

RESULTS

The survey area totaled approximately 387 acres, and the habitat types observed included both soft and hard-bottom substrate (Figure 4). The hard bottom substrate consisted for both vegetated (e.g., giant kelp canopy) and unvegetated habitat. Numerous hard targets (e.g., anchors, chain, and debris) were also detected. The various habitat types and targets are discussed in the following sections.

SOFT-BOTTOM OR SANDY SUBTIDAL HABITAT

From a coastal processes standpoint, the site is located within the Oceanside Littoral Cell, extending from Dana Point into Mexico. Within this cell, soft bottom habitat comprises the majority of the survey area (approximately 350 acres). Soft-bottom nearshore communities have similar characteristics for a given water depth, sediment type, and wave energy. Thus, sandy nearshore communities off Oceanside are similar to those found at similar depths and bottom type off Imperial Beach. The subtidal zone is classified into general regions, including the shallow subtidal to a depth of about -30 ft MLLW (generally corresponds to littoral zone), an inner shelf zone from about -30 to -80 ft MLLW, middle shelf from about -80 to -300 ft MLLW, and outer shelf zone from about -300 to -600 ft MLLW. Thus, the study area encompasses the shallow, inner, and a small portion of the middle shelf zones.

Bottom-dwelling invertebrate species in the shallow subtidal zone are well adapted to shifting sediments and turbidity, with suspension feeders being the dominant group. Many of the sandy beach invertebrates move between the intertidal and shallow subtidal depths and additional species live on and within sediments within increasing distance offshore as wave energy diminishes toward the seaward limit of the littoral zone. Common species in the shallow subtidal of the study region include burrowing anemones, crabs, sea pansy, sea pen, clams, snails, sand dollar, sand stars, and tube worms (SANDAG 2011).

Demersal fish commonly found on the bottom in shallow subtidal habitat (less than 30 ft) off San Diego County beaches include California halibut (*Paralichthys californicus*), California bat ray (*Myliobatus californica*), California scorpionfish (*Scorpaena guttata*), round stingray (*Urobatus halleri*), shovelnose guitarfish (*Rhinobatos productus*), speckled sanddab (*Citharichthys stigmaeus*), and turbot. Northern anchovy (*Engraulis mordax*), jack mackerel (*Trachurus symmetricus*), and Pacific bonito (*Sarda chiliensis*) are commonly encountered in the water column just beyond the surf zone. See Figures 5 for representative pictures taken in approximately -25 ft water depth in the study area.

The number of species and abundances of bottom-dwelling macroinvertebrates is lower in the inner shelf compared to the middle and outer shelf depth zones. Polychaete worms and/or small, mobile crustaceans dominate the inner to middle shelf infaunal community. The most abundant species collected in sediment core samples collected at depths of -49 to -134 ft MLLW on the San Diego shelf include brittle stars, polychaete worms (e.g., *Aricidea* spp., *Diopatra* spp., *Mediomastus* spp., *Monticellina* spp., *Spiophanes* spp., *Sternaspis fossor*, *Streblosoma crassibranchia*), and small crustaceans (*Heterophoxus oculatus*, *Photis* spp., and *Rhepoxynius* spp.) (SANDAG 2011). The most common macroinvertebrate species collected by otter trawl during the Regional Bight program surveys included blackspotted bay shrimp (*Crangon nigromaculata*), California sand star (*Astropecten verrilli*), yellow rock crab (*Cancer anthonyi*), sandflat elbow crab (*Heterocrypta occidentalis*), slender sea pen (*Stylatula elongata*), and white sea urchin (*Lytechinus pictus*) (SCCWRP 2003).

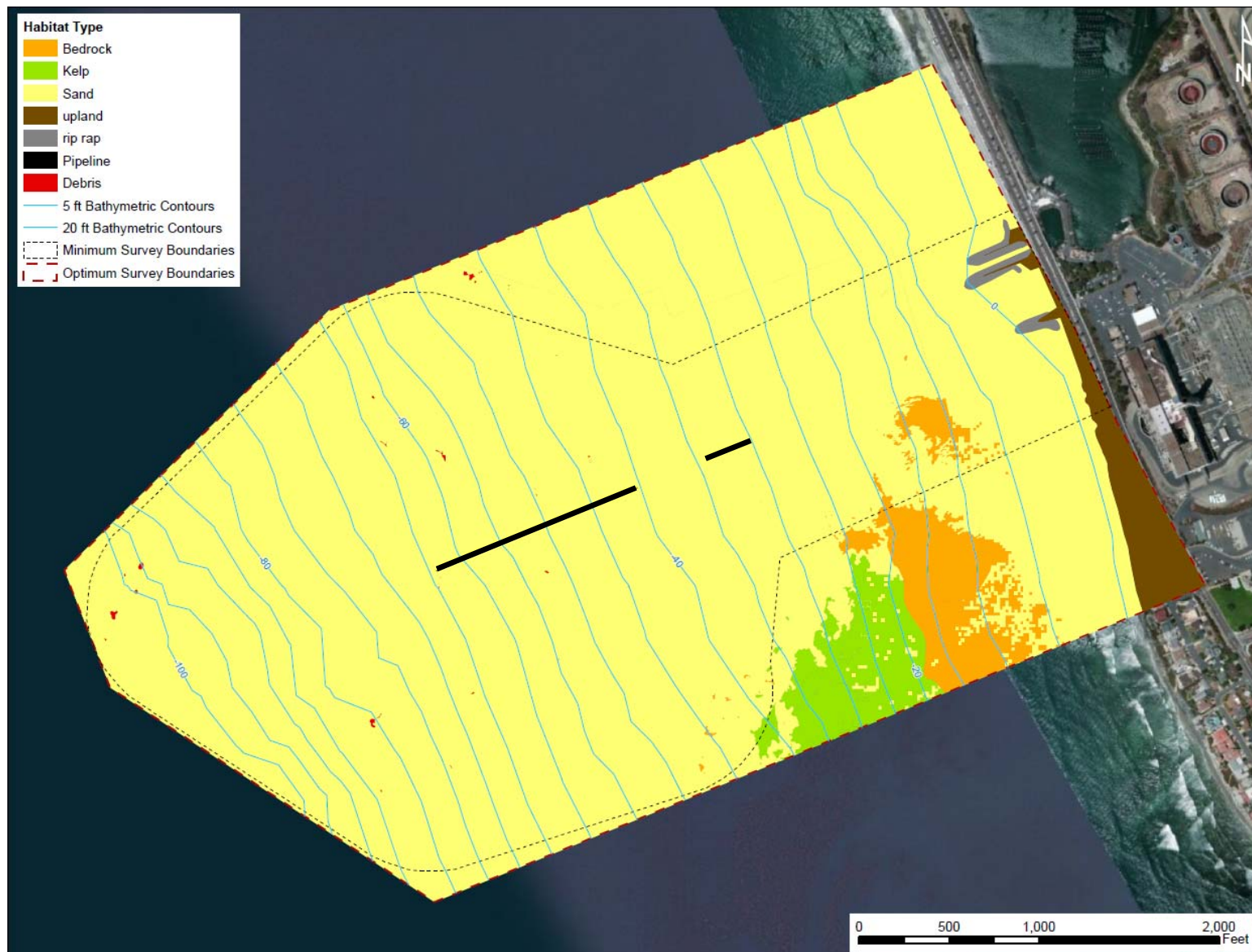


Figure 4. Marine habitats in the vicinity of the Encina Power Station

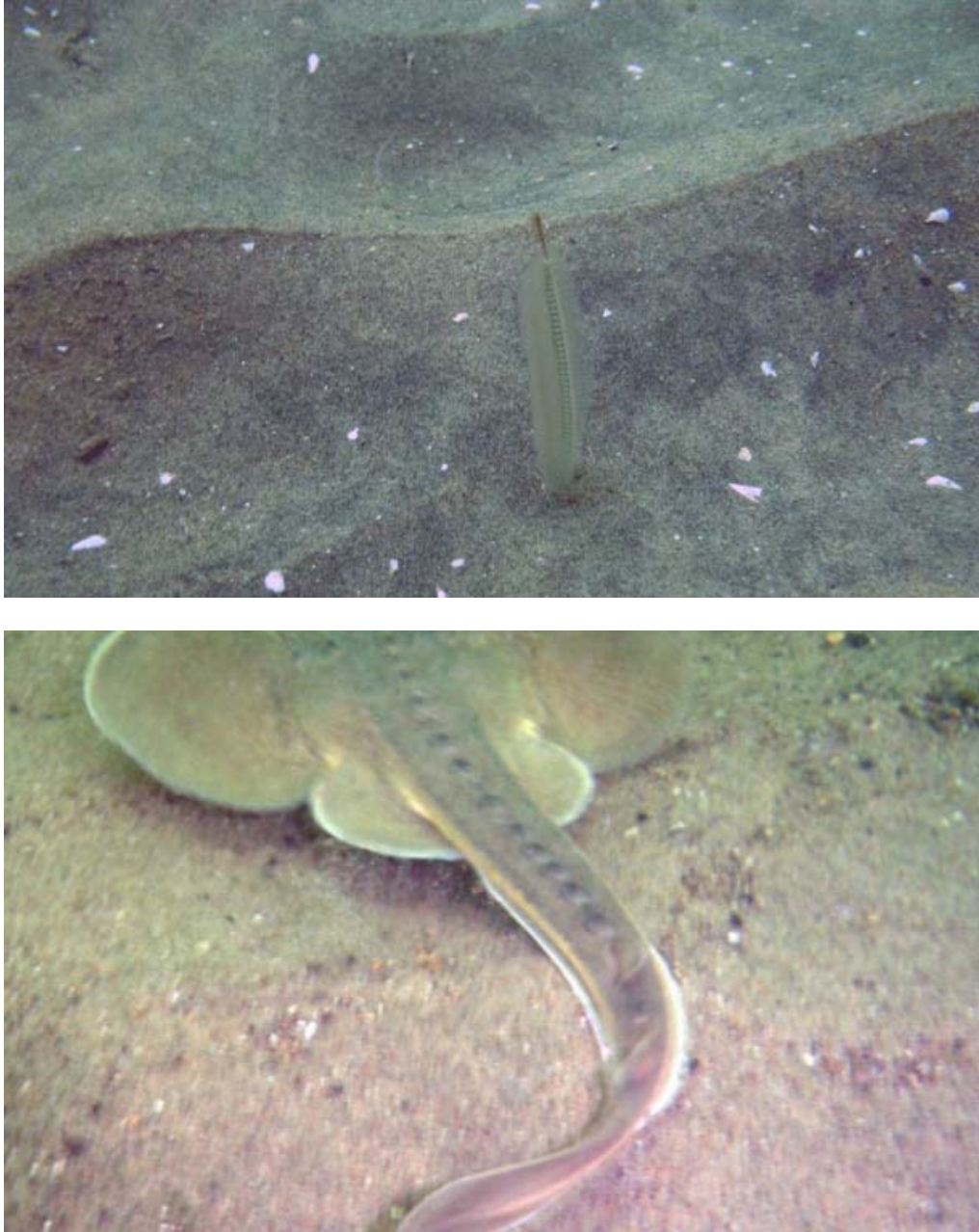


Figure 5. Representative photographs at water depth of -25 ft. Top – Sea pen (*Stylatula elongata*); Bottom – Thornback ray (*Platyrrhinoidis triseriata*)

Fish commonly collected by otter trawls during the Regional Bight program surveys included California halibut, California lizardfish fish (*Synodus lucioceps*), California scorpionfish, longfin sanddab (*Citharichthys xanthostigma*), and speckled sanddab (SCCWRP 2003). Fish species comprising 80% or more of the abundance in trawls on the inner shelf during the 2003 Regional Bight program included English sole (*Pleuronectes vetulus*), Pacific sanddab (*Citharichthys sordidus*), pink seaperch (*Zalembeius rosaceus*), speckled sanddab, yellochin sculpin (*Icelinus quadriseriatus*), and white croaker (*Genyonemus lineatus*) (SCCWRP 2003). The most abundant species of the middle shelf include Dover sole (*Microstomus pacificus*), longspine combfish

(*Zaniolepis latipinnis*), Pacific sanddab, speckled sanddab, and rockfish (*Sebastes* spp.). See Figures 6 and 7 for representative pictures taken in approximately -45 ft and -70 ft water depth in the study area, respectively.

Within the study site, brittle stars were common in the deeper portions of the site in sand bottom habitat. Also present were slender sea pens. Speckled sanddab were observed as was a thornback ray. The sediment consisted of a fine sand at all of the surveyed project area depths. The demersal macrofauna observed on the sand bottom was generally fairly sparse throughout the survey area.

HARD-BOTTOM SUBTIDAL HABITAT

Hard bottom habitat comprises a relatively small portion of the survey area (approximately 7 percent or 27 acres; Figure 4). Hard-bottom habitats are productive ecosystems that support a variety of plants and animals. They include rocky intertidal shores, and nearshore reefs that support vegetated habitats such as seagrass beds and kelp forests. Less than 15% of the coastline in San Diego County is estimated to be rocky (SANDAG 2011).

The species that associate with hard bottoms differ greatly with depth, type of substrate (e.g., cobble, boulders, rocky outcrop, sandstone reef), and substrate relief height and complexity. Rock or sandstone reefs provide hard substratum to which kelp and other algae can attach in the nearshore zone (<100 ft depth). In addition, many invertebrates such as sea anemones, sea fans, scallops, and sponges require hard substratum for attachment. The structural complexity of hard-bottom habitats provides shelter and foraging habitats for mobile invertebrates (e.g., lobster) and fish.

Several physical factors influence the types and diversity of marine life associated with rocky habitats. Important substrate qualities include relief height (low, high), texture (smooth, pitted, cracked), size, and composition (sandstone, mudstone, basalt, granite) (Ambrose et al. 1989). Substrates that are of higher relief, greater texture, and size generally have the richest assemblages of marine species. In contrast, low-lying rocks or reefs subject to sand scour, from seasonal burial and sand movement, typically lack vegetation or are colonized by opportunistic species (with annual life cycles) or scour and burial-tolerant species (Figure 8, SAIC 2007, AMEC 2005). The proportion of hard substrate habitat at any given time relates to relief height and time of year, with lower relief substrate subject to exposure or burial by sand associated with seasonal on- and offshore sand movement or large waves associated with substantial storm events (e.g., El Niño).

Vegetated habitats also experience variability in cover between years due to a number of factors. Surfgrass is a sand-tolerant, perennial species that may be subject to less interannual variability. However, it is slow to recover from die-back, particularly if its rhizomatous root mat becomes dislodged. Studies suggest it may be more vulnerable to variability along its inshore distribution limit in the lower intertidal, where wave action and sand movement are greater (Reed et al. 1999).

Nearshore Reefs

Subtidal reefs in the shallow nearshore also exhibit considerable variation in resource development associated with the seasonal onshore and offshore migration of sand, and other factors such as relief height, texture, composition, and size (Ambrose et al. 1989). Along the southern boundary of the study area, approximately 15 acres of bedrock, hard-bottom substrate is present in water depths ranging from -5 to -20 ft, with a small patch located approximately 100 ft south of the pipeline corridor (Figure 4).



Figure 6. Representative Photographs at water depth of -45 ft. Top – Black-eyed goby (*Coryphopterus nicholsi*); Bottom – California lizardfish (*Synodus lucioceps*)



Figure 7. Representative Photographs at water depth of -70 ft. Top – Sand waves; Bottom – Market squid (*Loligo opalescens*) egg cases and tube worms (*Diopatra ornata*)



Figure 8. Sediment-influenced low-relief bedrock habitat (from SANDAG 2011)

Understory algae are common on nearshore reefs (AMEC 2005). Feather boa kelp (*Egregia menziesii*) is conspicuous and can grow up to 12 ft in length. The sea palm (*Eisenia arborea*) may co-occur with feather boa kelp at subtidal depths. Sea palms may live more than 10 years and grow to about 1 to 1.5 ft in height in areas of high surge, but they may reach up to 3 ft in height in deeper water. Their shorter height and occurrence on higher relief reefs suggests they may be less tolerant of sand sedimentation than surfgrass and feather boa kelp (AMEC 2005). A variety of smaller red algae (*Corallina* spp., *Erythrogloussum californicum*, *Gigartina* spp., *Gracillaria* spp., *Jania* spp., *Lithothrix* spp. *Rhodomyenia* spp.) and brown algae (*Cystoseira osmundacea*, dictyotales, *Zonaria farlowi*) may co-occur with feather boa kelp and/or sea palms on nearshore reefs. Persistent reefs support hundreds of species of invertebrates (e.g., lobster [see Figure 9], crabs, nudibranchs, sea urchins, scallops, sea stars, snails, sponges, tunicates, worms) and attract a variety of fish such as garibaldi (*Hypsypops rubicundus*), blacksmith (*Chromis punctipinnis*), and black perch (*Embiotoca jacksoni*).

Surfgrass Beds

The most common type of seagrass along the open coast is surfgrass (*Phyllospadix* spp.), which is a flowering plant that forms beds on rocky substrate from the very low intertidal level to approximately -20 ft (Figure 10). Previous studies have indicated that surfgrass was present within the study area (Padre Associates Inc. 2013), and while the current survey was not able to detect surfgrass beds due to an inability to access the shallow waters over the reef features. Based on the presence of hard substrate within the shallow subtidal zone, surfgrass on these reefs cannot be ruled out and it has been previously observed in this area in prior years (K. Merkel, Pers. Comm.). Small beds of surfgrass may certainly be present on the reef top at the southeastern portion of the study area (Figure 4).



Figure 9. Spiny lobster observed on low-relief coralline algae covered reef in study area



Figure 10. Surfgrass beds in nearshore environment (from SANDAG 2011)

Surfgrass provides important habitat for a variety of algae, invertebrates, and fish. Up to 34 species of algae and 27 species of invertebrates may be associated with surfgrass on San Diego beaches (Stewart and Myers 1980). Surfgrass is also a known nursery habitat for California spiny lobster (*Panulirus interruptus*) (Engle 1979). Surfgrass is morphologically adapted to withstand shifting sand movement with long shoots (1 to 3 ft intertidal, 2 to 6.5 ft subtidal), which can extend above a variety of sand depths and are protected from sand abrasion by fibrous sheaths. Dense rhizomatous

roots bind and enmesh with sand to form an effective anchor, and growth and colonization are by vegetative propagation of rhizomes and/or seasonal seed production (Littler et al. 1983, Stewart 1989).

Kelp Forests

Farther offshore, to depths where there is less seasonal sand movement, hard substrates do not need to have as high a relief to support perennial species. Kelp attaches to hard substrate by means of a holdfast, and fronds may grow to heights that exceed the water depth, forming leafy canopies at the water surface. Kelp forests are among the most productive marine habitats along the coast of California providing habitat, feeding grounds, and nursery areas for many species of fishes, invertebrates, and marine mammals (Foster and Schiel 1985). Kelp beds in the study area are dominated by giant kelp (*Macrocystis pyrifera*), which ranges from water depths of about -20 ft to -120 ft. Invertebrates found in kelp beds include lobster, sea stars, sea urchins, and mollusks. Commonly observed fish include surfperch, rockfish (*Sebastes* spp.), cabezon (*Scorpaenichthys marmoratus*), lingcod (*Ophiodon elongatus*), and wrasses (senorita, rock wrasse, and sheephead).

Kelp beds in Southern California generally deteriorate during summer and fall when temperatures are higher and nutrient concentrations are lower. Giant kelp is adversely affected by sedimentation and turbidity. Sedimentation can bury small plants and prevent settling of microscopic spores, both of which can reduce kelp beds (Foster and Schiel 1985). El Niño conditions, which result in high waves, higher-than-average temperatures and low nutrients, have been linked to regional declines in kelp canopy (Tegner and Dayton 1987).

Approximately 12 acres of kelp forest habitat was present along the southern boundary of the study area in water depths ranging from -20 to -45 ft (Figures 4 and 11). High turbidity and unfavorable swell conditions limited ROV access into the kelp during the present survey.



Figure 11. Giant kelp observed on reef in study area

TARGETS

A variety of hard targets were detected from the sonar survey. Two separate portions of the 20-inch diameter submarine pipeline were detected in the survey area (Figure 4). Near shore, an approximately 150 ft section of the pipeline was detected in water depths ranging from -30 ft to -35 ft, while a longer portion (approximately 1100 ft long) extended from the -40 ft contour to the -63 ft contour. The sonar data indicated that the pipeline was detectable but was partially or entirely buried along various portions of the line. Given the relatively low relief of the pipeline and the adjacent sandy habitat, it is possible that the pipeline and hose experience periods of exposure or burial due to littoral sediment transport, and therefore, are unlikely to support a diverse community of perennial marine organisms. No kelp or other significant biological structure occurs on the narrow pipeline.

Several other targets included anchors and chain laying on the seafloor (Figure 12). Some of the anchors were not exposed with significant relief on the surface, presumably because they were buried (Figure 13). However, the recent removal of floating moorings and dropping of chain to the bottom has left the mooring chains generally exposed. The anchor chains that were not buried appeared to support some epibiota such as tunicates, bryozoans, sponges, sea fans (*Muricea* spp), and turf red algae, but few perennial macroalgal species and no canopy forming kelp. The investigated anchor chain was being used as limited structural cover by two juvenile lobster as well as a black-eyed goby. There was otherwise limited growth on or use of the feature.

Smaller isolated targets were also detected and investigated. These in general appeared to be remnants of biological growth that has fallen off or been scraped off of the surface moorings. Typically the debris piles consisted of mounds of dead mussel shells (*Mytilus* spp.). The mussel shell mounds supported a number of small crustaceans including decorator crabs and shrimp, but inadequate observations were made to determine the species of epifauna associated with mussel shell masses. In some instances such as illustrated in Figure 7, the hard substrate of the mussel shell debris was used as primary substrate for squid egg attachment.



Figure 12. Anchor chain in study area

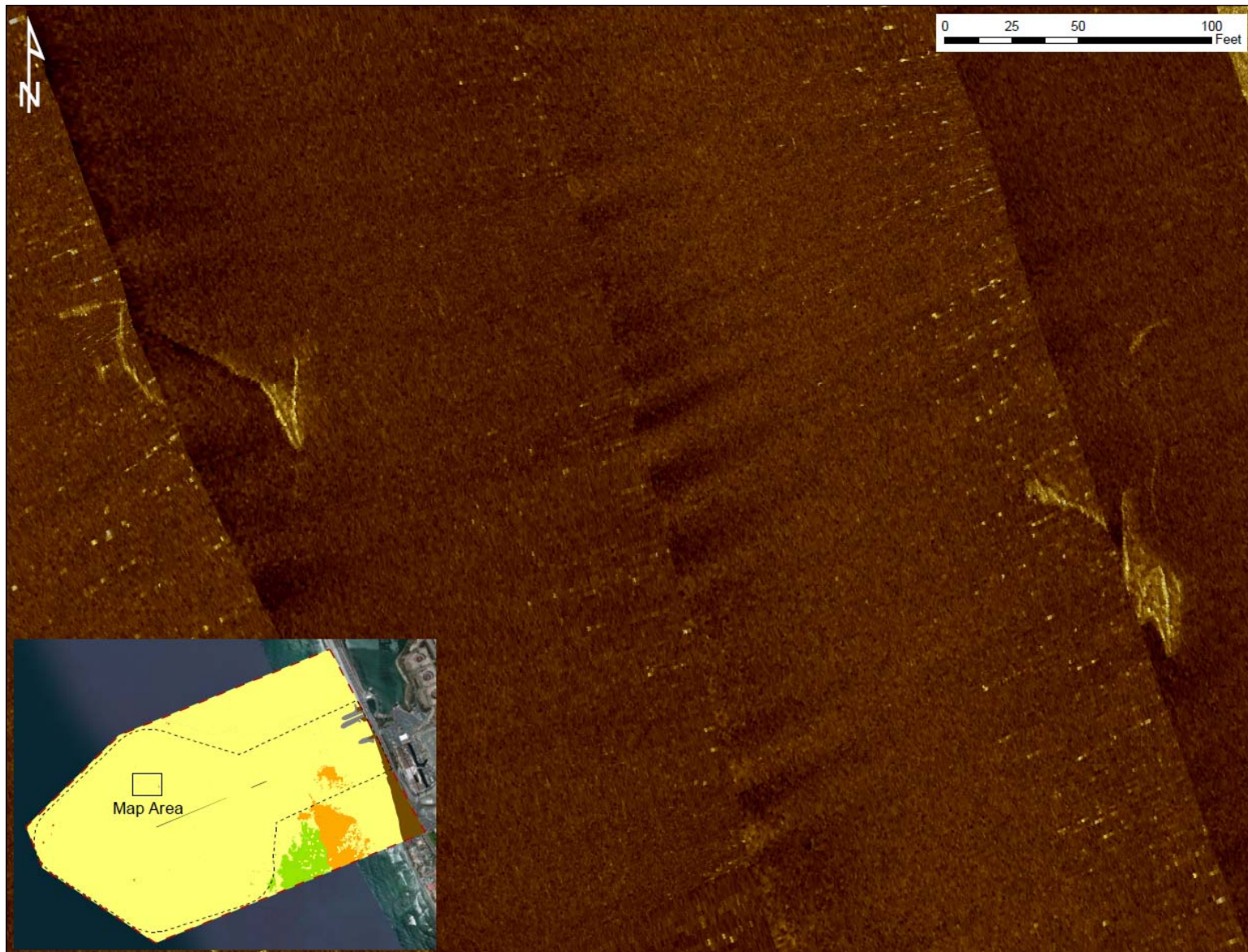


Figure 13. Sonar mosaic of anchor and chain

RECOMMENDATIONS TO AVOID/MINIMIZE POTENTIAL BIOLOGICAL IMPACTS

In line with the Site Assessment Report (Padre Associates, Inc. 2013), the seafloor habitats within the areas of potential effect (i.e. along the pipeline route and at proposed anchoring locations) were mapped, and based on the survey, the following are recommendations to avoid or minimize potential impacts to sensitive habitats:

- Beach construction activity (i.e., any activity that would disturb/disrupt the area below the highest tide) can potentially kill grunion eggs, if activities were to occur during the grunion spawning season. Per the Site Assessment Report (Padre Associates, Inc. 2013), potential grunion-related impacts could be reduced or eliminated by either scheduling intertidal activities outside of the grunion spawning season, which runs from March to August. If construction in the vicinity of the intertidal zone overlaps an anticipated grunion run, construction monitoring (conducted during construction and a grunion run) should be conducted by a qualified monitor. This may require the development of a Grunion Protection Plan and consultation with California Department of Fish and Wildlife (formerly Department of Fish and Game) prior to any construction.
- The inshore area south of the pipeline between water depths of -10 to -45 ft support sensitive hard bottom habitats. There is hard bottom habitat as close as 100 ft south of the pipeline in water depths of -10 to -15 ft. These areas should be avoided if possible. The provided barge anchoring layout noted two barges with downcoast anchors that would potentially be placed on or near hard bottom habitats (Figure 14). It is recommended that these anchoring locations be relocated or rotated such that anchoring is in soft bottom habitat at least 100 ft away from any hard bottom habitat. Recognizing that the anchoring plan is conceptual, this report submittal includes a geo-referenced deliverable, so that the construction contractor can develop an anchor plan to avoid impacts to sensitive habitats.
- Since portions of the pipeline appeared buried (mainly on the inshore portion), if any overlying sediment is to be removed during removal, it is recommended that all material be placed on the upcoast areas of the pipeline corridor (i.e. north of the pipeline) to avoid sedimentation impacts to downcoast reefs.

No additional recommendations are made with respect to protection of biological resources in the study area.

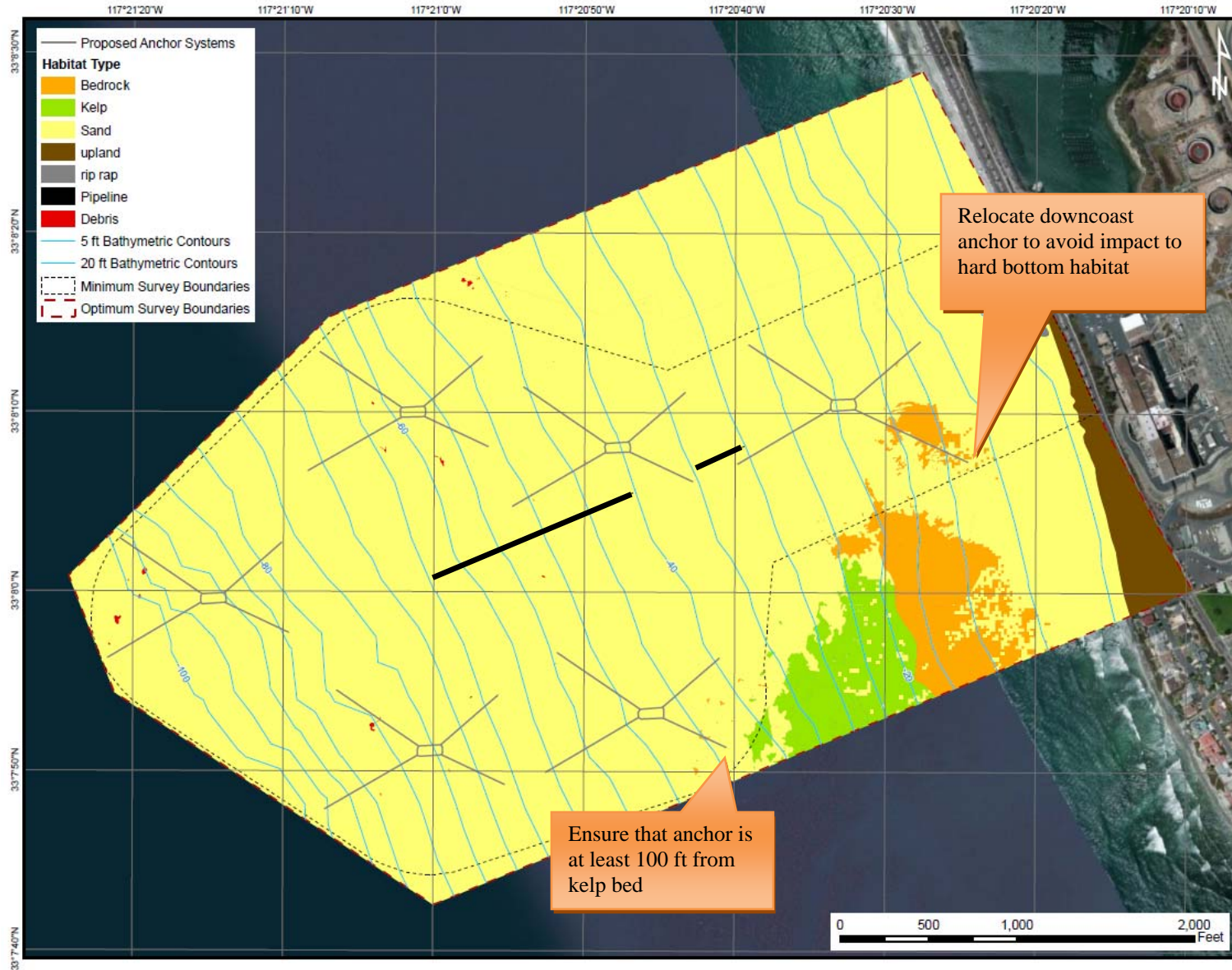


Figure 14. Marine habitats in the vicinity of the Encina Power Station with conceptual anchoring plan

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