Appendix A

Agency Correspondence

- Navy Request for Informal Section 7 Consultation and Concurrence from National Marine Fisheries Service
- Essential Fish Habitat Assessment
- National Marine Fisheries Service Response to Request of Informal Section 7 Consultation
- Navy Response to National Marine Fisheries Service 17 March 2016
- California Coastal Commission Negative Determination
- Navy Request for California Coastal Commission Negative Determination

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National Marine Fisheries Service Correspondence

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DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAVAL BASE SAN DIEGO
3455 SENN RD
SAN DIEGO, CALIFORNIA 92136-5084

IN REPLY REFER TO:
5090
Ser N411/U644
18 FEB 15

Regional Administrator
National Marine Fisheries Service
Southwest Regional Office
501 West Ocean Boulevard
Long Beach, CA 90802-4213

Dear Mr. Stelle:

SUBJECT: SECTION 7 CONSULTATION AND ESSENTIAL FISH HABITAT ASSESSMENT FOR MILITARY CONSTRUCTION PROJECT (MILCON) P-440 PIER 8 REPLACEMENT NAVAL BASE SAN DIEGO, SAN DIEGO, CALIFORNIA

The United States Navy, Naval Base San Diego, requests informal Section 7 consultation and concurrence regarding its conclusion that the Pier 8 Replacement Project at Naval Base San Diego (NBSD) is not likely to adversely affect the endangered green sea turtle (*Chelonia mydas* [GST]). The project consists of in-water construction and is located at Pier 8 on NBSD. Pier 8 is centered at 32.673133, -117.22714. No other threatened or endangered species of marine mammals are expected to occur in the project action area.

The proposed project is anticipated for contract award prior to 2018. Monitoring for sea turtles and marine mammals is proposed to ensure the avoidance of impacts to these sensitive resources (see below).

The purpose of the Proposed Action is to address the current and impending shortfall at NBSD of pier infrastructure necessary to support modern Navy ship classes with deep draft-power and power intensive requirements. The U.S. Navy proposes to demolish Pier 8, which is considered to be inadequate due to deteriorating physical condition and lack of necessary modernized infrastructure (e.g., electrical utilities). A new Pier 8 and associated pier utilities would be constructed at the same location as the existing Pier 8 at NBSD. No new ship homeporting actions are specifically planned in association with the proposed project. See enclosed project description and

figures for more details. As you know, the Navy has been in informal consultation with the National Oceanic and Atmospheric Administration (NOAA) since the beginning of the GST study (NOAA, Scripps, Port of San Diego and Navy Partners) in December of 2007. Shallow subtidal habitats do not occur in the affected project areas (Pier 8 is situated in depths of 21 to 39 feet [6.4 to11.8 meters] mean lower low water level) and there is no suitable substrate at the appropriate depths for eelgrass. There is no historic occurrence of eelgrass at the project site. There have been no green sea turtle sightings in the project area, which is a heavily used maritime industrial area and lacks eelgrass or other habitat features that might attract green sea turtles. The nearest eelgrass beds are approximately 1.5 miles away across the bay.

Based on recent research, the San Diego Bay population of GST includes both year-round and seasonal (winter) residents, and in recent years has numbered between 30 and 90 individual GSTs in San Diego Bay foraging in eelgrass beds, consuming a mixed diet of invertebrates, eelgrass, and algae. San Diego Bay's GSTs have historically resided in south San Diego Bay, attracted by warm-water discharge from the South Bay Power Plant. Mark-recapture studies have shown greater mobility during warm water months, suggesting that during winter, cold water in the northern bay acted as a barrier to GST movements resulting in their confinement to the warm-water area of the south bay. With the closure of the power plant in 2011 and its recent demolition, the seasonal distribution of GSTs in San Diego Bay may change and other locations with eelgrass or more stable temperature regimes may be attractive to GSTs. Although no GSTs have been observed or are expected in the immediate project area, GSTs may move throughout the southern half of the bay, and could pass near the project area; if so, adequate measures to avoid and minimize potential adverse effects will be taken.

Based on the foregoing, we consider the only mechanism of potential effect on GST to be the underwater noise associated with impact pile driving. During impact pile driving, potential behavioral harassment to a marine mammal is presumed to occur when the animal is exposed to an underwater sound pressure level (SPL) of 160 dB (root mean square [RMS]) re- 1µPa or greater. The Navy would conservatively apply the same threshold as indicating the possibility of behavioral effects on GST based on

an estimated sound source level for the pile driver of 176 dB RMS re- 1µPa at 33 ft (10 m) and a sound attenuation rate of 4.5 dB per doubling of distance (referred to as practical spreading 117-m) radius. Accordingly, the Navy would perform a visual sweep of the bay within this distance prior to commencing pile driving activities, and after a break in pile driving for more than 30 minutes. If any marine mammal or green sea turtle is seen within this visual range, pile driving activities would not commence until 15 minutes have passed since the last such sighting, or the animal has moved out of the established range. If a marine mammal or green sea turtle moves within the established range while pile driving activities are occurring, such activities would cease until the animal leaves the area.

In addition, prior to the start of pile driving each day, after each break of more than 30 minutes, and if any increase in the intensity is required, the Navy shall use a ramp-up procedure. The procedure involves a slow increase in the pile driving to allow any undetected animals in the area to voluntarily depart.

While avoiding behavioral effects, the implementation of these measures would also preclude the occurrence of injurious effects due to pile driving, which could only occur within a much smaller distance than behavioral effects.

The Navy has determined that the proposed project may affect but is not likely to adversely affect GST. Pursuant to Section 7 of the Endangered Species Act we request your concurrence with this determination within 30 days.

Also provided as Enclosure (1) is the Essential Fish Habitat (EFH) Assessment as required by the Magnuson-Stevens Fishery Conservation and Management Act. As described in the effects analysis, the Navy has determined that the project may have localized and temporary adverse effects on EFH for federally managed fish species within the Coastal Pelagic Species and Pacific Coast Groundfish FMPs. However, the project contains adequate measures to avoid and minimize potential adverse effects to EFH.

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If you have any questions, please feel free to contact Ms. Lisa Seneca, NEPA Planner, at (619) 556-9167 (Lisa.Seneca@navy.mil), or Mr. Mitchell A. Perdue, Project Biologist, at (619) 556-7187 (mitchell.perdue@navy.mil).

Sincerely,

JAMES J. CHO
Commander, U. S. Navy
Public Works Officer
By direction of the
Commanding Officer

Encl: (1) Essential Fish Habitat Assessment.

Essential Fish Habitat Assessment

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Final

Essential Fish Habitat Assessment
Pier 8 Replacement
Naval Base San Diego

August 2015

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
CFR	Code of Federal Regulations
cm	centimeter
CPS	Coastal Pelagic Species
dB	decibel
BOWTS	Bilge Oily Water Wastewater Treatment System
DDG	guided missile destroyer
EFH	Essential Fish Habitat
FMP	Fishery Management Plan
ft	feet
g	gram
HAPC	Habitat Area of Particular Concern
km	kilometer
LHA	amphibious assault ship
m	meter
mg O2/l	milligram oxygen per liter
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
NAVFAC	Naval Facilities Engineering Command
NBSD	Naval Base San Diego
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRSW	Navy Region Southwest
OWS	oil water separator
PAH	polycyclic aromatic hydrocarbon
PFMC	Pacific Fishery Management Council
POSD	Port of San Diego
rms	root mean square
RWQCB	Regional Water Quality Control Board
SAV	submerged aquatic vegetation
SCEMP	Southern California Eelgrass Mitigation Policy
SEL	Sound Exposure Level
TL	transmission loss
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
ZOI	Zone of Influence
µPa	microPascal

1.0 INTRODUCTION

Many marine habitats are critical to the productivity and sustainability of marine fisheries. The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) set forth the Essential Fish Habitat (EFH) provisions to identify and protect important habitats of federally managed marine and anadromous fish species. Section 305(b)(2) of the amended Magnuson-Stevens Act directs each Federal Agency to consult with the National Marine Fisheries Service (NMFS) with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any EFH identified under the Magnuson-Stevens Act. Implementing regulations for this requirement are at 50 Code of Federal Regulations (CFR) 600.

The project area overlaps designated EFH for two Fishery Management Plans (FMPs): Pacific Coast Groundfish (Pacific Fishery Management Council [PFMC] 2011a) and Coastal Pelagic Species (PFMC 2011b). Since adverse impacts to these EFHs may occur, consultation with NMFS is required. The Navy and NMFS signed an agreement in 2001 which allows the Navy's National Environmental Policy Act (NEPA) and Fish and Wildlife Coordination Act process to satisfy EFH analysis requirements. Therefore, the Navy will notify NMFS in writing as early as practicable regarding actions that may adversely affect EFH. Notification will facilitate discussion of measures to conserve EFH. For any Federal action that may adversely affect EFH, Federal agencies must provide NMFS with a written assessment of the effects of that action on EFH. The level of detail required in the assessment is commensurate with the magnitude of potential adverse impacts, so an action that may only result in minor impacts would only require a brief assessment. Mandatory contents of the assessment are outlined in 50 CFR 600.920.e.3.

This EFH Assessment is for the U.S. Department of the Navy's demolition and replacement of existing Pier 8 and is being provided in conformance with the 1996 amendments to the Magnuson-Stevens Act. The 1996 amendments to the Magnuson-Stevens Act set forth a number of new mandates for the NMFS, eight regional fishery management councils (Councils), and other federal agencies to identify and protect important marine fish habitat. The Councils, with assistance from NMFS, are required to delineate EFH for all managed species. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to the fisheries service's recommendations.

As the project location is within a general area designated as EFH by the Pacific Coast Groundfish and Coastal Pelagic Species FMPs, the species covered by these plans are considered in this assessment.

2.0 PROPOSED ACTION

2.1 Pier Demolition

Demolition of existing Pier 8, which is 66 feet (ft) wide by 1,610 ft long, would take approximately 11 months and would begin no sooner than 2017 (NBSD 2014). A total of 1,830 concrete structural piles would be removed using dry pulling alone or with the assistance of a vibratory hammer to loosen the piles. An additional 343 fender piles (concrete and plastic) would also be removed using the same method(s) (Naval Facilities Engineering Command [NAVFAC] Southwest 2004; NAVFAC Southwest 2014). Throughout the demolition phase, a spud-anchored barge, barge and wharf cranes, tug boat, mobile construction equipment, transport trucks, and scows for the collection and removal of demolition debris would be used to remove all pier deck material and pilings (NAVFAC Southwest 2007).

During demolition, floating slick bar booms would be used to provide a complete barrier to floating debris; however, because of the use of the system of rafts, very little debris (approximately 0.5 percent) is expected to reach the water. Any floating debris would be gathered in work boats and rafts and would be disposed of or recycled as appropriate.

Two driving/demolition crane barges (60 ft by 120 ft and 50 ft by 100 ft) and two support barges (both approximately 35 ft by 90 ft) would be used during demolition. In addition, a system of rafts would be used onto which demolition materials would be lowered and that would capture any incidental debris.

Several types of debris would result from the demolition of Pier 8, including concrete, steel, and asphalt. The Proposed Action would be in compliance with the Low-Impact Development Initiative requiring all demolition projects that take place after 2011 to recycle and divert materials from local landfills to the maximum extent practicable. Materials appropriate for recycling including concrete; steel; and asphalt would be recycled. Materials that cannot be recycled would be transported to an on-shore permitted landfill.

- Concrete debris would comprise the largest volume of demolition material, totaling approximately 26,000 cubic yards (NAVFAC Southwest 2008a). Approximately 75 to 90 percent of the concrete is estimated to be suitable for recycling. The steel reinforcement (re-bar) within the concrete would be removed and recycled separately. Alternately, an on-site mobile crusher would be used to crush the concrete debris. The crushed concrete would be stockpiled at an approved location on Naval Base San Diego (NBSD) and would be available for use (e.g., roadbase or revetment construction [NAVFAC Southwest 2008b]) by other construction projects. The concrete debris from Pier 8 that could not be recycled, estimated to be in the range of 10 to 25 percent of the total (2,600 to 6,500 cubic yards) would be hauled to the upland Miramar (San Diego) or Otay

Landfills (Chula Vista) that have capacity to accept this waste (Navy Region Southwest [NRSW] 2008; Allied Waste Industries 2008).

- Steel debris, including approximately 1,800 tons of steel ties, steel rebar removed from the concrete, and wiring (e.g., utility wires) from Pier 8 (NAVFAC Southwest 2008a) would also be recycled or appropriately disposed as a requirement of the demolition contract (Navy Region Southwest [NRSW] 2008). Steel debris that could not be recycled would be disposed at Miramar or Otay Landfills, which have adequate capacity to accept the waste (NRSW 2008; Allied Waste Industries 2008).
- Asphalt debris would comprise a minor amount, approximately 100 cubic yards of the material generated from demolition at the base of Pier 8 where it abuts the adjacent roadway. The asphalt from Pier 8 would be trucked off site to an asphalt recycling facility if the quantity is sufficient for recycling in a cost effective manner. If recycling is determined to not be feasible, the asphalt debris would be placed in a landfill, such as Miramar or Otay Landfills.

During pier demolition, turbidity would be increased in the immediate vicinity by pile extraction, which would stir up bottom sediments. Underwater noise and vibration will be generated from the operation of machinery to break up the existing structures and remove pier pilings. Navy vessels would relocate to other piers as needed during demolition and construction.

To the extent that the existing structures provide food and cover resources, fishes utilizing those resources would be affected by the activities and leave the immediate project area. However, similar structures and artificial habitats are abundant along the shoreline nearby. When the project activities are completed, the fish community is expected to return to the vicinity of Pier 8.

2.2 New Pier and Facilities Construction

2.2.1 Conventional Pier – Preferred Alternative

The Preferred Alternative to replace Pier 8 is to construct a single-deck, concrete berthing pier that is 117 ft wide by a length of 1,600 ft. This sized pier is needed to accommodate berthing requirements for four modern-sized ships (NAVFAC Southwest 2007). Construction would take approximately 11 months.

Approximately 512 concrete octagonal structural piles, four 24-inch concrete octagonal loadout cradle piles, and 204 concrete and composite square fender piles would be installed using a floating crane and diesel hammer (pile driver) (NAVFAC Southwest 2014). The structural piles would be 24 inches in diameter. The concrete/composite fender piles would be 24 inches square. Two hundred and thirty 14-inch diameter round plastic fender piles would also be installed with the pile driver, of a similar length (NAVFAC Southwest 2014). The average length of all the piles in the water column would range from 20.5 to 26 ft. The use of concrete, composite, and plastic piles in lieu of

creosote-treated wood pilings is consistent with Navy policy and is preferred by the Regional Water Quality Control Board (RWQCB) because, unlike creosote-treated wood pilings, they are not a potential source for polycyclic aromatic hydrocarbons (PAHs) to the bay. The total number of piles installed for the Conventional Pier option would be approximately 950.

The fender system for the Conventional Pier option would include 24 foam-filled fenders at the berths and plastic log camels, and would comply with current seismic standards. Pile installation would occur during an approximately 11-month period (NRSW 2011).

The pier deck would be constructed on-site of rebar-reinforced concrete. Deck support would be by pre-stressed concrete (structural) piles with cast-in-place concrete pile caps and a concrete deck structure (NAVFAC Southwest 2007). Construction would temporarily increase turbidity and noise in the area. The amount of vessel traffic is not expected to change with the new pier, but modern Navy vessels would be better accommodated by the new pier.

Improvements for the new Pier 8 would include a stormwater collection system with an oil-water separator (OWS) and copper and zinc treatment to meet current National Pollutant Discharge Elimination System (NPDES) permit requirements, and structural capacity for a 150 ton crane (NBSD 2012). Pier utilities would include potable water; wastewater; compressed air; steam; bilge oily water wastewater treatment system (BOWTS) pipelines; and compensating water systems. Additional ship-to-shore utilities would include: electrical; telephone; cable television; fiber optic communications; Supervisory Control and Data Acquisition system for energy monitoring and control; and fire alarms (NBSD 2012). The project would support a future upgrade of ship-to-shore power from 480 volts to 4,160 volts to meet future power-intensive Fleet requirements (e.g., for guided missile destroyers-1000 and multi-purpose amphibious assault ship -8 classes that are planned for berthing at the new Pier 8) by providing two new electrical vaults and spare six-inch ducts-conduits. However, the future ship-to-shore power upgrade is not included in the Proposed Action (NBSD 2012). In addition, the project would require replacing the 15 kilovolt cables from the existing Pier 8 and upgrading to four sets of 750 thousand Circular Mils 15 kilovolt cables (NAVFAC Southwest 2008d).

Table 2-1 Comparison of Pier 8 Preferred Alternative and Existing Pier

Specifications	Conventional Pier (Preferred Alternative)	Existing Pier 8 (No-Action Alternative)
Length (feet)	1,600	1,610
Width (feet)	117	66
Height (feet mean lower low water level)	12.0 at quaywall sloping up to 17.0 at the end	12.0 for entire length (approximately)
Bay Shading (acres)	4.30	2.44
Total Number of Piles	950	2,173
Days of Pile Driving	190	None
Total Length of Piles in Water Column (feet)	22,181	44,546
Total In-Water Surface Area (square feet)	153,411	279,360
Change in Total In-Water Surface Area from Existing Pier 8	45 percent reduction	no change
Electrical Capacity: Ship-to-shore Power	Replace 14 kilovolt cables and upgrade to 4 sets of 750,000 Circular Mils 15 kilovolt cables. Support future upgrade from 480 volts to 4,160 volts to meet future power-intensive Fleet requirements.	No upgrade: remain at 480 kilovolts, unable to supply the power required for power-intensive vessels.

Legend Surface areas for Conventional Pier option and Existing Pier 8 include only the indicated number of piles.

3.0 ESSENTIAL FISH HABITAT

3.1 EFH and Habitat Areas of Particular Concern (HAPC) Designations

EFH is described as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (50 CFR § 600.10). Regional Fishery Management Councils are required by the Magnuson-Stevens Act to identify EFH in Fishery Management Plans [16 United States Code [USC] §180l-189ld].

The PFMC is responsible for designating EFH for all federally managed species occurring in the coastal and marine waters off the coasts of Washington, Oregon, and California, including the Puget Sound. The PFMC has designated EFH for species within the FMPs for each of the four primary fisheries that they manage: Pacific Coast Groundfish (PFMC 2011a), Pacific Coast Salmon (PFMC 2012), Coastal Pelagic Species (PFMC 2011b), and West Coast Fisheries for Highly Migratory Species (PFMC 2011c).

In addition to designating EFH, the PMFC is also responsible for identifying Habitat Ares of Potential Concern (HAPC) for federally managed species. EFH that is considered to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, also may be identified by NMFS as HAPC. For types or areas of EFH to be considered HAPC, at least one of the following must be demonstrated:

- 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 would be, negatively impacting the habitat type
- The rarity of the habitat

The PFMC has only designated HAPC for groundfish. The HAPC are seagrass, canopy kelp, rocky reef, and estuarine habitats along the Pacific coast, including Puget Sound (PFMC 2008a). Two HAPC, estuarine habitats and eelgrass (*Zostera marina*), a species of seagrass, are in San Diego Bay (NAVFAC Southwest 2010). No HAPC occurs within or adjacent to the project area.

San Diego Bay has been described as a partitioned estuary with complex circulation and stratification components, and can be divided into four hydrodynamic regimes: marine region; thermal region; seasonally hypersaline region; and estuarine region (NAVFAC Southwest and Port of San Diego [POSD] 2013). NBSD is within the seasonally hypersaline region, which extends from Glorietta Bay to the Sweetwater Marsh National Wildlife Refuge. In this portion of the bay, circulation typically is not influenced by freshwater input, and water is seasonally stratified by salinity gradients that are induced by evaporation.

Estuarine conditions in the bay occur intermittently and are generally limited to the southern portion of the bay. For about nine months of the year, the bay receives no significant amount of fresh water. The absence of significant fresh water inflow for much of the year means that normal estuarine circulation in the bay is weak (NAVFAC Southwest 2010).

Freshwater discharges from the Paleta Creek, Sweetwater and Otay River drainages, and other small urban creeks, storm drains and surface runoff flow into San Diego Bay only during periods of heavy rainfall. Freshwater input to the Bay is limited for the most part to surface runoff from urban areas (e.g., from the over 200 storm drains).

Eelgrass habitat is extensive in San Diego Bay. This shallow water habitat supports a unique assemblage of juvenile and adult fishes (Pondella and Williams 2009a). It provides important nursery areas for fish and invertebrates that are forage for the California least tern and other marine birds. Furthermore, these sites are noted for overall higher diversity compared to unvegetated bottom habitat which characterizes the Pier 8 project area (Hoffman 1986). Results of recent eelgrass habitat mapping of San Diego Bay showed that approximately 11 percent of the Bay (about 1,319 acres out of 12,100 acres is vegetated with eelgrass (DoN 2011). The nearest beds of eelgrass, an established HAPC for Pacific Coast Groundfish, are approximately 1.5 mile south of Pier 8 (at the mouth of the Sweetwater River) and approximately 1.5 miles west, on the opposite shore of the bay.

3.2 Descriptions of Managed Species

Of the 109 species of fish identified in San Diego Bay (Bay), ten are managed by NMFS under the Coastal Pelagics and Pacific Groundfish Management Plans combined (PFMC 2011a, 2011b). The Coastal Pelagics of the Bay include northern anchovy (*Engraulis mordax*), pacific sardine (*Sardinops sagax*), pacific mackerel (*Scomber japonicus*), and jack mackerel (*Trachurus symmetricus*); whereas Pacific Groundfish of the Bay include California scorpionfish (*Scorpaena guttata*), grass rockfish (*Sebastes rastrelliger*), English sole (*Parophrys vetulus*), curlfin sole (*Pleuronichthys decurrens*), leopard shark (*Triakis semifasciatus*), and soupfin shark (*Galeorhinus galeus*) (NAVFAC Southwest 2010; NAVFAC Southwest and POSD 2013). These fish species are discussed in detail below.

3.2.1 Coastal Pelagic Species (CPS)

The CPS fishery includes four finfish (Pacific sardine, Pacific [chub] mackerel, northern anchovy, and jack mackerel) and the invertebrate, market squid (PFMC 1998b). CPS finfish are pelagic in the water column near the surface and are not associated with substrate. These fishes generally occur above the thermocline in the upper mixed layer. For the purposes of EFH, the four CPS finfish are treated as a single species complex, because of similarities in their life histories and similarities in their habitat requirements. Market squid are also treated in this same complex because they are similarly fished above spawning aggregations.

All except for market squid are likely to occur in San Diego Bay. The CPS finfish are highly transient and two, northern anchovy and Pacific sardine, can be found throughout San Diego Bay. Jack mackerel are typically only found in the north bay, whereas Pacific mackerel are found throughout much of the bay excluding its southern portion (Allen et al. 2002).

Northern anchovy, Pacific sardine, and Pacific mackerel have all been found to occur around manmade habitats such as Pier 8 and in the deep subtidal habitat that occurs next to the pier (Merkel and Associates 2014). The Merkel and Associates 2014 *Draft Wharf Shading Study for the Pier 8 Replacement and Demolition Project, Naval Base San Diego* follows this Final Essential Fish Habitat Assessment.

EFH for the CPS finfish is defined both through geographic boundaries and by sea-surface temperature ranges (PFMC 2011a). The east-west geographic boundary of EFH for each individual CPS finfish and market squid is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone (200 miles) and above the thermocline where sea surface temperatures range between 10 degrees Celsius (°C) and 26°C. The southern extent of EFH for CPS finfish is the U.S.-Mexico maritime boundary. The northern boundary of the range of CPS finfish is more dynamic and variable due to the seasonal cooling of the sea surface temperature. The northern EFH boundary is, therefore, the position of the 10°C isotherm which varies both seasonally and annually. San Diego Bay is entirely within the boundary of EFH for CPS finfish.

Aside from their value to commercial Pacific fisheries, CPS finfish species are also recognized for their importance as food for other fish, marine mammals, and birds (63 FR 13833). CPS are considered sensitive to overfishing, the loss of habitat, reduction in water and sediment quality, and changes in marine hydrology (PFMC 2011a).

Following are descriptions of CPS finfish that occur in San Diego Bay. All the CPS finfish have been documented to occur in deep subtidal habitat, and all but the jack mackerel - which is less common and hence less likely to have been detected in the few surveys conducted - have been documented around manmade structures (Merkel and Associates 2014).

Northern anchovies are small, short-lived fish that are typically found in schools near the water's surface. They are found from British Columbia to Baja California and have recently appeared in the Gulf of California. Northern anchovies are divided into northern, central, and southern sub-populations. The central subpopulation is located in the Southern California Bight, between Point Conception, California and Point Descanso, Mexico. They grow to approximately 8 inches (18 centimeters [cm]) and rarely live beyond four years. Northern anchovies spawn during every month of the year, but spawning increases in late winter and early spring (peaking from February to April).

In San Diego Bay, highly mobile schools of northern anchovies spend the majority of their time and feed in the water column in all the natural and man-made habitats primarily in the north bay. The bay serves as a nursery area for this species; 100 percent of northern anchovies collected in quarterly surveys throughout the bay over a course of five years (1994-1999) were juveniles (Allen et al. 2002).

Spawning primarily occurs outside of the bay, and the pelagic eggs and larvae are advected into the bay. Young-of-year northern anchovies recruit to the midwater of nearshore habitats and the channel, and abundances peak in late spring and early summer (Allen et al. 2002; Allen 1999 referenced by Robbins 2006). During this time, northern anchovies can numerically dominate the fish assemblage in the northern quadrant of the bay (Allen et al 2002; Pondella and Williams 2009a and 2009b).

Northern anchovies eat phytoplankton and zooplankton. Northern anchovies are subject to natural predation throughout all life stages and are important forage for other species. Eggs and larvae fall prey to an assortment of invertebrate and vertebrate planktivores. As juveniles, anchovies are vulnerable to a wide variety of predators, including many recreationally and commercially important species of fish. Adult anchovies are fed upon by numerous fishes (some of which have recreational and commercial value), marine mammals, and birds (PFMC 2011a; NAVFAC Southwest 2010).

Pacific sardines are also small schooling fish. At times, they have been the most abundant fish species in the California current, a highly productive current that extends up to 1,000 kilometers (km) (660 miles) offshore from Oregon to Baja California. When the population of Pacific sardines is large, they are abundant from the tip of Baja California to southeastern Alaska, and throughout the Gulf of California. Sardines typically grow to approximately 12 inches (30 cm) in length and may live as long as 13 years, but they are usually younger than five years old.

Pacific sardines are typically distributed more offshore than northern anchovies. Pacific sardines occur in estuaries, but the fish are most common in the nearshore and offshore domains along the coast (PFMC 1998). Spawning occurs year-round peaking April through August. Eggs and larvae occur nearly everywhere adults are found and eggs are most abundant between 14°C and 15°C. Sardines spawn in loosely aggregated schools in the upper 164 ft (50 meters [m]) of the water column. The main spawning area for the historical population off the U.S. was between Point Conception and San Diego, CA, out to approximately 100 mi (160 km).

In the proposed project area, Pacific sardines, like northern anchovies, occur in highly mobile schools and feed in the water column in all natural and man-made habitats. The species is among the numerically dominant taxa during the summer and fall in the bay (Allen et al 2002; Pondella and Williams 2009a and 2009b). The bay serves as a nursery area for this species; 96 percent of Pacific sardines collected in quarterly surveys throughout the bay over a course of five years (1994-1999) were juveniles (Allen et al. 2002).

Pacific sardines feed on phytoplankton and zooplankton. The fish are heavily preyed upon at all life stages. Sardine eggs and larvae are consumed by an assortment of invertebrate and vertebrate planktivores including northern anchovies. Juvenile and adult sardines are consumed by a variety of predators, including commercially important fish (e.g., yellowtail, barracuda, bonito, tuna, marlin, mackerel, hake, salmon, and sharks), seabirds (pelicans, gulls, and cormorants) and marine mammals (sea lions, seals, porpoises, and whales). In all probability, sardines are forage for the same predators that prey on northern anchovies (PFMC 1998a).

Pacific mackerel range from Mexico to southeastern Alaska. Pacific mackerel can grow to 25 inches (63 cm) and reach 11 years old; commercially fished Pacific (chub) mackerel rarely exceed 16 in (40 cm) and are under four years old. Adults are midwater pelagic fish and migrate inshore from July to November. They are most abundant south of Point Conception, California and usually appear within 20 mi (30 km) offshore. Pacific stock spawns from Eureka, California, south to Cabo San Lucas in Baja California between 2 and 199 mi (3 to 320 km) from shore. In general, juvenile Pacific mackerel are found along open coast sandy beaches, in kelp beds, bays, and estuaries (PFMC 2011a).

In San Diego Bay, Pacific mackerel have been observed in all major natural and man-made habitats except the shallow waters over riprap. This highly summer-seasonal species is far less abundant than northern anchovy or Pacific sardine in the bay, and like these two species, is most likely to occur in the northern quadrant than elsewhere in the bay (Allen et al. 2002). The species is likely to occur in the proposed project area.

Like sardines and anchovies, Pacific mackerel are schooling fish, and they may school with other pelagic species such as jack mackerel and sardines. Pacific mackerel feed on copepods, squid, euphausiids, and small fishes including their own larvae (Robbins 2006). They are also heavily preyed upon by a variety of fish, mammals, and sea birds.

Jack mackerel are schooling fish that range widely throughout the northeastern Pacific. They grow to about 24 inches (60 cm) and can live 35 years or longer. Much of their range lies far offshore outside the 200-mile U.S. Exclusive Economic Zone. Jack mackerel in southern California are more likely to appear on offshore banks in late spring, summer, and early fall. The spawning season for jack mackerel off California extends from February to October, with peak activity from March to July. Little is known about the maturity cycle of large fish offshore, but peak spawning appears to occur later in more northerly waters. Small jack mackerel (up to six years of age) are most abundant in the Southern California Bight, where they are often found near the mainland coast and islands and over shallow rocky banks.

Young juvenile fish sometimes form small schools beneath floating kelp and debris in the open sea. In southern California waters, jack mackerel schools are often found over rocky banks, artificial reefs, and shallow rocky coastal areas including kelp beds. They remain near the bottom or under kelp canopies during daylight and venture into deeper surrounding areas at night.

Jack mackerel is least common among the managed pelagic finfish species in the bay (Allen et al. 2002). Jack mackerel has been observed over bare sand, bare mud, and eelgrass, in marinas and under wharves in northern San Diego Bay (Table 3-1). Jack mackerel have been observed over eelgrass only in an experimental transplanted bed located across the channel from the proposed project area (Pondella et al. 2006). The species could occur in the proposed project area, although it has not been observed in the southern half of the bay.

Small jack mackerel taken off southern California and northern Baja California eat large zooplankton, juvenile squid, and juvenile northern anchovies. Larvae feed almost entirely on plankton. They provide forage for a variety of fish, mammals, and sea birds. In the north bay, sea lions and coastal bottlenose dolphin opportunistically prey on this species.

3.2.2 Pacific Groundfish Species

The Pacific Coast Groundfish FMP manages 91 species over a large ecologically diverse area covering the entire west coast of the continental United States. Although groundfish are those fish considered demersal (fish that live on or near the seabed), they occupy diverse habitats at all stages in their life histories. EFH areas may be large because a species' pelagic eggs and larvae are widely dispersed, for example, or comparatively small as is the case with the adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate. The following are descriptions of the six FMP groundfish species that are known to occur in the bay, although only one, California scorpionfish, is likely to occur in the project area (Merkel and Associates 2014).

Curlfin sole are found along the Pacific Coast of North America from the Bering Sea south to San Quintin, Baja California (NMFS 2007). Adults are demersal (bottom dwellers) flatfish and are associated with soft bottoms, occurring all along the west coast at depths from 38 to 350 m (125 to 1,150 ft). This species spawns from April to August and grows to a maximum size of 37 cm (15 inches). Curlfin sole feed primarily on polychaete worms, crustacean eggs, and brittle star fragments.

Curlfin sole are documented to occur in bare sand and bare mud habitat in northern San Diego Bay (Table 3-1, NAVFAC Southwest 2010). However, the species is very uncommon in San Diego Bay; no specimens were collected during quarterly surveys from 1994-1999 or surveys in 2008 (Allen et al. 2002; Pondella and Williams 2009a and 2009b). Kramer (1991) conducted extensive trawl and seine surveys in San Diego County and found that curlfin sole were very uncommon nearshore along the open coast and absent from catches in San Diego Bay. This flatfish has not been found in eelgrass beds of San Diego Bay. Thus, curlfin sole is unlikely to occur in the proposed project area.

English sole are found in water less than 300 m (1,000 ft) from Baja California to the Gulf of Alaska (PMFC 1998b). Spawning occurs offshore in waters shallower than 100 m (330 ft), primarily during the autumn and winter, depending on the stock. English sole

use nearshore coastal and estuarine waters as nursery areas. Adults and juveniles prefer soft bottoms composed of fine sands and mud, but also occur in eelgrass habitats. This species may reach ages in excess of 20 years. Females generally reach maturity after four years. Juveniles and adults are carnivorous, feeding on polychaetes, small bivalves, clam (*Tagelus californianus*) siphons, and other benthic invertebrates. English sole is uncommon in the San Diego Bay, and few have been collected infrequently over bare mud and sand habitat in the northern quadrant of the bay (Allen et al. 2002; NAVFAC Southwest 2010; Merkel and Associates 2014). English sole is unlikely to occur in the proposed project area.

California scorpionfish is a benthic species found from central California to the Gulf of California in depths between the inter-tidal and 170 m (555 ft). Although it generally inhabits rocky reefs, it also aggregates over sandy or muddy substrate, depending on the area or season (PFMC 2006). California scorpionfish migrate to deeper water to spawn from May to September (peaking in July). This species feeds on a wide variety of prey, including crabs, fishes, octopi, isopods and shrimp. California scorpionfish will utilize eelgrass beds as juvenile nursery habitat and a resource for prey.

California scorpionfish occur somewhat frequently in very low numbers in San Diego Bay. From 1994-1999, 37 California scorpionfish were collected in quarterly surveys in the north bay comprising less than 0.01 percent of the total catch throughout the bay, and only 2 individuals were collected in the southern half of the bay (Allen et al. 2002). NAVFAC Southwest (2010) indicates that California scorpionfish occur in all manmade habitats comprised of hard structure. Juvenile and adult California scorpionfish has been collected in eelgrass (a designated HAPC) and channel habitats of north and north-central San Diego Bay (Allen et al. 2002; Pondella and Williams 2009a and 2009b). Pondella et al. (2006) report the species was observed in an established natural eelgrass bed near Shelter Island and in experimental artificial reefs set in the north bay across the channel from the proposed project area. Merkel and Associates (2014) report additional observations of California scorpionfish within structured habitats, including the seawall of the Tenth Avenue Marine Terminal, on the Coronado Bridge piles, and on the pendant wall at the J. Street Marina. Thus, California scorpionfish may occur, although in small numbers, under piers, including Pier 8, in NBSD. The Merkel and Associates 2014 *Draft Wharf Shading Study for the Pier 8 Replacement and Demolition Project, Naval Base San Diego* follows this Final Essential Fish Habitat Assessment.

Grass rockfish is a common, shallow-water rockfish found from Playa Maria Bay, Baja California to Yaquina Bay, Oregon, although they are most common south of southern Oregon. Among rockfishes, they have one of the shallowest and narrowest depth ranges. They are found from the intertidal zone to 184 ft, frequently less than 49 ft, and are commonly found from the intertidal to 20 ft. The species is common in nearshore rocky areas, along jetties, and in kelp. Around reef structures, adults may be found hiding in crevices (PFMC 2005). Grass rockfish have become an important component of the live-fish fishery.

Both sexes of grass rockfish begin to mature at 9 inches and are fully mature at 11 inches; these lengths correspond to ages 2 to 5 years for males and 3 to 5 years for females. Larvae are released from January to March (PFMC 2005). Grass rockfish habitat generally is restricted to rocky areas (Leet et al. 2001).

Grass rockfish are documented to occur in eelgrass beds, a designated HAPC, but not in any other habitat in the north bay. Juveniles of shallow dwelling rockfish species will inhabit eelgrass habitat as shelter and resource for prey for months; however, no life history stage of this or other rockfish species is dependent on eelgrass beds. Grass rockfish is very uncommon in San Diego Bay; no specimens of this species or other rockfishes (Sebastes spp.) were collected in more than five years of fish surveys in eelgrass, unvegetated nearshore and channel habitats in the bay (Allen et al. 2002; Pondella et al. 2006; Pondella and Williams 2009a and 2009b). Thus, grass rockfish are unlikely to occur in the project area.

Leopard sharks are found from southern Oregon to Baja California, Mexico including the Gulf of California. They are most common at depths ranging from 0 to 5 m (0 to 15 ft) in muddy bays, and reside in estuaries, bays, and kelp beds over soft and hard bottoms, as well as along open coast sandy beaches (PFMC 2006). Leopard sharks are most common on or near the bottom in waters less than 4 m (13 ft) deep, but have been caught as deep as 91 m (300 ft).

Leopard sharks spawn and give birth to live young ("pup") in shallow water. Seasonally, pups occur along sandy beaches and in protected bays. Leopard sharks will utilize eelgrass beds as juvenile nursery habitat and a resource for prey. The maximum recorded length of a leopard shark is 180 cm (6 ft), but most do not exceed 150 cm (5 ft) in length. Females may take 10 to 15 years to reach maturity, while males may only take 7 to 13 years. Maximum age is reported to be 30 years. This species feeds on a variety of prey including crabs, clams, fish, and octopus.

Leopard sharks have been documented to utilize intertidal sandy beach and subtidal soft–bottom sediments (mud, sand, and silty sand), two habitat components of San Diego Bay (Hoffmann 1986 referenced by Robbins 2006). These habitats can be influenced by seasonal freshwater input, and thus are designated estuarine HAPC for this managed groundfish species. In Humboldt and San Francisco Bay, females have been observed releasing their young in beds of eelgrass, while in southern California females are thought to release their pups along more open coastal areas (Carlisle and Smith 2009). No specimens were collected over six years of surveys by Allen et al. (2002) and Pondella and Williams (2009a and 2009b). Thus, leopard shark is expected to be very uncommon in San Diego Bay and the project area.

Soupfin sharks range from northern British Columbia to Abreojos Point, Baja California and the Gulf of California. This shark is an abundant coastal-pelagic species of temperate continental and insular waters. They are often associated with the bottom, inhabiting bays and muddy shallows.

Males and females apparently segregate by gender; adult males occur in deeper water and adult females occur closer inshore. Females and young tend to be more common in southern California waters. Primary nursery grounds are in southern California inshore areas south of Point Conception, with females moving in to bays to bear live young (PFMC 2005). Soupfin sharks are opportunistic carnivores, preying upon moderate-sized bony fishes, echinoderms, shrimp, invertebrates and squid. This species is one of many caught by recreational fishermen in the San Diego Bay (NAVFAC Southwest 2000). Although the whereabouts of this species in the bay is unknown, its rarity makes it unlikely to occur in the project area.

3.3 Description of Habitats in the Proposed Project Area

This EFH assessment refers to habitat-specific information in NAVFAC Southwest (2010) and Merkel and Associates (2014) to evaluate how the actions proposed may affect managed fish species and EFH designated by the PFMC. NAVFAC Southwest (2010) provides a broad-scale, qualitative assessment of habitat classifications within San Diego Bay with a map and description of those habitats. The habitat characterization provides information on the use of dominant habitat in San Diego Bay by managed fish species and on ecosystem function and productivity generally within these habitats present in the bay. Habitats found in the project area are the water column, bare mud, wharf, and bulkhead wall. Additional information about habitat use by fishes was from field surveys reported in Allen et al. (2002), Pondella and Williams (2009a and 2009b), and Merkel and Associates (2014).

San Diego Bay presently has 8,779 acres of shallow and deep water habitats. The Bay is characterized by a wide range of marine habitats including soft-bottom, which predominates in the bay, eelgrass, and artificial hard substrates primarily associated with piers and jetties (NAVFAC Southwest 2000). These habitats represent important breeding, nursery, and feeding areas for hundreds of fish and their prey species. Many fish species, but particularly the pelagic species, are forage for marine mammals and birds (NAVFAC Southwest and POSD 2013).

San Diego Bay has experienced substantial historical degradation and loss in quantity and quality of intertidal and subtidal habitat as a result of human development. Losses of intertidal habitat have been severe; up to 90 percent of intertidal areas in the San Diego Bay have been lost, due to historic reclamation activities (NAVFAC Southwest and POSD 2013). Intertidal areas have historically been filled with dredged material. The intertidal zone is also threatened by shoreline alteration and development such as the building of piers, docks and seabreaks, as well as the placing of riprap to slow erosion of the crumbling sandstone cliffs, which can often lead to unintended but devastating changes in sedimentation along the shoreline. Less than 16 miles of “soft” shoreline remain (NAVFAC Southwest and POSD 2013). The entire shoreline inshore of the proposed project area, Pier 8, is armored (a bulkhead wall).

The Pier 8 project site is characterized by a developed shoreline, and manmade structures such as pier pilings and seawalls that descend steeply to unvegetated soft-bottom subtidal habitat. The hardened shoreline typically has a vertical profile and provides the poorest habitat for marine species, as their relatively smooth surfaces reduce suitable areas for attachment (NAVFAC Southwest and POSD 2013). Pier pilings at the project site support a productive epifaunal-encrusting community dominated by sponges, but including attached bivalves, tunicates, and bryozoans, relatively scant algae, and abundant associated mobile invertebrates. The pier structure creates a shaded open water environment of which the area under the center of the pier is permanently shaded (Merkel and Associates 1999; NAVFAC Southwest and POSD 2013; U.S. Navy 2001). Merkel and Associates (2014) measured light levels as a function of depth and location under Pier 8 and Pier 2. They found that at both piers, light levels decreased to approximately 20 percent of ambient (as measured in adjacent open water) at the pier face; to 4 percent at the quarter pier width; and to 2 percent at the midline of the pier. It is noteworthy that although light levels were diminished under the piers, they did not approach zero, even at the larger pier (Pier 2). The elevation of the deck above the waterline, especially for the larger pier, evidently allows considerable light penetration, which in turn facilitates the use of the piers by fish. The Merkel and Associates 2014 *Draft Wharf Shading Study for the Pier 8 Replacement and Demolition Project, Naval Base San Diego* follows this Final Essential Fish Habitat Assessment.

Table 3-1 is a summary of the local-scale habitats that the ten managed fishes are expected to utilize in the northern and southern halves of San Diego Bay. The data is excerpted from NAVFAC Southwest (2010) which provides characterizations of the potential community of fishes, including the managed species, and other marine organisms at each habitat. One natural habitat, bare mud, is in the proposed project areas. Six habitats are man-made: riprap, marina, wharf, artificial reef, bulkhead wall, and launch ramp. Mud, wharf and bulkhead wall habitats are in the proposed project areas.

Highly mobile, mixed schools of pelagic finfish frequently occur under and around piers/wharfs in the north bay and very likely occur in this habitat in the south bay and in the proposed project area around Pier 8. Northern anchovies and Pacific sardines move through and feed in the water column of all natural and manmade habitats (Table 3-1, NAVFAC Southwest 2010). Pacific mackerel and jack mackerel occur infrequently in the northern bay, but would be expected to occur in the water column of all habitats with the likely exception of waters along the armored shoreline (riprap and bulkhead wall). These two open coastal species are likely to be rare in the vicinity of Pier 8.

The managed groundfish species are expected to be uncommon if not rare in the proposed project area. California scorpionfish is a rocky reef residing species known to occur under wharfs and other man-made hard structured habitats in north San Diego Bay (Table 3-1, NAVFAC Southwest 2010). Similarly, grass rockfish reside in shallow rocky reef habitat in coastal waters; however, the species has not been observed around wharfs and other artificial hard structures in the north bay nor any habitat in the south bay. Wharf habitat offer little or no crevices and ledges that rocky reef residing groundfish use as shelter. Curlfin sole and English sole, both uncommon in the bay, would be expected to utilize unvegetated soft bottom habitat (i.e., bare sand and bare mud) but have not been observed under wharves in the north bay nor anywhere in the south bay. Leopard shark has not been observed in the various man-made hard structured habitats in north or south San Diego Bay (NAVFAC Southwest 2010). Soupfin shark have reportedly been caught by anglers in San Diego Bay (NAVFAC Southwest and POSD 2013); however, the whereabouts is unknown and the species is unlikely to occur in the proposed project area.

Table 3-1. Summary of Federally Managed Fishes Observed in Habitats of the Northern (N) and Southern (S) Half of San Diego Bay

Species	Bare sand*	Bare mud*	Eelgrass*	Riprap*	Marina	Wharf*	Artificial Reef	Bulkhead wall*	Launch ramp
Coastal Pelagic Species									
Northern anchovy	N, S	N, S	N, S	N	N	N	N	N	N
Pacific sardine	N, S	N, S	N, S	N, S	N, S	N	N	N	N
Pacific mackerel	N	N	N		N	N	N	N	N
Jack mackerel	N	N	N ***		N	N			
Pacific Coast Groundfish									
Curlfin sole	N	N							
English sole	N	N							
California scorpionfish			N, S	N, S	N,S	N,S	N, S	N,S	
Grass rockfish			N						
Leopard shark			N **						
Soupfin shark#									

* habitat present in the proposed project area based on maps from NAVFAC Southwest 2010.
** leopard shark observed by Hoffman 1986 referenced by Robbins 2006.
***may occur in bar sand and eelgrass habitat; observed in an eelgrass transplantation bed (Pondella et al.2006).
caught by recreational anglers in the San Diego Bay (Pondella et al. 2009), whereabouts unknown.
Source: NAVFAC Southwest 2010; Merkel and Associates 2014

Pier 8 is situated in depths of 21-39 ft which is categorized as "deep water" in the bay (DoN 2011). Sediment accumulation under the pier has resulted in shallower depths - approximately 15 ft under the midline of the pier (Merkel and Associates 2014). Many soft bottom habitats throughout San Diego Bay are covered with mats of various algal species; however, densities typically are reduced due to lower light levels at bottom depths greater than about 20 ft (7 m) (DoN 2011). This habitat supports an infaunal and epifaunal invertebrate community (DoN 2011). Infaunal benthic invertebrate communities in these areas are dominated by polychaete worms, with a lesser abundance and diversity of crustaceans, snails, bivalves, and other groups (Merkel and Associates 1999; U.S. Navy 2001; Merkel and Associates 2014)

On the pilings of Piers 2 and 8, Merkel and Associates (2014) documented an intertidal epifaunal community of oysters, mussels, and barnacles, but no attached algae. Below the intertidal zone, the pilings supported a typical epifaunal "fouling" community of sponges, hydroids, tunicates, bryozoans, and anemones; and mobile snails, crustaceans, and echinoderms (U.S. Navy 2001; Merkel and Associates 2014). A rain of detritus from surface waters is the primary source of production supporting the infaunal and epifaunal community of deep water, unvegetated soft bottom habitat in the bay. Detrital material from the encrusting community of the pilings probably increases the productivity of the habitat beneath these structures, relative to the benthic habitat of open deep water areas in the bay (Merkel and Associates 1999, 2013). Merkel and Associates (2014) documented similar infaunal abundances but much greater biomass under Pier 8, including under the midline, as compared to a reference site in open water. The larger Pier 2 showed a similar pattern but declining abundance and biomass under the midline.

The most abundant fish species that occur in the subtidal habitats such as those around Pier 8 typically include round stingray (*Urobatis halleri*), spotted sand bass (*Paralabrax maculatofasciatus*), juvenile California halibut (*Paralichthys californicus*), and barred sand bass (*Paralabrax nebulifer*) close to the bottom; whereas the most abundant fishes of the overlying water column include topsmelt (*Atherinops affinis*) shiner surfperch (*Cymatogaster aggregata*) and several species of anchovies (Allen et al. 2002; Vantuna Research Group 2006). Other species documented in a survey of Pier 13, which is in close proximity and structurally similar to the project site, included kelp bass (*Paralabrax clathratus*), California scorpionfish (*Scorpaena guttata*), giant kelpfish (*Heterostichus rostratus*), and black croaker (*Cheilotrema saturnum*) (Merkel and Associates 1999). Spotted sand bass, barred sand bass, kelp bass, black croaker, round stingray, yellowfin croaker (*Umbrina roncador*), slough anchovy (*Anchoa delicatissima*), and giant kelpfish were all observed under Pier 8, and another 34 fish species, including all of the remaining subtidal species mentioned above, are listed by Merkel and Associates (2014) as being associated with man-made structural habitats in San Diego Bay.

3.3.1 Use of Water Column Habitat by Fishes

The kind of substrate in the vicinity will influence the species assemblage in the water column habitat. Furthermore, the water column properties of temperature, salinity, stratification, turbidity, dissolved oxygen, and turbidity also influences what species are likely to occur.

In San Diego Bay, the water column habitat extends over subtidal depths ranging from -2.2 (-0.7 m) to >-20 ft (6 m) MLLW. The substrates in the water column habitat differ with depth and location in the bay, and include mud, sand, and man-made hard structure. In general, coastal pelagic fishes numerically dominated the catches of surveys conducted over 5 years in San Diego Bay (Allen et al. 2002). The slough anchovy, an indigenous estuarine species that utilizes the bay throughout its life history, was most abundant in the southernmost quadrant and decreased in abundance further north toward the mouth of the bay. In the south-central ecoregion, slough anchovy was the most abundant fish species comprising 55 percent of the total catch. This species together with other pelagic schooling fishes, topsmelt at 22 percent, northern anchovy (a managed species) at 6 percent across all habitats comprised 83 percent of the total fish collected across all habitats (vegetated and unvegetated nearshore habitats and the channel) in the south-central ecoregion of San Diego Bay (Allen et al. 2002).

Natural, or ambient, turbidity comprised of both organic and inorganic suspended particles is distinguished here from turbidity caused by dredging or other human activities. Ambient turbidity varies spatially and over time, with waters of San Diego Bay becoming more turbid, or less transparent, as distance increases from the entrance. Wind and wave action cause a marked increase in turbidity during the winter and early spring in the bay. Shallow areas are more affected than deep waters. The wind is able to scour up the finer sediments of this region at that time of year. Turbidity also varies through the day with both wind and tides.

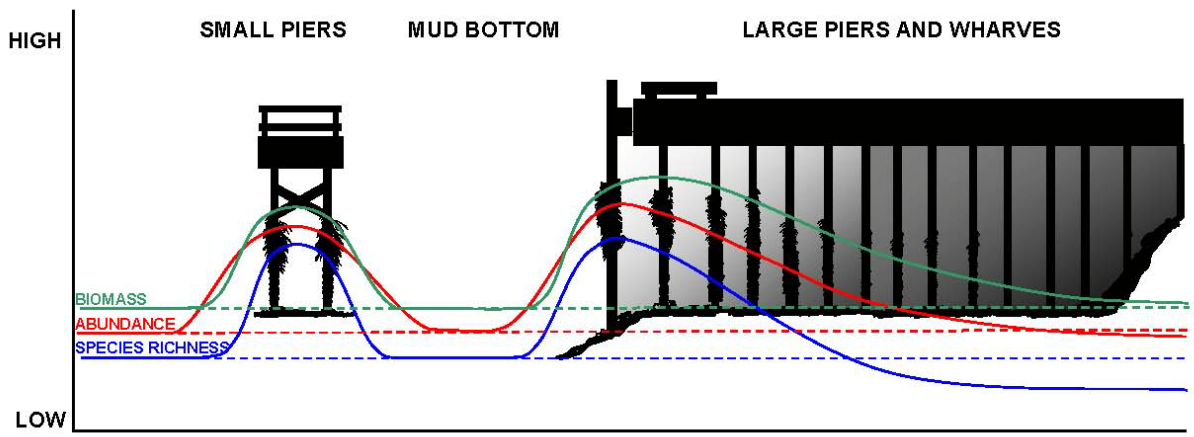
Dissolved oxygen concentrations in surface waters of San Diego Bay in April and July 2008 and June 2009 ranged between about 4.5 and 6.6 milligrams oxygen per liter (mg O2/l) (Pondella and Williams 2009a, 2009b). Dissolved oxygen concentrations in the north bay are most similar to that in coastal waters outside of the bay. Dissolved oxygen generally decreases from north to south with most of the decrease observed between the North and North-Central quadrants of the bay.

The water column habitat is an important nursery area for coastal pelagic fishes: juveniles represented 100 percent of the northern anchovy catch in San Diego Bay, 96 percent of the Pacific sardine, 73 percent of topsmelt, 66 percent of California grunion, and 43 percent of slough anchovy (Allen et al. 2002). These pelagic fish species are forage for other fishes, marine mammals, and birds. California least terns forage in waters less than 60 ft deep; however, the birds do not utilize the proposed project area (NAVFAC Southwest and POSD 2013).

3.3.2 Artificial Hard Substrate habitat and its Use by Fishes

Large piers, such as the existing and proposed new construction of Pier 8, provide a high concentration of piles, and impose shading on the water column (NAVFAC Southwest 2010). In contrast to small piers, water movement and illumination can be significantly affected around and under large pier structures (Figure 3-1). While Figure 3-1 was generalized from previous studies, the recent work at Piers 2 and 8 indicates that even under the furthest recesses of large piers, abundance and species richness, along with biomass, can be equal to or higher than in the adjacent mud bottom/open water habitat (Merkel and Associates 2014).

Figure 3-1. Biomass, Abundance, and Species Richness at small and large piers



At more exposed portions of larger piers, similar elevation of biomass, abundance and richness of fish communities is seen as with smaller piers (NAVFAC Southwest 2010). Microalgae and drift kelp are within the upper portions of the pier at elevations that would be low intertidal and shallow subtidal zones. Below the algal communities, encrusting growth of sponges, bryozoans, rock jingles, and tube-forming polychaetes often occur. These algal and encrusting invertebrate communities host a number of mobile invertebrates and small fish such as blennies, pipefish and kelpfish and can also attract perches, opaleye, and scorpionfish. Sand bass and kelp bass often occur in association with such piers. As encrusting organisms die or are broken free of the piles, they drop to the bay floor and create a zone of enriched sediment and more diverse rubble that supports gobies, blennies, and scavenging demersal fish at higher concentrations than typically observed away from the structures. Within the water column around piers, schooling pelagic fish tend to aggregate for shelter or forage. This often attracts larger predatory fish as well. Around small piers and at the exposed portions of larger piers, the biomass, abundance, and species richness of fish typically rises relative to that observed in surrounding open mud bottom habitats.

Larger piers tend to include areas beneath the piers that experience reduced circulation and light levels (NAVFAC Southwest 2010). Pile communities of large piers are distinguished from natural intertidal reefs and the man-made hard substrate habitats of riprap armament, pontoons, docks, and artificial reefs, by having extensive intertidal areas (periodically exposed to air) and limited light. Merkel & Associates (1999 referenced in NAVFAC Southwest 2010) performed a study of wharf shading impacts to associated encrusting communities and to fish. Infaunal communities continued to be present in the shaded regions. In contrast, it was determined that encrusting pile communities were not as numerous or species rich on the inside shaded piles. These areas promote a gradient of cryptic invertebrate community development beginning with jingles and bryozoans in the twilight zone, transitioning to sponges and ultimately very little growth in the darkest most quiescent waters beneath the piers. Only one detailed study including multi-season data has been conducted describing the invertebrate communities on concrete and wooden piles in San Diego Bay (Ford et al. 1975 referenced in NAVFAC Southwest 2010). This study was conducted on concrete and wooden piles at the B Street, Broadway, and Navy Piers during 1972-1973. The attached and free living invertebrates associated with the piles included polychaete worms, crustaceans, molluscs, cnidarians, tunicates, and sponges in order of abundance. Species composition and abundance was found to be highly seasonally variable.

The invertebrate fouling community on the pilings appears to attract schooling fish, which feed on the attached invertebrates and algae. The piers provide refuge to principally nocturnal species such as black croaker, round stingray, and smooth hound. As a result, large numbers of fish may be found beneath pier structures and biomass may exceed that of open waters due to fish size, however, species richness generally is depressed below that observed in open bay environments. In the deepest recesses of the piers, fish abundance and biomass also decline to low levels (NAVFAC Southwest 2010). Total fish abundance is heavily influenced by transient, schooling pelagic fish. Fish surveys beneath large wharfs at Pier 13 at NBSD and CVN Pier 700 at Naval Air Station North Island showed that seasonal differences in fish communities can be greater than differences associated with the light gradient (NAVFAC Southwest and POSD 2013).

The invertebrate and fish community of large piers are reported to differ between the north and south areas of San Diego Bay. The communities present on these and other manmade structures, as well as communities on soft bottom habitats and in the water column are subject to the same gradient in availability of oceanic water with distance from the mouth of the bay. The availability of food with a moving current, the supply of larval recruits, and water quality all depend on the level of flushing (NAVFAC Southwest 2010). Species characteristic of open coastal communities were observed in a north bay pier site and were not present at a pier site in the southern bay (NAVFAC Southwest 2010). These included the California scorpionfish, rock scallop (*Crassedoma giganteum*), California sea cucumber (*Parastichopus californicus*), giant spined star (*Pisaster giganteus*), and giant keyhole limpet (*Megathura crenulata*).

3.3.3 Use of Unvegetated Soft Substrate Habitat by Fishes

Estuarine sediments are the sites of key ecological functions such as decomposition, nutrient cycling, and nutrient production (NAVFAC Southwest 2010). Infaunal invertebrates in these sediments increase percolation of water and oxygen levels through bioturbation and suspension feeding. Shredders such as gastropod mollusks break up large pieces of organic matter, while deposit feeders both transform and bury or bring up organic matter. Dominant suspension feeders are often bivalve mollusks, but some polychaetes, crustaceans, and sponges also perform this function. These animals can increase water clarity and light levels, and reduce pollutants. Infaunal and epifaunal invertebrates serve as the major food base for many species of fish and larger invertebrates including shrimp, crabs, lobster, halibut and croaker which transfer this production across habitats.

Based on the abundances and distribution of 40 top ranking fishes by total biomass or abundance in surveys from 1994 through 1999 of intertidal, unvegetated nearshore, eelgrass (vegetated nearshore), and channel habitats within San Diego Bay, Allen et al (2006) reported that at least 8 fish species were associated with soft substrate habitats in the nearshore and channel habitats in the south bay. Large, predatory benthic species, spotted sand bass (*Paralabrax maculatofasciatus*), barred sand bass (*Paralabrax nebulifer*), round stingray (*Urolophus halleri*), and black croaker (*Cheilotrema saturnum*) are residents in the nearshore areas and channels of the north bay and throughout the interior of the bay to its southernmost area. Four resident, benthic flatfishes occur primarily in channel habitat: juveniles and adults of California halibut (*Paralichthys californicus*) and diamond turbot (*Hypsopsetta guttulata*) occur throughout the bay in both channel and nearshore sand and mud habitat. None are EFH groundfish species.

4.0 ASSESSMENT OF IMPACTS AND CONSERVATION MEASURES

An adverse effect to EFH is "any impact that reduces the quality and/or quantity of EFH" (see 50 CFR § 600.91O (a) for further clarification).

4.1 Impacts to Essential Fish Habitat

Four managed coastal pelagic fish species (PFMC 1998a), northern anchovy, Pacific sardine, jack mackerel, and Pacific mackerel occur in San Diego Bay (NAVFAC Southwest and POSD 2013; Allen et al. 2002; Pondella et al. 2006; Pondella and Williams 2009a and 2009b). Northern anchovy and Pacific sardine can be found throughout the bay in all habitats. Jack mackerel were only found in the north bay survey area and Pacific mackerel were found at all but the southern survey stations (Allen et al. 2002). The managed groundfish species, California scorpionfish, curlfin sole, English sole, grass rockfish, leopard shark, and soupfin shark are known to occur in San Diego Bay; however, with the exception of California scorpionfish, all are uncommon in the bay at large and unlikely to occur in the proposed project area (NAVFAC Southwest and POSD 2013; Allen et al. 2002; Pondella et al. 2006; Pondella and Williams 2009a and 2009b; Merkel and Associates 2014).

The area surrounding Pier 8 is not optimal habitat for FMP species in San Diego Bay due to the existing usage of the facilities, armored shoreline, and historic dredging in the channel adjacent to the site. Juvenile and adult pelagic fish of species which might visit the area are mobile and would be able to avoid any action that may occur at the project site. EFH species and most other fish species that are known to occur around eelgrass habitat, non-vegetated intertidal and subtidal mud and sand habitats, and man-made structures in San Diego Bay may already avoid the proposed project site due to the large amount of vessel traffic through the area and routine dredging activities. Eggs and larvae should not be harmed by the renovations at Pier 8. Short-term impacts associated with pier demolition and replacement will occur from increased suspended sediments and noise levels. Turbidity may impact sight feeding, but affected EFH species and other fishes will presumably disperse to surrounding habitats where feeding will be less problematic.

Impacts from in-water project activities may adversely affect EFH by temporarily displacing EFH species due to underwater noise from pier demolition and construction activities. However, all of the managed species are not dependent on artificial substrates, and routinely experience turbid and noisy conditions due to natural processes and ship traffic within the bay. Furthermore, there is an abundance of pier structures and other artificial habitat in the vicinity of NBSD outside of the proposed project area of Pier 8. For these reasons and for the reasons discussed below, the adverse effects that would be created by the proposed project would be minimal.

4.1.1 Underwater Acoustic Analysis

In 2008, NOAA Fisheries, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game, and transportation agencies of California, Oregon, and Washington agreed in principle to assess project effects using Interim Criteria for Injury to Fish from Pile Driving Activities (Fisheries Hydroacoustics Working Group 2008). These interim criteria are provided in Table 4-1. The criteria were developed principally for salmonids in the Northwest and they are conservative, indicating the potential for the identified effect, rather than a likelihood of occurrence.

Table 4-1. Interim Criteria for Fish Injury and Disturbance by Underwater Sound from Pile Driving

Effect	Size of Fish	Underwater Impact Pile Driving Criteria	Underwater Vibratory Pile Driving Criteria
Onset of Injury	All fish	206 dB peak re: 1μPa	N/A
	≥ 2 grams	187 dB SEL re: 1μPa2sec	N/A
	< 2 grams	183 dB SEL re: 1μPa2sec	N/A
Behavioral Impacts	All fish	150 dB rms re: 1μPa	150 dB rms re: 1μPa

Notes: dB peak re: 1μPa = peak decibels referenced to one microPascal
dB SEL re: 1μPa2sec = sound exposure level decibels referenced to one microPascal squared per second
dB rms re: 1μPa = decibels root mean square referenced to one micro Pascal

Popper and Hastings (2009) critically examined the peer-reviewed and grey literature on the effects of anthropogenic sounds on fishes and found that very little is known and the results from what are mostly cage-in-field and tank studies are equivocal. Moreover, there is uncertainty in extrapolating the physiological and behavioral effects of sound at different frequencies, pulse rates, intensities, and distances from the source.

Injury to fish from intermittent sounds can begin at 206 decibels (dB) root mean square (rms) re 1 microPascal (μPa) (National Oceanic and Atmospheric Administration [NOAA] et al. 2008). However, reef-associated fish have shown only minor behavioral responses to sounds of 210 dB re 1 μPa at 16 m and 195 dB re 1 μPa at 109 m from a seismic air-gun source while remaining on the reef (Wardle et al 2001 summarized in Popper and Hastings 2009). Sound levels as low as 160 dB re 1 μPa for continuous and/or intermittent sounds and 140 dB re 1 μPa from pile driving can cause behavioral disturbance observable as changes in swimming speed and direction (Navy 2011; Mueller-Blenke 2010; CALTRANS 2009). No physical injury or behavioral response has been associated with vibratory pile driving in two reported studies which did not report sound levels (Popper and Hastings 2009).

Recent controlled experiments exposing fish to pile driving noise (CALTRANS 2010; Halverson et al. 2011) and critical reviews (Popper and Hastings 2009; Halverson et al.

2011) have not found evidence of injuries at SELs well above these criteria, and thus do not support their use as thresholds for injuries to fish from pile driving operations.

Underwater sound levels received at a given distance from an acoustic source such as pile driving are a function of the source level and transmission loss (TL). TL underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The following equation is used to estimate transmission loss:

$TL = F * \log10 (D1/D2)$ where

TL= transmission loss

F = attenuation constant, a logarithmic (predominantly spreading) loss

D1=distance at which the targeted transmission loss occurs

D2= distance from which the transmission loss is calculated

The attenuation constant, F, is site-specific based on several conditions, including water depth, pile type, pile length, substrate type, and other factors. The NMFS Office of Protected Resources and USFWS have accepted the use "practical spreading loss" in which F=15, resulting in the following formula for transmission loss:

$TL = 15 \log10 (D1/D2)$.

To estimate the Sound Exposure Level (SEL) to which a fish at a given location would be exposed through multiple hammer strikes, a simple summation procedure is used where

Total SEL = Single Strike SEL + 10log (number of strikes).

The number of strikes per day is conservatively estimated to be 1,000 strikes per day based on 200 repeat strikes per pile and 5 piles per day. The limits of potential effects within associated potential distances of influence are shown in Table 4-2. Underwater noise from vessels moving through the bay would presumably fill in and dominate the underwater soundscape across the frequency range of pile driving; masking sound that is of lesser amplitude than typical vessel noise of 150-160 dB (Kipple and Gabrielle 2007).

Table 4-2. Calculated radius of the Potential Zones of Influence (ZOIs) (km) Corresponding to Interim Criteria for Fish

Description	Source Levels			Radius of Potential ZOI (m)			
	Source, dB peak @ 10m	Source, dB rms @ 10m	Source, dB SEL @ 10m	All Fish Injury – 206 dB peak	Fish ≥2g Injury – 187 dB SEL	Fish < 2g Injury - 183 dB SEL	All Fish Behavior 150 dB rms
Vibratory extraction – non-steel piles	170	160	160	N/A	16	29	46
Impact driving 24-inch concrete piles	188	176	166	1	40	74	541

All sound levels expressed in dB re 1 µPa rms. dB = decibel; N/A = not applicable; rms = root-mean-square; µPa = microPascal. Pile driving sound sources based on CALTRANS 2009; Washington State Department of Transportation 2010, 2012, NMFS 2010. SELs for fish injury were calculated by assuming 1000 hammer strikes per day (200 strikes per pile, 5 piles per day).

In general, the area of the potential adverse effect of underwater noise on fishes from pier demolition and construction is small and limited (Table 4-2). Fish behavior is not expected to be disrupted by the underwater noise from the vibratory extraction of concrete piles beyond 46 m from the immediate area where the pile is being removed. The area of potential injury from impact pile driving extends out to a distance of 74 m. The areas of potential behavioral effects, particularly for concrete pile installation by impact driving, are limited to a distance 0.541 m (0.54 km).

The 206 dB injury threshold would only be exceeded during impact installation of the concrete piles, and only encompassing a zone of 1-m radius from the pile driver. It is unlikely that fish would remain this close to the pile being driven after the ramp-up period. The areas encompassing the weight-based criteria for potential injury are somewhat larger, 40 m for fish < 2 grams (g), 74 m for fish > 2 g, but as noted previously, there is little evidence for injurious effects to fish at these SELs (Popper and Hastings 2009; CALTRANS 2010; Halverson et al. 2011). All fish species that are likely to occur in the area would be able to swim the distance beyond the threshold.

Fish species occurring in the area routinely experience noisy conditions due to anthropogenic activities such as ship traffic, construction, and other industrial activity at NBSD. In general, fish are likely to be temporarily disturbed or leave the immediate project area of demolition and construction until activities cease. Thus, underwater noise would create an adverse effect on EFH under the Magnuson-Stevens Act, but this effect

would be minimal due to its limited temporal and geographic scale. Furthermore, fish species would return to the project area following the completion of in-water activities.

4.1.2 Sediment Disturbance

Increased turbidity due to sediment disturbance during pile removal and installation would have temporary adverse effects due to direct displacement of pelagic and benthic fishes, possibly including managed coastal pelagic and groundfish species.

Turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis (e.g., adjacent eelgrass beds) and the primary productivity of an aquatic area if suspended for variable periods of time. CPS finfish may suffer reduced feeding ability if suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

This greater potential for adverse effects would exist if there were substantial amounts of fine sediments; however, grain sizes are predominately of coarser grain, beach-compatible grain sands, in historically dredged areas such as around Pier 8. In addition, as a result of the rain of shells from the invertebrate community on the pilings, a considerable amount of shell hash is present in the sediment around and under the piers (Merkel and Associates 2014). The sandy-shelly material settles quickly instead of remaining suspended in the water column. Based on observations of turbidity caused by bottom disturbances in areas similar to the project sites, turbidity plumes are expected to be localized within the project area and persist for less than one hour following disturbance (AMEC 2008).

Hence, there would be minimal, temporary, adverse effects on EFH due to sediment disturbance during project activities.

4.1.3 Habitat Alteration

With the replacement of the existing pier, there would be no increase in vessel activity and consequently no increase in vessel-related substrate and water column disturbance.

Demolition of existing Pier 8, which is 66 ft wide by 1,610 ft long, would take approximately 11 months. A total of 1,830 concrete structural piles would be removed using dry pulling alone or with the assistance of a vibratory hammer to loosen the piles. An additional 343 fender piles (concrete and plastic) would also be removed using the same method(s) (NAVFAC Southwest 2014).

Pier removal would reduce the algal and invertebrate production associated with encrusting communities on the pilings; however, over time, algae and invertebrates are expected to colonize the replacement pier.

With the removal of the existing pier, the area of unshaded moderately deep and deep subtidal habitat would increase temporarily, although this area would be subject to recurring noise and substrate disturbance until construction of the new pier is completed. As all of the CPS and groundfish species that could be present use both shaded and unshaded habitats, intermittent use of the area would occur through the construction period and as the fouling community develops on the pilings. Hence, there would be minimal, temporary, adverse effects on EFH from habitat alteration due to pier removal activities.

Based on the number and diameter of piles that are part of the existing Pier 8 compared to the Conventional Pier, there would be a net decrease in underwater hard surface area. This may be beneficial in terms of a) reduced impediments to water movement, i.e. greater circulation and less tendency for sediment accumulation under the pier; and b) a smaller area of artificial substrate available for colonization by non-native species. However, the net change represents a minute fraction of the artificial substrate habitat in the relatively industrialized, east-central part of the bay, and is thus considered inconsequential for EFH.

The replacement of Pier 8 with either option would result in a larger deck area, which would shade the existing deep subtidal habitat at the edge of the existing pier. Since the habitat is unvegetated and light levels reaching the bottom are very low (Merkel and Associates 2014), there would be no local effect on primary production. The larger deck area would incrementally increase the shading of the uppermost surface layer inhabited by phytoplankton, and as these organisms drift through the bay, their overall rates of photosynthesis should, theoretically, be correlated with the duration of exposure to sunlight versus shading, although other factors (e.g., turbulence, turbidity, nutrients, temperature) would also be important. Net primary production from the phytoplankton could also be affected by the filter feeding invertebrates that inhabit the pilings. In this respect, the reduction in surface area should reduce the size of the fouling community on the pilings and in turn reduce the amount of phytoplankton grazing by barnacles, oysters, tunicates, etc. However, it should be noted that the production of planktonic larvae by the fouling community also contributes to the food supply for managed fish species. Overall, the net effect of pier replacement on phyto- and zooplankton food resources is uncertain, but would be very small in any case given the magnitude of change in the context of San Diego Bay. The Merkel and Associates 2014 *Draft Wharf Shading Study for the Pier 8 Replacement and Demolition Project, Naval Base San Diego* follows this Final EFH Assessment.

The Shading Study (Merkel and Associates 2014) suggests that the structural habitat of the existing Pier 8 supports a greater abundance, biomass, and diversity of fish and invertebrates than the adjacent deep subtidal habitat. Either new pier option would create habitat for fish that is generally similar to that of the existing pier, with a net loss of hard substrate habitat from the reduction of the number of pilings in the water, and a corresponding gain of open water habitat under the pier. Overall, the small magnitude of change and similarity of existing and future conditions suggests no ecological change

related to fish abundance, diversity, or biomass would be expected to occur in the project vicinity. To the extent that structural and/or shaded habitats are preferred or avoided by certain species, utilization of the project site by different fish species may shift slightly toward or away from the project site, relative to the existing condition. Considering this, and the characteristics of the EFH species that may potentially occur in the project area and the habitat characteristics of the project area itself, there would be no adverse effect to EFH from the small increase of open water habitat and increased areal shading.

Conventional Pier Option

Temporary impacts to bay bottom and water column habitats would occur from increased suspended sediments and turbidity, and increased underwater noise levels from pier demolition and construction activities. Based on observations of turbidity caused by bottom disturbances in areas similar to the project sites, turbidity plumes are expected to be limited to the areas of bottom disturbance, and would persist for less than one hour following disturbance (AMEC 2008).

The open-water area of San Diego Bay would be decreased by the replacement of Pier 8. On a small scale within the project site, water circulation may change slightly due to the removal of old and addition of new in-the-water structures, but any such changes would be negligible given that the boundaries, bathymetry, configuration and use of all piers at NBSD would remain essentially unchanged. The proposed project area is soft-bottom substrate and supports no eelgrass beds, so the net effect of increased shading on benthic primary production would be negligible, although there would be reduced sunlight in the water column. To the extent that structural and/or shaded habitats are preferred or avoided by certain species, utilization of the project sites by different fish species may shift slightly toward or away from the project site, relative to the existing condition. However, due to the characteristics of the EFH species and the affected area, the small increase in shading and artificial substrate would not have an effect outside the immediate area of the piers, and therefore would not have a long-term adverse effect on EFH for coastal pelagics or groundfish in San Diego Bay.

The pelagic and groundfish species of concern are highly mobile and not closely tied to artificial substrates. Hence, individuals would be expected to move away from and avoid the areas of demolition and construction activity, but to return and utilize the area in essentially the same extent as at present once the activities cease. Pier removal would temporarily reduce the algal and invertebrate production associated with encrusting communities on the pilings. Over time, algae and invertebrates are expected to colonize the new pier, and the resultant production of organic material from the new pier would tend to offset the effects of reduced sunlight. Hence, there would be a minimal, temporary adverse effect on EFH.

The Conventional Pier would involve installing a total of 950 structural and fender piles. Assuming a rate of five concrete piles installed per day, impact pile driving activities would occur for approximately 190 days (Navy Region Southwest and Naval Base Point Loma 2013).

Relative to the existing pier, the Conventional Pier option would increase bay shading by 1.86 acres, but reduce the in-water surface area of artificial structure by 125,949 square feet (Table 2-1). As discussed in Section 4.1.3, there are a variety of ecological ramifications associated with these physical changes, but in the context of the industrialized shoreline of the project area, the overall effects on EFH are considered minimal and inconsequential in terms of populations of managed species.

Comparison of Pile Density and Bay Shading

In terms of pile density and bay shading, the Conventional Pier option represents the worst-case of the two construction options. However, either option would have minimal adverse effects on EFH.

Programmatic EFH Consultation Considerations (NMFS 2013)

Although the Programmatic EFH Consultation developed by NMFS for the U.S. Army Corps of Engineers permitting of overwater structures in southern California waters (NMFS 2013) does not procedurally apply to the Navy, we have used the discussion of adverse effects and proposed conservation measures to serve as points of discussion and analysis to this project.

1. Since the project area does not contain estuarine, seagrass, kelp canopy, rocky reef HAPC or other areas of interest, there would be no negative effects to groundfish HAPC.
2. The direct and indirect effects of overwater structures cited in the Programmatic Consultation (NMFS 2013), including shading, wave energy and substrate, water quality, noise, and non-indigenous species evidently do not reduce fish and invertebrate abundance, diversity or biomass under existing Pier 8 and other Navy piers relative to adjacent deep subtidal habitat. Since negative effects are not being manifested in the fish community, there do not appear to be potentially negative corresponding cumulative effects.

4.2 Proposed Conservation Measures and Guidelines for EFH Protection

4.2.1 Consideration of NMFS (2013) Programmatic EFH Conservation Recommendations

As recommended by NMFS, the following provides the Navy's detailed consideration of the conservation recommendations developed in the Programmatic EFH Consultation for Overwater Structures (NMFS 2013). For the sake of completeness, the NMFS measures are reproduced in their entirety, followed by Navy responses in **bold**.

General Recommendations

1. All overwater structure construction (including in-kind replacement) should be required to follow eelgrass monitoring requirements put forth in the Southern California Eelgrass Mitigation Policy (SCEMP). Exceptions may be granted for areas that U.S. Army Corps of Engineers and NMFS believe are highly unlikely to support eelgrass habitat. **Not applicable because the project area does not support eelgrass**.
2. Given the significant alteration of existing shoreline and shallow water habitats in southern California, all overwater structures should be water dependent. Proposed projects should clearly explain their water dependency and why the project is in the public's best interest. **The project is water dependent.**
3. As part of the project application, the proponent should describe how their proposal addresses the specific conservation recommendations identified below. NMFS recognizes that not all conservation recommendations will be relevant in all situations. Therefore, the proponent should clearly articulate when a particular recommendation is not applicable to the proposed project. Based upon the project application, the U.S. Army Corps of Engineers should determine if the project implements appropriate conservation recommendations and, therefore, can be covered by this programmatic consultation. **See measures and discussion below**.

Mooring Anchors and Persistently Moored Vessels

For all projects, the project proponent should strive to implement avoidance measures to the extent feasible. When avoidance measures are not feasible, minimization measures should be implemented.

Avoidance:

1. All new anchored moorings and persistently moored vessel should be placed in areas in which suitable submerged aquatic vegetation (SAV) (e.g., eelgrass, kelp) habitat is absent. This will prevent adverse shading impacts to SAV. **Not applicable because SAV does not occur.**
2. Persistently moored vessels should be placed in waters deep enough so that the bottom of the vessel remains a minimum of 18 inches off the substrate during extreme low tide events. This will prevent adverse grounding impacts to benthic habitat. **Water depths are sufficient to preclude grounding by Navy vessels that use the pier.**

Minimization:

1. Mooring anchors placed within suitable SAV habitat should be of the type which use midline floats to prevent chain scour to the substrate. This will prevent adverse impacts to SAV and other benthic habitat. **Not applicable because SAV does not occur.**

2. Persistently moored vessels that are moored over SAV or rocky reef habitats with less than 18 inches between the bottom of the vessel and the substrate at low tides should utilize float stops. This will prevent adverse grounding impacts to benthic habitat. **Not applicable because SAV and rocky reef habitats do not occur.**

Pile Removal and Installation

Minimization:

1. When feasible, remove piles with a vibratory hammer rather than a direct pull or clamshell method. The piles would be removed using dry pulling, with the assistance of a vibratory hammer to loosen piles as needed, which only would be the case if they were heavily coated with mud. Otherwise, if the piles can be easily removed by crane, indicating they are relatively free of mud, use of the vibratory hammer would not be feasible because it would be substantially slower and would not result in a meaningful reduction in sediment resuspension.
2. Slowly remove pile to allow sediment to slough off at or near the mudline.
3. Hit or vibrate the pile first to break the bond between the sediment and the pile to minimize the likelihood of the pile breaking and to reduce the amount of sediment sloughed.
4. Encircle the pile with a silt curtain that extends from the surface of the water to the substrate, where appropriate and feasible. **This is not proposed because currents are weak in the Pier 8 area: speeds range from five centimeters per second near the quaywall to 10 to 15 centimeters per second between the piers. Sediments resuspended by pier removal/installation and construction vessel movements would settle out around the nearby Navy piers, where sediment and marine water quality conditions are similar to those at Pier 8 (i.e., industrial marine facilities where water and sediments are not pristine).**
5. If contaminated sediment occurs in the footprint of the proposed project, cap all holes left by the piles with clean native sediments. **This is not proposed because the holes will fill rapidly as a result of a) inward collapse of the unconsolidated sediments as pile is removed; and b) filling of the residual volume by sediment dispersed through the project area by the continuing project activities as well as tidal currents.**
6. Drive piles during low tide periods when substrates are exposed in intertidal areas. This minimizes the direct impacts to fish from sound waves and minimizing the amount of sediments re-suspended in the water column. **Not applicable because all of the piles are in deep water.**
7. Use a vibratory hammer to install piles, when possible. Under those conditions where impact hammer are required (i.e. substrate type and seismic stability) the pile should be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer. This will minimize noise impacts. **The Navy does not**

believe this measure is warranted because of the relatively small ZOIs for potential injury to fish associated with the use of an impact pile driver for 24-inch piles (Table 4-2). Fish are expected to leave the immediate area of pile driving and not incur injury. The larger ZOI of potential behavioral effects (Table 4-2), would encompass an area of heavy ship traffic from Navy and other vessels in this part of the bay. Given the absence of sensitive habitats and the background of underwater noise from vessels, the Navy does not believe that there would be important added behavioral effects from pile driving.

Pile-supported Overwater Structures

For all projects, the project proponent should strive to implement avoidance measures to the extent feasible. When avoidance measures are not feasible, minimization measures should be implemented.

Avoidance:

1. To the maximum extent practicable, site overwater structures in areas not occupied by or determined to be suitable for sensitive habitat (e.g., SAV, salt marsh, intertidal flats). **Sensitive habitats are not present in the project area.**
2. Any cross or transverse bracing should be placed above the Mean Higher High Water (MHHW) to avoid impacts to water flow and circulation. **For the Conventional Pier option, all pier deck structures are above the MHHW.**

Minimization:

1. Minimize, to the maximum extent practicable, the footprint of the overwater structure. The overwater structure should be the minimum size necessary to meet the water- dependent purpose of the project. **The proposed new pier design is no larger than necessary to meet the purpose and need.**
2. Design structures in a north-south orientation, to the maximum extent practicable, to minimize persistent shading over the course of a diurnal cycle. **Not feasible.**
3. For residential dock and pier structures, the height of the structure above water should be a minimum of 5 feet above MHHW. **Not applicable.**
4. For residential dock and pier structures, the width of the structure should be limited to a maximum of 4 ft wide. Exceptions may be provided to comply with the Americans with Disabilities Act. **Not applicable.**
5. For residential dock and pier structures, one turnaround is permitted not exceeding 10 ft in length and 6 ft wide, or 60 square ft. The turnaround is intended to accommodate efficient unloading/loading of boating equipment and is not intended to be used for non-water-dependent uses. **Not applicable.**
6. For residential dock and pier structures, a terminal platform should not exceed 5 ft long by 20 ft wide, or 100 square ft. **Not applicable.**

7. Extend the structure's terminal platform into nearest adjacent deep water to minimize the need for dredging and to minimize the likelihood of boat grounding, propeller scar/scour in shallow water habitat. **The pier is in deep water that is already maintained by dredging.**
8. Use the fewest number of piles as practicable for necessary support of the structure to minimize pile shading, substrate impacts, and impacts to water circulation. Pilings should be spaced a minimum of 10 ft apart on center. **Some parts of the Conventional Pier would have pilings spaced 10 ft apart on center; however, the majority of the Conventional Pier would have pilings spaced further than 10 feet apart on center.**
9. Gaps between deck boards should be a minimum of 1/2 inch. If the overwater structure is placed over SAV or salt marsh habitat, 1-inch deck board spacing or use of light transmitting material with a minimum of 40 percent transmittance should be used. Exceptions may be provided to comply with the Americans with Disabilities Act. **Not applicable.**
10. The use of floating dock structures should be minimized to the extent practicable and should be restricted to terminal platforms placed in the deepest water available at the project site. **Pier 8 is a deep water pier maintained by dredging.**
11. Incorporate materials into the overwater structure design to maximize light transmittance. When suitable SAV habitat is within the project vicinity, the use of appropriate grating should be used to permit sufficient light for SAV production. **Not applicable due to the depth of water under the pier, and would not be practicable because a solid concrete deck is needed to support loads on the pier deck.**

4.2.2 Additional Proposed Measures

To reduce and avoid the potential impacts to FMP species, the following measures would be implemented to minimize impacts:

- A cable net and floating boom would be used to capture debris that falls into the water during pier demolition. Such debris would be collected and disposed of onshore.
- Spill kits and cleanup materials would be present during construction should there be a leak into the surrounding water.
- The contractor would use only clean construction materials suitable for use in the oceanic environment. The contractor would ensure no debris, soil, silt, sand, sawdust, rubbish, cement or concrete washings thereof, chemicals, oil or petroleum products from construction would be allowed to enter into or placed where it may be washed by rainfall or runoff into waters of the U.S. Upon completion of the project authorized, any and all excess material or debris would

be completely removed from the work area and disposed of in an appropriate upland site.

- All debris would be transported to, and disposed of, at an appropriate upland disposal site, or recycled, if appropriate.
- During project implementation the Navy would regularly monitor construction activities to ensure that no deviation from the project as described herein are occurring. The Navy would report any violation of authorized impacts to NMFS within 24 hours of its occurrence.

5.0 CONCLUSION

According to the final rule implementing the EFH provisions of the Magnuson-Stevens Act, temporary impacts are those that are limited in duration and that allow the particular environment to recover without measurable impact. Minimal impacts are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (50 CFR Part 600 2002).

As described in the above effects analysis, the Navy has determined that the project may have relatively minimal, temporary adverse effects on EFH for federally managed fish species within the Coastal Pelagic Species and Pacific Coast Groundfish FMPs. However, the project contains adequate measures to avoid and minimize potential adverse effects to EFH. The negative effects of overwater structures identified in the NMFS (2013) Programmatic EFH Consultation on Overwater Structures with the Los Angeles District do not apply. Since no long-term adverse effects would occur with either construction option, no compensatory mitigation is proposed for either construction option.

6.0 REFERENCES

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- *National Marine Fisheries Service Response to Request of Informal Section 7 Consultation*

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

January 19, 2016

In response, refer to:
2015/3737:DDL

J. J. Cho
U.S. Department of the Navy
Commander
Public Works Officer
Naval Base San Diego
3455 Senn Road
San Diego, California 92136-5084

Re: Endangered Species Act Section 7(a)(2) concurrence and Essential Fish Habitat response letter for replacement of Pier 8 at Naval Base San Diego

Dear Mr. Cho:

On October 22, 2015, NOAA's National Marine Fisheries Service (NMFS) received your request for a written concurrence that the proposed replacement of Pier 8 at Naval Base San Diego (NBSD) by the U.S. Department of the Navy (Navy) is not likely to adversely affect (NLAA) species listed as threatened or endangered or critical habitats designated under the Endangered Species Act (ESA). In the October 22, 2015, letter, the Navy also requests concurrence that the proposed project is likely to have localized and temporary effects on Essential Fish Habitat (EFH) within San Diego Bay and provided a revised EFH Assessment. This response to your request was prepared by NMFS pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402, section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), agency guidance for preparation of letters of concurrence, and the Fish and Wildlife Coordination Act (FWCA). Because the proposed project occurs in areas where marine mammals may be found, NMFS also provides comments relative to compliance with the Marine Mammal Protection Act (MMPA; 16 U.S.C. § 1361 et. seq.).

On June 22, 2015, NMFS transmitted a response to the Navy following a request for ESA and EFH consultation on alternatives for proposed replacement of Pier 8 submitted to NMFS by the Navy on February 18, 2015, recommending that consultation proceed once a preferred alternative for this proposed project had been selected. In the June 22, 2015 letter, NMFS also requested additional information be provided to facilitate the EFH consultation, including a cumulative impact analysis, and an estimate of the total area expected to drop out of the euphotic zone as a result of the overwater structure expansion. The revised EFH Assessment provided on October 22, 2015, identified the conventional pier option as the preferred alternative, thus removing the modular hybrid pier from consideration, but did not provide the additional EFH-related information NMFS requested. On November 19, 2015, NMFS requested additional time to conduct the analyses necessary to complete the EFH consultation.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The concurrence letter will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). A complete record of this consultation is on file at the NMFS Long Beach office.

Proposed Action

The Navy proposes to demolish the existing Pier 8 (2.44 acre footprint), which is located in the central portion of San Diego Bay near downtown San Diego, and replace it with a conventional pier (4.30 acre footprint) in order to accommodate berthing and logistical requirements for four modern-sized ships. The existing pier is 1,610 feet (ft) long by 66 ft wide and is supported by a total of 1,830 24-inch concrete structural piles that need to be removed. An additional 343 16-inch concrete filled poly fender piles will also be removed. Pile removal would occur via dry pulling alone or in combination with a vibratory hammer. A spud-anchored barge, two barge and wharf cranes, tug boat, and various other types of mobile construction equipment would be used to support the demolition process. Two driving/demolition crane barges and two support barges would be used in combination with a system of rafts to capture and transport construction debris (i.e., concrete, steel, asphalt). Floating slick bar booms would be deployed to contain any floating debris, though only approximately 0.5 percent of the demolished material is expected to reach the water. Demolition of the existing pier is expected to take approximately 11 months and would begin in 2017 at the earliest.

Construction of the conventional replacement Pier 8 would be a single-deck, concrete pier that is 117 ft wide by 1,600 ft long (4.30 acre footprint), which represents an increase in bay coverage of 1.86 acres. The total in-water surface area associated with the 950 piles that will be installed would be 153,411 square ft (ft^2), a reduction of 125,949 ft^2 compared to the existing pier structure, which has 2,173 piles. Construction activities would include the installation of 512 24-inch concrete structural piles, four 24-inch concrete loadout cradle piles, 204 24-inch concrete and composite square fender piles, and 230 14-inch plastic fender piles. Installation of the approximately 950 piles would be done with a floating crane and impact diesel pile driver. Additional features of the new Pier 8 that are expected to improve water quality include a stormwater collection system with an oil-water separator and copper and zinc treatment, and bilge oily water wastewater treatment system pipelines. Other pier improvements include fiber optic communications, an improved energy monitoring and control system, and modifications to accommodate shore power in the future. Construction is expected to take approximately 11 months, and the anticipated service life of the pier would be approximately 67 years.

Endangered Species Act

Action Agency's Effects Determination

For this proposed project, the Navy determined that green sea turtles (*Chelonia mydas*) may be affected, but were unlikely to be adversely affected, by the associated project activities. Green turtles are the only species identified by the Navy listed under the ESA and under NMFS' jurisdiction that could be expected to occur in the proposed action area and may be affected by

this project. San Diego Bay serves as important habitat for a resident population of approximately 60 juvenile and adult green turtles in this area (Eguchi *et al*. 2010). Based on genetic analyses and tracking studies conducted by NMFS' Southwest Fisheries Science Center, green turtles found in San Diego Bay likely represent the endangered population of turtles breeding on the Pacific coast of Mexico. There are no areas designated as critical habitat under the ESA in San Diego Bay.

In their letter the Navy indicated that the proposed project would employ avoidance and minimization measures to avoid adverse effects to green sea turtles. For all project activities including demolition, construction, and associated vessel traffic, the Navy has proposed to establish a shutdown area where all project activities would immediately cease if a sea turtle is seen within 10 meters of the project area while work is in progress, until at least 15 minutes had passed since the last sighting. During all pile driving activities (both removal and installation), the Navy proposes additional monitoring to minimize the risks of injury or significant behavioral impacts to green sea turtles, as well as marine mammals protected under the MMPA. Before initiating pile driving, and after any break in activity for more than 30 minutes, the Navy will visually monitor the project area for the presence of sea turtles out to 125 meters. If a green turtle or marine mammal is present in the area within this range, pile driving would not commence until the animal has left the area or until at least 15 minutes had passed since the last sighting. If a sea turtle moves into this area during pile driving activities these activities would immediately cease until the animal leaves or has not been sighted for at least 15 minutes. In addition, prior to the start of pile driving each day, after each break of more than 30 minutes, and if any increase in pile driving intensity is required, the Navy will employ soft-start[1] and ramp-up methods to slowly increase the sound levels produced and allow undetected animals an opportunity to move away before full intensity of pile driving operations is reached. Other best management practices will also be implemented, including deploying surface booms and the use of rafts to prevent the release of any debris into San Diego Bay. Given these measures, the Navy concluded that adverse effects to green sea turtles were unlikely.

Effects of the Action

Under the ESA, "*effects of the action*" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

San Diego Bay is one of the northern-most foraging areas for green turtles along the U.S. west coast, with the shallow inlet providing valuable food resources such as marine algae and seagrass. While some of the San Diego Bay green turtles are year-round residents, others migrate seasonally in order to reach their southern breeding grounds, located in the southern state of

[1] Specifically the soft-start procedure requires three initial strikes of impact hammers at 40% energy followed by a 30 second waiting period, and then two subsequent 3-strike sets. For vibratory pile driving, hammers are initiated at reduced energy for 15-seconds followed by a 30 second waiting period. This process is repeated two additional times.

Michoacán, Mexico, and at the Revillagigedos Islands, offshore central Mexico. Green turtles are attracted to the shallow waters and high concentrations of eelgrass in southern San Diego Bay (South Bay), and the presence of this important food item and habitat for other preferred prey species likely influences sea turtle activity patterns within the Bay (Lemmons *et al*. 2011). Data generated from tag-recapture studies suggest that San Diego Bay is a productive habitat for green sea turtles, with green turtles from the Bay showing fast growth rates comparable to green turtles found in more tropical environments (Eguchi *et al*. 2012). Surveys show that the sea turtles generally forage and are typically located within the confines of the South Bay, in relative proximity to the former South Bay Power Plant, and that areas outside of South San Diego Bay are not as commonly visited and do not appear to sustain the regular presence of green turtles like the South Bay (MacDonald *et al*. 2012). However, occasional observations of green turtles by the public and Navy personnel, historical records of sea turtle strandings in San Diego Bay collected by NMFS (NMFS unpublished stranding data), and recent research using satellite telemetry (Madrak *et al*. 2014; Bredvik *et al*. 2015), indicate that the occasional presence of green turtles throughout San Diego Bay at any time of the year can occur. As a result, it is reasonable to expect that green turtles could be found within the project area.

Potential impacts to any green turtles include risks of injury or disturbance as a result of construction activities, including use of boats, cranes, dredges, and other equipment as needed, to support demolition and reconstruction of Pier 8. Any turtle present in the project area could receive significant injuries if struck by a vessel or equipment being used, or by any debris that may be released during project activities. In addition, the removal/installation of piles involves the generation of loud sounds that have the potential to disturb, or potentially cause hearing impairments, to any animals that are in the vicinity. Other potential impacts include disturbance or degradation of any habitat that sea turtles may use. The Navy indicated they would employ the avoidance and minimization measures during activities conducted described above to avoid adverse effects to green sea turtles. The Navy expects these actions to minimize the risk of potential adverse effects to green sea turtles from these activities, in the unlikely event that green sea turtles do enter the vicinity of the project area.

In assessing the risk of this project, NMFS considers the location of project activities in relation to the probability that green turtles may be found in the vicinity. The project area for activities at Pier 8 lies in the central portion of San Diego Bay. Past research has indicated that this area is less frequently visited by foraging green turtles compared to the regular and sustained presence of sea turtles in south San Diego Bay. Therefore, turtle interactions with the proposed project are less likely, but not discountable. Green turtles have been occasionally documented throughout San Diego Bay even during the colder seasons, and have been known to migrate completely out of San Diego Bay. Given the chance that sea turtles could be found in the project area, the Navy will monitor the area surrounding the project area for the presence of turtles, and will postpone or cease all activities if a turtle is seem within 10 meters of project activities until the turtle leaves. This is expected to minimize the risk of direct injury with contact between any equipment or vessels that may be used, as well as any debris that may be produced from demolition or construction activities. In order to control debris, the Navy will use surface booms and floating rafts to surround and contain all project activities. If any turtles are in the construction site area but avoid detection, we expect turtles will detect the commencement of project activities and will have an opportunity to move away during the soft-start and ramp up activities. Based on our understanding of their behavior, they are expected to avail themselves of this opportunity. Based on the very low chance of a turtle being in or remaining within the project area and the additional

impact minimization measures triggered by Navy monitoring for turtle presence, the risk of direct contact and injury or death of a green sea turtle during pile removal or installation and associated activities as a result of the proposed project is discountable.

There are risks of exposure to loud sounds that may cause injury and disturbance during pile driving activities. In their letter the Navy indicated that the proposed project would employ avoidance and minimization measures to avoid adverse effects to green sea turtles as a result of exposure to acoustic impacts. Specifically for pile driving, these mitigation measures included visual monitoring of the surrounding project area out to 125 meters during pile driving. Monitoring will commence at least 15 minutes prior to in-water construction activities and after each break of at least 30 minutes. If a sea turtle is observed prior to these activities, pile driving will not commence until at least 15 minutes has passed since the last sighting. If a green turtle is observed at any time within the monitoring zone, all activities will immediately cease until the sea turtle has left the project area (at least 125 meters away) or 15 minutes have elapsed from the last sighting in the area.

Currently, there are no specific guidelines for safety criteria that directly relate to sea turtle injuries or behavioral changes resulting from elevated sound pressure levels that may result from the removal or installation of piles. In general, NMFS and other federal agencies have relied upon the noise criteria for marine mammals (cetaceans or pinnipeds) and the safety zones that have been employed for projects to minimize the risk of injury to these species as a conservative proxy for managing impacts of very loud sound on sea turtles. While sea turtle hearing has not been studied nearly as much as marine mammal hearing, the general consensus is that, given what is known about the relative complexity of hearing and underwater communication abilities of many marine mammal species compared to sea turtles, it is likely that most, if not all, marine mammal species are more sensitive to underwater sound than sea turtles. Although experimental research on sea turtle response to loud underwater sources is limited, McCauley *et al*. (2000) documented increased swimming activity for loggerhead and green sea turtles in a caged environment during periods of received sound in excess of 165 decibels (dB) root mean square (RMS) , and increased erratic swimming behaviors at received sound levels above 175 dB RMS. The authors concluded these behaviors were marking the relative point where avoidance would occur for unrestrained turtles in that acoustic environment.

We expect the monitoring program proposed for pile driving to minimize the chance of green sea turtles being exposed to potentially injurious sound levels during pile driving. The monitoring zone of 125 meters is greater than the 117 meter zone of acoustic influence at received levels of 160 dB RMS for monitoring potential behavioral impacts to marine mammals under the MMPA from impulsive sound sources for 24-inch concrete pile driving using impact hammers during Navy P-151 Fuel Pier Replacement Project, also located in San Diego Bay (CALTRANS 2009, NAVY P-151 NMAWC acoustic data). Given that 24-inch concrete piles are the largest/loudest piles included in this proposed project, we expect that sea turtles will not be exposed to sound levels greater than 160 dB if they aren't within 125 meters of pile installation and removal operations. If they are within 125 meters and exposed to sound levels approaching 165 dB or greater and avoid detection, we expect the likely response will be to avoid the increased sound levels and leave the area. Regardless of the specific noise exposure that sea turtles might experience in the unlikely event that any occur in project areas, even if initially undetected by monitoring, we conclude that it is likely that any disturbance from this project would lead to turtles avoiding the immediate project area once the activity has commenced, reducing the

likelihood of turtles remaining in the area long enough to experience hearing injury. As a result, the risks of injuries for turtles resulting from exposure to loud sounds produced from pile driving are discountable.

The proposed monitoring plan and shutdown zones apply to all types of pile driving methods. The monitoring plan and shutdown were designed around the potential impacts of impact driving, which is expected to produce the loudest peak sound pressure (see Caltrans 2009 for review). As a result, the potential sound levels that any sea turtle could be exposed to would be less using these other methods. However, vibratory hammers, if necessary during pile removal, produce more continuous sounds, which have been shown to elicit behavioral responses from fish and marine mammals at lower sound pressure levels, 150 dB and 120 dB respectively. We do not know if or how sea turtles might similarly respond and the Navy did not attempt to quantify the range of potential sound pressure level resulting from vibratory driving or jetting. However, given that ambient sounds in San Diego Bay regularly approach or exceed 130 dB (Navy 2013), the risk of potential harassment far away from project sites is low regardless of the specific method of pile driving or removal used.

In general, all in-water construction projects present some risk of disturbance to any green sea turtles that may be present in the project area. In general, we expect the reaction to disturbance will be avoidance of those project areas. Given that green sea turtles are not known to spend significant portions of time outside of South San Diego Bay to begin with, avoidance of the proposed project area for any period of time is not likely to significantly impact or disrupt their regular movement and behavior patterns. Also, avoidance of a project area for any period of time is not likely to limit their ability to forage or have any detectable effect on health. Adequate habitat exists beyond the construction zone, with adequate carrying capacity to support any relocating sea turtles without any reduction in their fitness. Therefore, the effects of disturbance resulting from exposure to sound produced from all underwater maintenance construction, including pile driving, are expected to be insignificant given the low probability that sea turtles will be in project areas for any length of time and the lack of any expected impact on health and fitness that avoidance of this area would have on green sea turtles.

As mentioned above, while the area of San Diego Bay near the project area does not appear to be the typical location of green turtle presence in the Bay, it is possible that green turtles may occasionally be in this area and take advantage of any available eelgrass habitat that is near the project area temporarily or while transiting out of San Diego Bay. Based on the proposed project description, eelgrass habitat is not present anywhere near the project area and impacts to eelgrass habitat are not expected. However, the Navy is taking steps to avoid impacts to habitat surrounding the project area as a result of this project. The Navy indicates that a surface boom and rafts will be used to surround the project site during all project activities to prevent the release of debris that can negatively affect the local habitat, as well as any individual animals. During the EFH consultation, we did identify expected impacts to habitat features that are associated with increased overwater coverage and decreased primary productivity for constituents such as benthic macroalgae, as well as additional impacts to fish and other species. Although the potential for inclusion of macroalgae in a green sea turtle diet in San Diego Bay cannot be discounted, the location of the proposed project leads us to conclude that any potential reduction of macroalgae productivity there is not likely to affect the health of green sea turtle foraging habitat in San Diego Bay. As a result, we conclude that the expected local habitat impacts resulting from the proposed project will be insignificant for green sea turtles.

Conclusion

NMFS concurs with the Navy's determination that the proposed action may affect, but is not likely to adversely affect, green sea turtles. In the unlikely event that a sea turtle is injured or killed as a result of the project, NMFS recommends that the Navy immediately cease operations and contact our regional stranding coordinator, Justin Viezbicke, at (562) 980-3230. This event would also trigger initiation of a formal consultation under section 7(a)(2) of the ESA.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the Navy or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (2) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter; or if (3) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA portion of this consultation. As noted above, injury or death of sea turtles are not expected from this project; evidence of such an outcome would require re-initiation under (1) of this paragraph. In such a case, the Navy should require that operations cease immediately, our regional stranding coordinator, Justin Viezbicke, be contacted at (562) 980-3230, and the Navy should request re-initiation of section 7(a)(2) consultation with NMFS-WCR.

Magnuson-Stevens Fishery Conservation and Management Act Comments

Action Area

The proposed project occurs within EFH for various federally managed fish species within the Coastal Pelagic Species (CPS) and Pacific Coast Groundfish Fishery Management Plans (FMPs). In addition, the project occurs within an estuary, which was designated as a habitat area of particular concern (HAPC) for various federally managed fish species within the Pacific Coast Groundfish FMP. HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process.

Coastal estuaries, such as San Diego Bay, are historically shallow, protected, nutrient rich and biologically productive habitats. The bay supports a diverse fish assemblage, including commercially and recreationally important species. San Diego Bay is the largest estuary in southern California and provides an important nursery habitat function for a variety of fish species. Williams and Pondella (2012) found that approximately 81% of the fishes sampled in their baywide survey were juveniles. As indicated in the Navy's EFH Assessment, San Diego Bay provides nursery functions for northern anchovy and Pacific sardine, which feed upon phytoplankton and zooplankton. Surveys conducted from 1994 to 1999 indicated that northern anchovy was the most abundant fish species comprising 43% of the total catch (Allen *et al*.

2002). Furthermore, Northern anchovy was also one of the top species in terms of percent juveniles captured during a 2008 baywide fishery inventory (Pondella and Willams, 2009).

Estuaries also support numerous species of algae, flowering plants, plankton and microphytobenthos that are integral in nutrient cycling and primary productivity. In fact, shallow coastal bays represent some of the most productive ecosystems on earth. And because much of the sediment surface within these bays lies within the euphotic zone, the depths at which the vast majority of primary productivity occurs (Behrenfeld and Falkowski 1997), benthic autotrophs, such as microphytobenthos and benthic macroalgae, are often the dominant primary producers in these systems (Hardison *et al*. 2013). In subtidal habitats, primary productivity in the water column from phytoplankton is often greater than that associated with microphytobenthos, while the opposite is true for intertidal habitats (MacIntyre *et al*. 1996). Microphytobenthos, which typically account for 20-50% of the total primary production in shallow estuaries (Underwood and Kromkamp 1999), are a vital component of these systems, providing direct support for much of the secondary production of benthic invertebrates and fishes that use shallow water habitats (Ray 2005). Similarly, Miller *et al*. (1996) observed that phytoplankton and microphytobenthos are often the major food sources for a variety of animals, and thus play a large role in supporting secondary productivity in shallow unvegetated habitats.

Effects of the Action

NMFS has previously relayed analyses regarding the potential adverse effects to EFH from overwater structure projects (e.g., NMFS letter re: Pier 21 modifications dated June 13, 2014; NMFS letter re: Pier 2 upgrades dated January 22, 2015; EFH Programmatic Consultation for Overwater Structures between NMFS and the U.S. Army Corps of Engineers, Los Angeles District, South Coast Branch). The EFH Programmatic Consultation for Overwater Structures applies to new or expanded overwater structure construction, modification, maintenance, and associated indirect activities in tidally influenced waters of the United States and immediate fringes within Orange and San Diego Counties. Information contained within that EFH Programmatic Consultation for Overwater Structures is applicable to the proposed project. Accordingly, NMFS appreciates the Navy's thorough consideration of the Conservation Recommendations from the EFH Programmatic Consultation for Overwater Structures into section 4.2 of the EFH Assessment. Those responses facilitated our evaluation of the potential impacts to EFH, and reduced the number of Conservation Recommendations we're providing for this project since some had already been adequately addressed.

Overwater structures and associated activities affect the ecological functions of habitat through the alteration of abiotic factors, including light regime, wave energy, substrate, and water quality. These alterations can, in turn, interfere with habitat processes supporting the key ecological functions of fish spawning, rearing, foraging and refugia. The types of effects discussed below can result in direct, indirect, or cumulative impacts. Nightingale and Simenstad (2001) identify the potential mechanisms of impact overwater structures can pose to nearshore habitats. Some of the impacts that may result from the proposed overwater structure and related activities (e.g., construction, vessel operations) include: 1) reduced light levels and altered ambient light patterns; 2) altered wave and tidal energy patterns 3) substrate disturbance and smothering; 4) an increase of non-indigenous species; and 5) elevated levels of toxics, nutrients and bacteria. These impacts can limit plant growth and recruitment, alter plant and animal assemblages, affect animal

behavior, modify substrate type, alter sediment transport and distribution, and facilitate the replacement of native species with exotics.

Light is the single most important factor affecting aquatic plants (Hauxwell *et al*. 2003), and marine and estuarine primary producers, including seagrass, salt marsh plants, and algae are particularly susceptible to light limitation (Kearny *et al.* 1983, Dennison *et al.* 1993, Shafer 1999, Shafer and Robinson 2001, Whitcraft and Levin 2007, Shafer *et al*. 2008). Moreover, light availability is a major controlling factor for phytoplankton production in nutrient-rich estuaries (Gameiro *et al*. 2011, Cloern *et al*. 2014). Light levels underneath overwater structures have been found to fall below threshold levels for photosynthesis of diatoms, benthic algae, eelgrass, associated epiphytes and other autotrophs (Burdick and Short 1999). These photosynthesizers are an essential part of nearshore habitat and the estuarine and nearshore food webs that support many species of marine and estuarine fishes and invertebrates. Moreover, microalgal communities in shaded areas are generally less productive than unshaded areas, with productivity positively correlated with ambient irradiance (Whitney and Darley 1983; Lehrer *et al.* 2014). Loss of this productivity decreases available energy for growth and reproduction throughout the food web, including fishes (Miller *et al*. 1996).

The increased shading associated with the proposed expansion of Pier 8 would result in a net reduction of the euphotic zone and a corresponding decrease in primary productivity. For instance, light levels measured at various depths and distances from the pier face underneath existing Navy piers were below 1% of ambient surface levels (Merkel & Associates 2013). Specifically, light levels at all four sampled depths (surface, top, middle and bottom) in the mid-pier sampling location and three of the four sampled depths (top, middle and bottom) in the quarter pier location were below 1% of ambient light measured at the surface at a reference site. These levels are sufficiently low to drop out of the euphotic zone (Kirk 1994; Lee *et al*. 2007). As mentioned previously, in our June 22, 2015 letter, NMFS requested that the Navy calculate the area, or preferably volume, expected to drop out of the euphotic zone as a result of the proposed project, but we never received that information. We attempted to perform the calculation ourselves using a non-linear regression equation. However, because we lacked the raw data, we ultimately decided that our calculations included too many assumptions to produce viable results. Therefore, NMFS still believes it is appropriate for the Navy to provide this information to improve our understanding of the impact to primary productivity, an important habitat function.

Changes to the light regime may affect fish behaviors associated with sight. Fishes rely on visual cues for spatial orientation, prey capture, schooling, predator avoidance, and migration. For example, pelagic schooling fishes likely avoid overwater structures given the importance of vision for the ecology and behavior of these fishes. Able *et al*. (2013) found that many pelagic fish species avoided using under-pier environments compared to adjacent open water areas. Limited observations of fish utilization of piers in San Diego Bay also suggest that pelagic fish species are not found beneath piers (Merkel and Associates 1999 and 2013). Thus, increases in overwater structure coverage may reduce the quantity and/or quality of foraging and nursery habitat available to CPS and other small pelagic fish species.

Juvenile and larval fish are primarily visual feeders with starvation being the major cause of larval mortality in marine fish populations. The reduced-light conditions found under overwater structures limit the ability of fishes, especially juveniles and larvae, to perform essential

activities like finding refuge and ample food resources. For example, Able *et al*. (1999) found that caged fish under piers had growth rates similar to those held in a laboratory setting without food. In contrast, growth rates of fish caged in pile fields and open water were significantly higher. Able *et al*. (1998) also demonstrated that juvenile fish abundance and species richness was significantly lower under piers in an urban estuary. Although some visual predators may use alternative modes of perception, feeding rates sufficient for growth in dark areas usually demand high prey concentrations and encounter rates (Grecay and Targett 1996). Therefore, the expansion of overwater coverage is expected to adversely impact the growth of juvenile and larval fish.

As indicated in the Navy's EFH Assessment, San Diego Bay has experienced substantial historical degradation and loss in quantity and quality of intertidal and subtidal habitat as a result of human development. For example, according to the San Diego Bay Integrated Natural Resources Management Plan (INRMP; U.S. Navy and Port of San Diego 2013), within San Diego Bay approximately 41% of shallow subtidal habitat (in this case defined as -2.2 to -12 feet mean lower low water [MLLW]) and 84% of intertidal habitat (defined as +2 to -2.2 feet MLLW) excluding salt marsh has been lost since 1859. Salt marsh losses since that time have been approximately 70%, while artificial substrate has gone from 0 to 74% of the shoreline. Moreover, only 17 to 18% of the bay floor has not been impacted by dredge or fill activity (U.S. Navy and Port of San Diego 2013). Recognizing the importance of these habitats, in addition to implementing avoidance and minimization measures to preclude additional impacts, the San Diego Bay INRMP identifies the need to create or restore habitat to offset some of these losses.

Cumulative impacts from these types of habitat losses and modifications can be substantial. For instance, Lotze *et al*. (2006) note that estuarine and coastal transformation has depleted more than 90% of important (based on economic, structural, or functional significance) species, destroyed greater than 65% of seagrass and wetland habitat, degraded water quality, and facilitated the invasion of non-native species. The San Diego Bay INRMP also recognizes the importance of cumulative impacts, noting "*Individual projects may have little measurable ecological effect beyond the project footprint. However, dozens of similar projects could measurably change sediment erosion and deposition patterns, organic matter production and movement, as well as affect types and extent of habitat within the bay.*" Other potential cumulative effects from bay projects identified in the San Diego Bay INRMP include: 1) habitat conversion, 2) changes in sediment or salinity dynamics, 3) habitat degradation for birds with projects that increase boat traffic, 4) increased risk of oil spills and exotic species invasions, 5) increased risk to water or air quality, 6) hardening of the intertidal zone that reduces forage for shorebirds (and fishes), and 7) increased disturbance of birds using shoreline areas. Accordingly, one of the objectives within the San Diego Bay INRMP is to "*Minimize adverse cumulative effects on habitats and species of the bay ecosystem*", and a number of steps are listed to accomplish that objective, including developing conservation measures for cumulative impacts.

The Navy indicates that the area surrounding Pier 8 is not optimal habitat for FMP species in San Diego Bay due to the existing usage of the facilities, armored shoreline, and historic dredging adjacent to the site. Currently, there are approximately 131 acres of surface structures shading bay waters in the intertidal and subtidal habitats (U.S. Navy and Port of San Diego 2013), and the proposed project would result in an increase in overwater coverage of 1.86 acres. Therefore, this overwater expansion represents a 1.4% increase above the current, degraded habitat condition baseline within San Diego Bay. Continued modification of estuarine-marine shorelines

as a result of overwater structures further reduces the ecological functions and services provided by San Diego Bay. Given this context, NMFS does not concur with the Navy's conclusion that there is no adverse effect to EFH from increased areal shading.

As previously discussed, overwater structures directly reduce the amount of light in the aquatic environment, and therefore, may decrease the productivity of San Diego Bay. In addition, the cumulative impacts associated with alterations to natural estuarine habitats and overwater structures can be substantial. Shallow-water estuarine habitats are ecologically important, but have generally been under-valued during the consideration of activities that impact these habitats (Ray 2005). NMFS commends the Navy for recognizing the importance of conserving these habitats within the San Diego Bay INRMP. For instance, the Navy states their intent to, "*Achieve no net loss of structure and function of natural intertidal and shallow subtidal habitats and a long-term net gain in acreage and function,*" and that, "*Aggressive avoidance should remain the primary strategy to avoid loss of natural resource values in the bay.*" Moreover, the San Diego Bay INRMP "*proposes a major change in routine management of the bay's shoreline through baywide planning to improve the habitat value of artificial structures; incentives to improve the habitat value of existing shoreline structures; and conservation and enhancement of the remaining natural shorelines.*" As noted previously, estuarine environments like San Diego Bay provide vital nursery habitat for important commercial and recreational fish species. Without compensation for the degradation of aquatic resources, the proposed activity may be contrary to public interest. Therefore, NMFS believes compensatory mitigation options should be pursued for new or expanded overwater structure projects.

Most compensatory mitigation implemented for impacts to aquatic resources in the marine realm have been based upon reductions in the quantity of a particular habitat (i.e., habitat loss). With the exception of structural habitats associated with primary producers (e.g., seagrass and salt marsh habitat), overwater structures and associated structures generally do not result in a reduction in quantity. Instead, these activities generally result in a reduction in habitat quality. Reductions in quality are inherently more difficult to quantify, and rigorous quantification of reductions in quality may be cost prohibitive for many projects. Therefore, similar to previous EFH consultations for Navy overwater structure projects, NMFS provides a Conservation Recommendation below regarding the development and adoption of a framework for quantifying reduction in quality that incorporates expert opinion from qualified representatives of the Navy, NMFS, and other interested resource agencies as appropriate. It's worth noting that for those projects that do not involve impacts to vegetated habitat, given the reduction in the quality, not quantity, of habitat, NMFS anticipates a mitigation ratio less than 1:1 for most overwater structure projects.

The Navy has rejected previous EFH Conservation Recommendations proposing compensatory mitigation for impacts from increased overwater coverage (e.g., Navy letter re: Pier 21 modifications dated September 8, 2014; Navy letter re: Pier 2 upgrades dated March 5, 2015). In their justification for rejecting compensatory mitigation for the Pier 21 modifications, the Navy cited the Merkel & Associates (2013) wharf shading study that sought to quantify habitat changes from overwater structures. The Navy's interpretation of the wharf shading study was that although there was a change in habitat type, the additional structures would increase fish and invertebrate richness, abundance, and biomass relative to open water and soft muddy bottom habitats. In addition, the Navy stated that light transitivity effects were minimal "*since despite the increase in surface coverage area, light levels adjacent to and underneath older, smaller*

piers were similar to the newer, larger piers." Finally, any hydrodynamic changes were deemed minimal. As a result, the Navy concluded that the wharf shading study, "*clearly demonstrates that there will likely be increases in measureable fisheries and fish production which does not support NMFS statement of anticipated reduction in quality of habitat.*" NMFS may provide additional comments from our review of Merkel & Associates (2013) in the future, but in the meantime, we note that we do not consider this study to be a comprehensive evaluation of all potential habitat impacts from overwater structures. Overall, we believe the study has significant limitations and does not support the conclusions that were made regarding impacts to EFH. Some of our specific concerns relate to: 1) study design (e.g., manipulation of more than one independent variable, insufficient replication, inappropriate transect placement); 2) important factors not considered (e.g., facilitation of non-native species, changes in predator/prey dynamics); and 3) interpretation of results [e.g., the study concludes that addition of overwater structures increases invertebrate richness, density and biomass, yet only one of eighteen Tukey's post-hoc tests and one of three analysis of variance tests supporting this claim were significant ($\alpha = 0.05$)]. NMFS believes the Navy should consider the best scientific information available regarding the impacts of overwater structures rather than reliance upon a study of limited scope and power.

The EFH Programmatic Consultation for Overwater Structures includes a comprehensive effects analysis based on a larger body of literature, which, at the time of release, was believed to represent the best scientific information available (NMFS 2013, pp. 13-32). NMFS also notes that under the EFH regulations, based on the definition of "*necessary*," EFH is the "*habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem*." In other words, NMFS has already made the finding in its designation of EFH that the protection of habitat quality and quantity in this area is necessary to support the fishery and ecosystem. Therefore, given the extensive literature providing evidence of impacts to EFH from overwater structures, the previously stated concerns with the Merkel & Associates (2013) study, and the absence of adequate literature supporting the conclusions from that report, NMFS does not consider the Merkel & Associated (2013) study to be adequate scientific justification for rejecting compensatory mitigation to offset impacts from increased overwater coverage.

<u>EFH Conservation Recommendations</u>

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for various federally managed fish species within the Pacific Coast Groundfish and Coastal Pelagic Species FMPs. Therefore, pursuant to section 305(b)(4)(A) of the MSA, NMFS offers the following EFH Conservation Recommendation to avoid, minimize, mitigate, or otherwise offset the adverse effects to EFH.

1) Due to an anticipated reduction in quality of habitat associated with the expanded overwater structures, compensatory mitigation may be warranted. The Navy should coordinate with NMFS and other interested resource agencies to develop and adopt a framework for quantifying reduction in habitat quality that incorporates all available relevant information, including expert opinion from qualified representatives of these agencies. The framework could then be used to develop an appropriate compensatory mitigation plan to address the 1.86 acre increase in overwater coverage, as well as related projects in the future. Compensatory mitigation options to consider include, but are not limited to, removing an existing overwater structure, restoring armored

shoreline to its original soft-bottom inter- and subtidal habitats, developing an overwater structure coverage ledger to ensure no net increase of overwater coverage within Naval facilities in San Diego Bay, and/or using credits from the Navy's San Diego Bay Eelgrass Mitigation Bank. If the Navy ultimately concludes compensatory mitigation is not appropriate for this project, the Navy should describe the overwater coverage threshold in San Diego Bay for which an exceedance would trigger the need for compensation.

Statutory Response Requirement

Please be advised that regulations at section 305(b)(4)(B) of the MSA and 50 CFR 600.920(k) of the MSA require your office to provide a written response to this letter within 30 days of its receipt and at least 10 days prior to final approval of the action. A preliminary response is acceptable if final action cannot be completed within 30 days. Your final response must include a description of measures to be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH Conservation Recommendation, you must provide an explanation of the reasons for not implementing that recommendation. The reasons must include the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

Supplemental Consultation

Pursuant to 50 CFR 600.920(l), the Navy must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendation.

Fish and Wildlife Coordination Act Comments

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development [16 U.S.C. 661]. The FWCA establishes a consultation requirement for Federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage [16 U.S.C 662(a)]. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources. The FWCA allows the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the MSA.

As described in the EFH effects analysis, NMFS has determined that estuarine habitat will be negatively impacted by proposed project activities. Given the importance of this habitat to a variety of fish and wildlife species, the Conservation Recommendation provided above to avoid or minimize adverse effects to EFH is also considered necessary to address negative impacts to fish and wildlife resources managed under the FWCA.

Marine Mammal Protection Act Comments

Common marine mammal species that may be found in the project area include California sea lions (*Zalophus californianus*) and Pacific harbor seals (*Phoca vitulina*). Marine mammals are protected under the Marine Mammal Protection Act (MMPA) (16 U.S.C. § 1361 et. seq.). Under the MMPA, it is generally illegal to "*take*" a marine mammal without prior authorization from NMFS. "*Take*" is defined as harassing, hunting, capturing, or killing, or attempting to harass, hunt, capture, or kill any marine mammal. Except with respect to military readiness activities and certain scientific research conducted by, or on behalf of, the Federal Government, "*harassment*" is defined as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal in the wild, or has the potential to disturb a marine mammal in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

During the monitoring associated with this proposed project, the Navy should note marine mammal presence and behaviors indicative of potential harassment. The use of protocols for marine mammals described earlier for sea turtles should help minimize the potential for marine mammal harassment or injury under the MMPA resulting from this additional proposed activity. NMFS requests that the Navy carefully record the behavior of any marine mammals that do occur within the project area. If the project disturbs marine mammals, the Navy should cease activity and contact NMFS before proceeding further. In the unlikely event of an injury or mortality of a marine mammal due to this project, please immediately contact our regional stranding coordinator, Justin Viezbicke, at (562) 980-3230.

Thank you for consulting with NMFS and consideration of our MMPA comments. If you have any questions pursuant to this letter or other ESA, EFH, or MMPA issues, please contact Dan Lawson at (562) 980-3209 or Dan.Lawson@noaa.gov, Eric Chavez at (562) 980-4064 or Eric.Chavez@noaa.gov, or Monica DeAngelis at (562) 980-3232 or Monica.DeAngelis@noaa.gov, respectively.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

cc: Administrative File: 151422WCR2015PR00170

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17 March 2016

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
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SAN DIEGO, CA 92132-5190

5090
Ser OPUE20.LS/30
March 17, 2016

Regional Administrator
National Marine Fisheries Service
Southwest Regional Office
501 West Ocean Boulevard
Long Beach, CA 90802-4213

Dear Mr. Stelle:

SUBJECT: ENDANGERED SPECIES ACT INFORMAL CONSULTATION AND ESSENTIAL FISH HABITAT ASSESMENT FOR MILITARY CONSTRUCTION PROJECT (MILCON)P-440 PIER 8 REPLACEMENT NAVAL BASE SAN DIEGO, SAN DIEGO, CALIFORNIA

The Navy sent a letter to NOAA Fisheries (NOAA) on 18 February 2015 requesting concurrence of our finding of "may effect but not likely to adversely affect" the endangered green sea turtle (Chelonia mydas [GST]) as a result of the subject project. The Navy also requested concurrence of our finding that the subject project may have localized and temporary adverse effects on Essential Fish Habitat (EFH) for federally managed fish species within the Coastal Pelagic Species and Pacific Coast Groundfish Fisheries Management Plans (FMPs). The Navy's EFH Analysis included the site specific data included in the Wharf Shading Study, Navy 2014. On 22 June, 2015 the Navy received comments from NOAA regarding the subject Project. Overall NOAA generally supported the avoidance and minimization measures provided in our ESA, MMPA and EFH informal consultations. However, NOAA requested that the Navy would be better served in this consultation by selecting one preferred alternative. For this reason, the Navy provided a follow-up informal consultation letter 22 October, 2015 that analyzed a single preferred alternative, the construction of a conventional pier. The Navy then received NOAA's response letter dated 19 January, 2016 which the Navy understood to convey that NOAA concurred with the Navy's finding of "may effect but not likely to adversely affect" GST under ESA which includes the avoidance and minimization measures included in the consultation letter. The Navy also understands that NOAA agrees with our approach to avoid, minimize and implement monitoring protocol established for GST to avoid any potential "harassment" to any marine mammals protected under the Marine Mammal Protection Act (MMPA). Finally, the Navy understands the NOAA believes the EFH adverse effect as a result of the pier replacement project at Naval Base

San Diego (NBSD) rises to the level impact warranting compensatory mitigation. The Navy has reviewed NOAA's analysis and reasoning for the request of mitigation and respectfully disagrees with that finding. The Navy's EFH analysis and findings remain the same as described in the first Navy letter and EFH Analysis sent on 18 February, 2015 and our subsequent letter sent on 22 October, 2015.

Naval Base San Diego (NBSD), requests to finalize Essential Fish Habitat (EFH) Assessment as required by the Magnuson-Stevens Fishery Conservation and Management Act.

The project consists of in-water pile driving, demolition and construction and is located at Pier 8 on NBSD.

The purpose of the Proposed Action is to address the current and increasing shortfall at NBSD of pier infrastructure necessary to support modern Navy ship classes with deep draft-power and power intensive requirements. The U.S. Navy proposes to demolish Pier 8, which is considered to be inadequate due to deteriorating physical condition and lack of necessary modernized infrastructure (e.g., electrical utilities). A new Pier 8 and associated pier utilities would be constructed at the same location as the existing Pier 8 at NBSD. No new ship homeporting actions are specifically planned in association with the proposed project.

PROJECT DESCRIPTION - Conventional Pier

The proposed conventional pier will be a single-deck, concrete berthing pier that is 117 ft wide by a length of 1,600 ft (Table 1). This sized pier is needed to accommodate berthing requirements for four modern-sized ships. Construction would take approximately 11 months.

Approximately 512 concrete octagonal structural piles, four 24-inch concrete octagonal loadout cradle piles, and 204 concrete and composite square fender piles would be installed using a floating crane and diesel hammer (pile driver) (NAVFAC Southwest 2014). The structural piles would be 24 inches in diameter. The concrete/composite fender piles would be 24 inches square. Two hundred and thirty 14-inch diameter round plastic fender piles would also be installed with the pile driver, of a similar length. The average length of all the piles in the water column would range from 20.5 to 26 ft.

The use of concrete, composite, and plastic piles in lieu of creosote-treated wood pilings is consistent with Navy policy and is preferred by the Regional Water Quality Control Board (RWQCB) because, unlike creosote-treated wood pilings, they are not a potential source for polycyclic aromatic hydrocarbons (PAHs) to the bay. The total number of piles installed for the Conventional Pier would be approximately 950.

Table 1 Comparison of Pier 8 Preferred Alternative and Existing Pier

Specifications	Conventional Pier (Preferred Alternative)	Existing Pier 8 (No-Action Alternative)
Length (feet)	1,600	1,610
Width (feet)	117	66
Height (feet mean lower low water level)	12.0 at quaywall sloping up to 17.0 at the end	12.0 for entire length (approximately)
Bay Shading (acres)	4.30	2.44
Total Number of Piles	950	2,173
Days of Pile Driving	190	None
Total Length of Piles in Water Column (feet)	22,181	44,546
Total In-Water Surface Area (square feet)	153,411	279,360
Change in Total In-Water Surface Area from Existing Pier 8	45 percent reduction	no change
Electrical Capacity: Ship-to-shore Power	Replace 14 kilovolt cables and upgrade to 4 sets of 750,000 Circular Mils 15 kilovolt cables. Support future upgrade from 480 volts to 4,160 volts to meet future power-intensive Fleet requirements.	No upgrade: remain at 480 kilovolts, unable to supply the power required for power-intensive vessels.

Legend * Surface areas for Conventional Pier option and Existing Pier 8 include only the indicated number of piles.

The fender system for the Conventional Pier option would include 24 foam-filled fenders at the berths and plastic log camels, and would comply with current seismic standards. Pile installation would occur during an approximately 11-month period.

These changes, along with the higher elevation and fewer pilings of the Preferred Alternative versus the existing pier as described in Table 1 will greatly improve water quality and benthos quality under and around the new pier.

The pier deck would be constructed on-site of rebar-reinforced concrete. Deck support would be by pre-stressed concrete (structural) piles with cast-in-place concrete pile caps and a concrete deck structure.

Construction would temporarily increase turbidity and noise in the area. The amount of vessel traffic is not expected to change with the new pier, but modern Navy vessels would be better accommodated by the new pier.

Improvements for the new Pier 8 would include a stormwater collection system with an oil-water separator (OWS) and copper and zinc treatment to meet current National Pollutant Discharge Elimination System (NPDES) permit requirements. Eliminating these sources of pollutants which are highly toxic to phytoplankton, ichthyoplankton and all benthic communities will greatly improve primary and secondary production in this portion of the bay. These benefits far outweigh any need for mitigated compensation for the new pier versus the no action alternative.

Additional improvements which will serve the important role San Diego Bay plays in the national defense mission far into the future are the addition of structural capacity for a 150 ton crane. New pier utilities which would include potable water; wastewater; compressed air; steam; and compensating water systems. Additional ship-to-shore utilities would include: electrical; telephone; cable television; fiber optic communications; Supervisory Control and Data Acquisition system for energy monitoring and control; and fire alarms (NBSD 2012). The project would support a future upgrade of ship-to-shore power from 480 volts to 4,160 volts to meet future power-intensive Fleet requirements (e.g., for guided missile destroyers-(DDG-1000) and multi-purpose amphibious assault ship (LHA-8) classes that are planned for berthing at the new Pier 8) by providing two new electrical vaults and spare six-inch ducts-conduits. However, the future ship-to-shore power upgrade is not included in the Proposed Action. In addition, the project would require replacing the 15 kilovolt cables from the existing Pier 8 and upgrading to four sets of 750 thousand Circular Mils 15 kilovolt cables.

EFH Analysis

Provided in our letters of 18 February 2015 and 22 October, 2015 was the Essential Fish Habitat (EFH) Assessment as required by the Magnuson-Stevens Fishery Conservation and Management Act. As described in the effects analysis, the Navy has determined that the project may have localized and temporary adverse effects on EFH for federally managed fish species within the Coastal Pelagic Species and Pacific Coast Groundfish FMPs. However, the project contains adequate measures to avoid and minimize potential adverse effects to EFH.

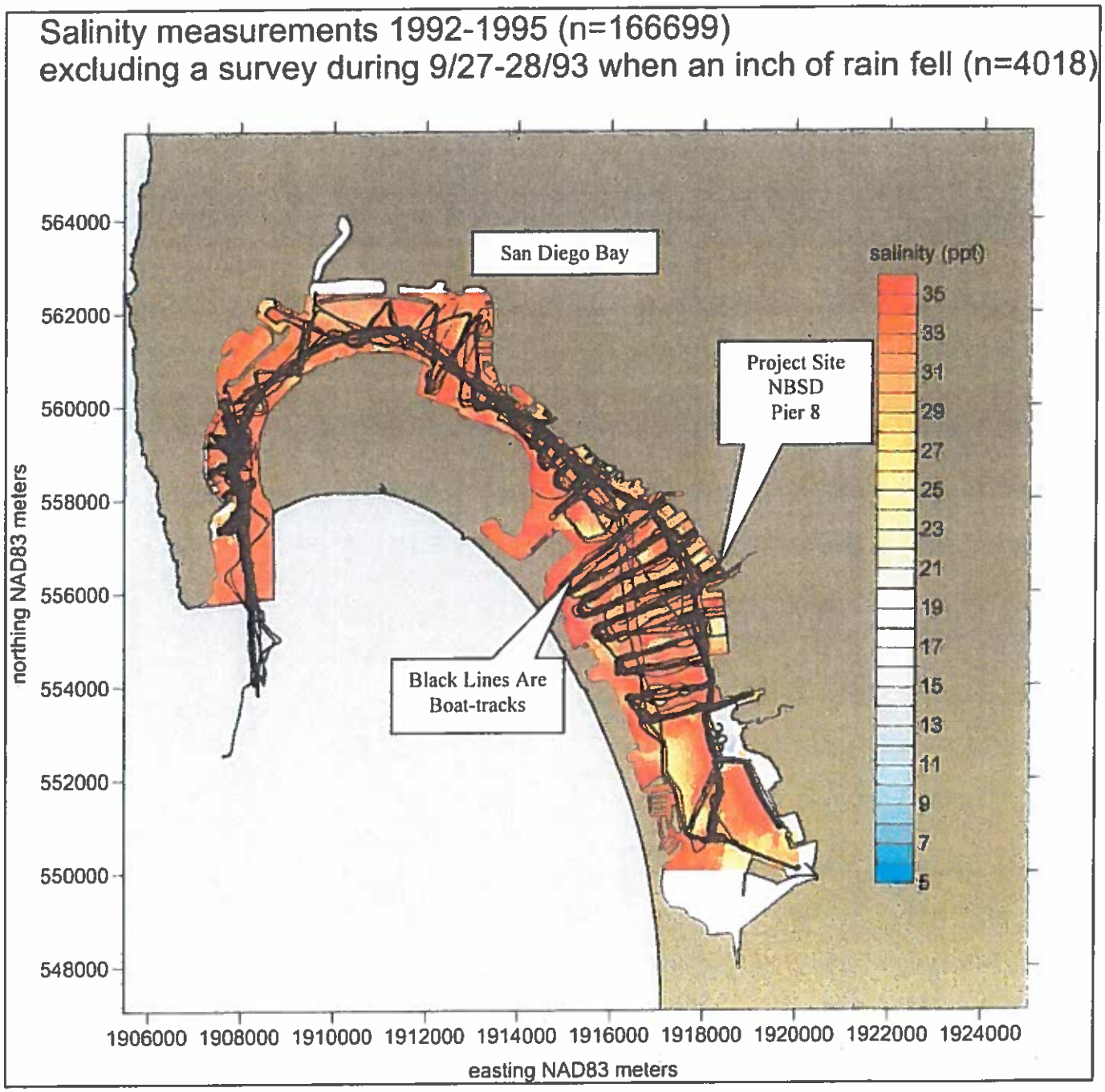
The Navy reviewed NOAA's concerns of the project and its' potential effects to EFH and offers the following comments.

1. NOAA is basing their effects assessment on the assumption that the project area is located within a habitat area of particular concern (HAPC) within Essential Fish Habitat for various federally managed fish species within the Pacific Coast Groundfish FMP. Although the Navy has no issue with the EFH designation of all of San Diego Bay including the Project Site, the determination that the habitat at the project site (which is the Homeport to the Pacific Fleet) occurs in an estuary and therefore an HAPC is a flawed assumption. The Pacific Coast Groundfish Fishery Management Plan (FMP) describes estuaries as, bays, sounds, inlets, and river mouths, influenced by ocean and freshwater that tends to be shallow, protected, nutrient-rich, and are biologically productive. It also states that the defining characteristic of the estuary (HAPC)is the Mean Higher High Water MHHW, or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.

As discussed in the EFH Analysis, the project site is located in the middle of a 13 pier shoreline that makes up Naval Base San Diego, in addition to the multiple ship building and repair facilities adjacent and to our north which occupy similar habitat. The average depth in this area ranges from -30 to -43 feet deep with a soft bay bottom and no submerged aquatic vegetation. The Navy's EFH Analysis and Wharf Study determined the project site to be low in productivity as compared to other eco-regions of the bay and within the Projects own south-central eco-region. The shoreline is a 1:1 fortified slope or quaywall. During a bay-wide water quality study from 1992-95, the Navy collected over 170,000 records of temperature, pH and salinity

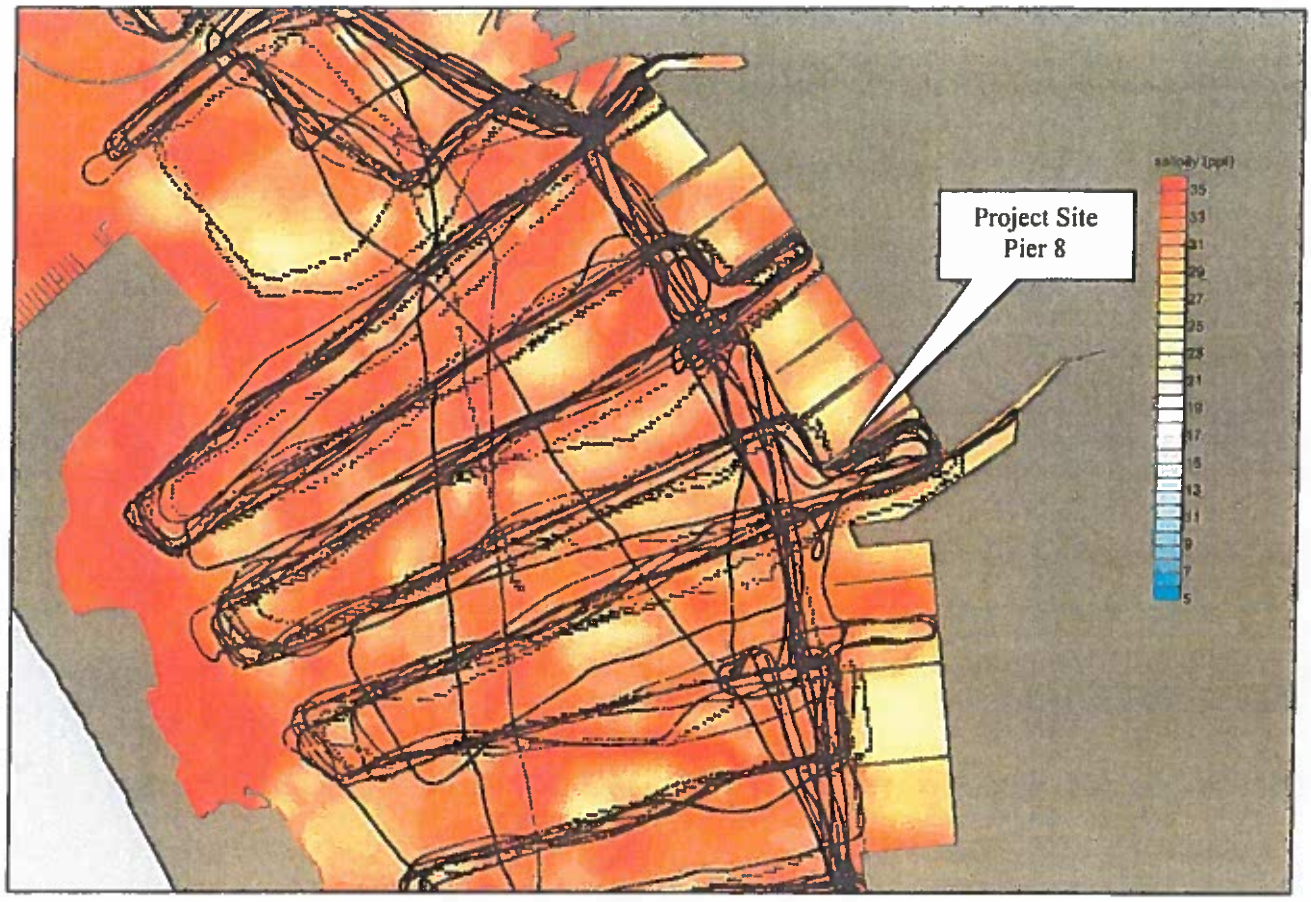
(Figure 1). Data points where recorded throughout NBSD including the Project Site (Figure 2). The salinity at the Project Site averaged at 30.0 ppt compared to the 0.5 ppt salinity for an estuary as defined in the FMP.

Figure 1



US Navy 1992-5, Ken Richter, SSC Pacific

Figure 2



US Navy 1992-5, Ken Richter, SSC Pacific

Based on the data above and the information provided in the EFH Analysis and Wharf Study, the Navy does not believe the waters surrounding Pier 8 at NBSD meet the definition of an estuary and therefore is not an HAPC. The FMP states that mapping only offers a first approximation of HAPC locations and that specific mapping of the areas of interest are required.

2. NMFS describes the adverse effects in terms of current degraded habitat; however, San Diego Bay is 17 square miles in surface area or about 11,000 acres at mean lower low water. An increase in surface coverage of 1.86 acres represented by this project results in 0.000169 percent increase of bay surface coverage over already degraded habitat that will greatly benefit from the modern design attributes of the new pier. This is a truly insignificant and minimal effect on the bay's overall habitat and productivity. Concurrently, our original Eelgrass

mitigation Bank (Bank) currently has 13.12 acres of available eelgrass habitat.

The last Navy Eelgrass Mitigation Site (NEMS) within the Bank met its success criteria in 2007. Therefore, these 13.12 ac of created eelgrass beds have been providing habitat for juvenile fish and providing overall primary production in the Bay for the past 9 years. Although the Bank Instrument allows for spatial credits, the Navy has not received nor sought credit for the temporal primary production credits discussed above.

3. Additionally, the Navy's Eelgrass Mitigation Bank has proven to be an immense success for both agencies in our shared stewardship of San Diego Bay. The Eelgrass beds have resulted in extensive expansion of eelgrass in and around the bay to the point that eelgrass can now be found at depths not seen in the past, increasing productivity, fishery nursery habitat, and water quality in San Diego Bay. This Bank was designed by both agencies to help mitigate for future defense requirements of the Navy and improve the habitat of San Diego Bay. It has served both missions well and continues to provide a growing and sustainable habitat enhancement affect to San Diego Bay.

4. The Navy agrees with NOAA on the HAPC status of eelgrass beds and mudflats in San Diego Bay and has partnered with NOAA over the past 30 years to map these areas. The Navy has mapped the area at Pier 8 and control sites as described in the Navy's Wharf Study and has determined that the Pier 8 site does not meet the HAPC definition.

5. Although not required, the Navy has reviewed and incorporated all feasible recommendations from the EFH Programmatic Consultation for Overwater Structures between NMFS and the U.S. Army Corps of Engineers, Los Angeles District, South Coast Branch.

6. The San Diego Bay Integrated Natural Resources Management Plan (INRMP) is a guidance document that has allowed the Navy and the Port of San Diego to plan a long term managed program to improve the habitat of San Diego Bay. Both the Port and the Navy have used this document to guide our activities and have accomplished a great deal of the work following the intent of the INRMP. The Navy must continue to improve our facilities using the INRMP and the best of intentions to meet our national defense needs while improving San Diego Bay habitats. The Navy complies with the INRMP while still adapting to national defense

fleet modernization requirements including the Navy's overall pivot to the Pacific to face increased threats and an increasing need to homeport larger and more advanced ships and hardware to San Diego Bay.

Although the Navy and NOAA disagree on the magnitude of EFH effect at the deep-water Pier 8 Project Site, we do believe that other increases in over-water structures in intertidal and shallow subtidal above -10 MLLW with gradual 20:1 slopes may have a significant effect on EFH and are worthy of future definition and discussion with NOAA. It is in this shallow water arena where we think both the Navy and NOAA can best work together to improve and protect high risk productive zones that will better serve San Diego Bay and the mission of the Navy and our shared stewardship of this valuable resource.

If you have any questions, please feel free to contact Ms. Lisa Seneca, NEPA Planner, at (619) 556-9167 (Lisa.Seneca@navy.mil), or Mr. Mitchell A. Perdue, Project Biologist, at (619) 556-7187 (mitchell.perdue@navy.mil).

Sincerely,

Richard J Basinet

RICK BASINET
Environmental Business Line Team Leader
By direction of the
Commanding Officer

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Coastal Consistency Negative Determination

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CALIFORNIA COASTAL COMMISSION
45 FREMONT, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE (415) 904-5200
FAX (415) 904-5400
TDD (415) 597-5885

December 19, 2014

Commander James J. Cho
Public Works Officer
Naval Base San Diego
3455 Senn Road
San Diego, CA 92136-5084

Subject: Negative Determination ND-0044-14 (Replacement of Pier 8, Naval Base San Diego, San Diego County)

Dear Commander Cho:

The Coastal Commission staff has reviewed the above-referenced negative determination for the replacement of Pier 8 at Naval Base San Diego (NBSD). The Navy states that the project is necessary in order for NBSD to support modern Navy ship classes with deep drafts and large power requirements, and will provide modern berthing, logistics, maintenance, and utility support for ships homeported in the San Diego region. The replacement pier will provide two outer berths for modern Navy vessels comparable in size to amphibious assault ships, and two inner berths for smaller ships such as guided missile destroyers. The project consists of: (1) demolishing the 50-year-old Pier 8 and disposing all pilings, debris, and other materials at an off-site location; (2) constructing a new pier at the same location using a conventional piling-supported pier design or a floating modular hybrid pier design; and (3) installation of utility infrastructure on the pier, including water, wastewater, and electric power lines. The Navy expects demolition and construction to take approximately 21 months in 2017 and 2018.

The Navy has not yet selected the pier design to be used in the Pier 8 replacement project and is requesting concurrence with both design options. The existing single-deck Pier 8 is 66 feet wide, 1,610 feet long, is supported by 2,173 timber pilings, and shades 2.44 acres of bay water. The proposed conventional pier would be constructed as a single-deck, concrete pier 117 feet wide and 1,600 feet long, would be supported by 950 concrete pilings, and would shade 4.3 acres of bay water. The proposed modular hybrid pier would consist of five 90-foot-wide, double-deck floating concrete modules constructed off-site, towed to the Pier 8 site, and connected to mooring shafts and 96 concrete pilings to create a 1,560-foot-long pier. The double-deck design would separate utilities on the lower deck from crane, vehicle, and maintenance operations on the upper deck. This floating pier design provides for a narrower pier and reduced shading of bay water (3.22 acres) compared to the conventional pier.

Under the federal consistency regulations, a negative determination can be submitted for an activity "which is the same as or similar to activities for which consistency determinations have

been prepared in the past." The proposed project is similar to previously concurred with consistency and negative determinations for adjacent pier replacement and construction projects at NBSD (CD-031-01 and ND-011-11).

The Navy reports that the proposed project contains and is consistent with the water quality and marine resource avoidance, monitoring, and mitigation commitments agreed to under the Commission's concurrence with demolition of Piers 10 and 11 and construction of a single replacement pier (CD-031-01) and the Executive Director's concurrence with the demolition of Pier 12 and construction of a replacement pier (ND-011-11). A stormwater pollution prevention plan will be implemented to minimize water quality degradation from demolition and construction activities by using site-specific best management practices, standard erosion control measures, and spill prevention and containment measures to avoid or minimize the potential for accidental release of debris or fuels during construction. Special construction features for the replacement pier would include installation of a stormwater collection system with an oil-water separator to meet current National Pollutant Discharge Elimination System permit requirements.

No dredging would occur with this project. Disturbance of bottom sediments during removal of existing timber pilings and installation of new concrete pilings would cause a temporary increase in turbidity in the waters adjacent to the pier. The Navy will implement turbidity control measures to ensure that resuspension of bottom sediments into the water column during construction are confined to the immediate project area. The project area does not support eelgrass beds nor does it include nesting or foraging habitat for listed species. Pile driving could temporarily disturb fish, marine mammals, and sea turtles in the immediate vicinity of the project site. To minimize potential impacts to these species, the project includes monitoring and minimization measures to avoid exposing marine mammals and sea turtles to excessive noise from pile driving.

The proposed pier would result in a small increase in bay coverage over the existing pier – 1.86 acres for the conventional pier option and 0.78 acres for the modular hybrid pier option. The Navy reports that the San Diego Bay Integrated Natural Resources Management Plan (INRMP) was updated in 2013 and concurred with by the U.S. Fish and Wildlife Service (USFWS). The Navy stated that the INRMP included an analysis of wharf shading of San Diego Bay waters and found that "newly designed Navy replacement piers and overwater structures provide different but still beneficial habitat thus having a positive benefit to the ecosystem." Notwithstanding the increase in bay water shading, the removal from the bay of the 2,173 timber pilings that support the existing Pier 8, and the reduced number of pilings required for both replacement pier options, will significantly improve marine habitat at the project site over current conditions.

The project will not adversely affect public access or boating recreation. The pier area is currently off limits to public access and boating for military security and public safety reasons, and the replacement pier would not create additional burdens on public access or recreation. The replacement of Pier 8 with either design option would not adversely affect the visual characteristics of the area and would be compatible with adjacent piers at NBSD. The industrial nature of NBSD, when viewed from either San Diego Bay or adjacent upland areas, would remain unchanged with construction of the replacement.

In conclusion, the Commission staff **agrees** that with the monitoring, avoidance, and mitigation measures the Navy has incorporated into the proposed Pier 8 replacement project (both the conventional and modular hybrid pier design options), the project will not adversely affect coastal resources, and that with these commitments the project is similar to previously concurred with consistency and negative determinations for pier replacement projects at NBSD. We therefore **concur** with your negative determination made pursuant to 15 CFR 930.35 of the NOAA implementing regulations. Please contact Larry Simon at (415) 904-5288 should you have any questions regarding this matter.

Sincerely,

(for) CHARLES LESTER
Executive Director

cc: CCC – San Diego Coast District
U.S. Fish and Wildlife Service
National Marine Fisheries Service
U.S. Army Corps of Engineers

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DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAVAL BASE SAN DIEGO
3455 SENN RD
SAN DIEGO, CALIFORNIA 92136-5084

IN REPLY REFER TO:
5090
Ser N411/U627
16 Oct 14

Mr. Mark Delaplaine
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

Dear Mr. Delaplaine:

SUBJECT: COASTAL CONSISTENCY NEGATIVE DETERMINATION FOR PIER 8 REPLACEMENT AT NAVAL BASE SAN DIEGO

I am submitting this Coastal Consistency Negative Determination (CCND) for Pier 8 Replacement Military Construction (MILCON) P-440 at Naval Base San Diego (NBSD). The proposed project comprises the demolition and replacement of Pier 8 and is needed to address the current and impending shortfall of pier infrastructure at NBSD necessary to support modern Navy ship classes with deep draft and power intensive requirements.

This submittal is in compliance with Section 930.35 (d) of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR 930). The Navy has determined that the proposed project would have no effect to coastal resources for the reasons identified in the enclosure (1).

I request your concurrence on this proposed project. When completed, please email a letter of concurrence to Ms. Deb McKay, Region NEPA Coordinator, at deborah.mckay@navy.mil. If you have any questions or need further information, please contact Ms. Deb McKay at (619) 532-2284.

Sincerely,

JAMES J. CHO
Commander, U. S. Navy
Public Works Officer
By direction of the
Commanding Officer

Enclosure: (1) Coastal Consistency Negative Determination

Coastal Consistency Negative Determination

In accordance with the Federal Coastal Zone Management Act of 1972 as amended, Section 307c(1), the United States Department of the Navy (DoN) has determined that the proposed project, Pier 8 Replacement, Military Construction (MILCON) P-440, at Naval Base San Diego (NBSD) in San Diego, CA will not affect the resources or uses of the coastal zone. Therefore, the Navy has concluded that a Coastal Consistency Determination is not required and is requesting your concurrence with this Coastal Consistency Negative Determination (CCND) in compliance with the Ocean and Coastal Resource Management regulations (15 CFR 930.35).

This project and consultation are consistent with prior pier construction projects at Naval Base San Diego (ND-011-011, CD-031-01, CD-51-94, CD-64-92, and CD-51-87) and at Naval Base Coronado (CD-89-99). In those decisions, the Commission found that Navy activities had either no effect on resources or uses of coastal waters and that the activities complied with water quality, public access and recreation, and environmentally sensitive habitat policies of the Coastal Act or were allowable uses for dredging and filling of coastal waters for pier construction.

An Environmental Assessment has been prepared for this project and will be available for public review soon.

PROJECT DESCRIPTION

The proposed Pier 8 replacement project area is located at NBSD (Figure 1). Pier 8 is located approximately in the center of the NBSD pier complex, just north of the Mole Pier and the Paleta Creek Channel; and extends 1,610 ft into San Diego Bay (Figure 2).

The purpose of the project is to address the current and impending shortfall at NBSD of pier infrastructure necessary to support modern Navy ship classes with deep draft and power intensive requirements. The U.S. Navy proposes to demolish Pier 8, which is considered to be inadequate due to deteriorating physical condition and lack of necessary modernized infrastructure (e.g., electrical utilities). A new Pier 8 and associated pier utilities would be constructed at the same location as the existing Pier 8 at NBSD (Figure 3).

Demolition of existing Pier 8, which is 66 feet (ft) wide by 1,610 ft long, would take approximately 11 months. Typical pier demolition takes place bayward to landward and from the top down. First, the fender piles and exterior appurtenances (such as utilities) would be demolished above and below the pier deck. Then, the deck would be demolished using sawcutting and jack hammering. Subsequently structural piles would be extracted with a vibratory hammer (if needed) and a crane. Throughout the demolition, barge-mounted cranes and scows would be used for the collection and removal of demolition debris.

There are two construction options to replace Pier 8: the Conventional Pier option or the Modular Hybrid Pier (MHP) option. In either case, the new Pier 8 would be constructed in the footprint of the old Pier 8 following demolition.

The Conventional Pier option would be constructed as a single-deck, concrete berthing pier that would be 117 ft wide and 1,600 ft long. The deck would be constructed on-site. This option would represent a net increase in bay shading of about 1.86 acres (0.75 hectare) for total bay shading of approximately 4.30 acres (1.7 hectares), based on an increase in width of 51 ft and a decrease in length of 10 ft as compared to the existing Pier 8.

The MHP option would consist of five double-deck, floating concrete modules that would be constructed at a concrete pre-cast facility and towed to the Pier 8 site where they would be connected to mooring shafts secured by foundation piles. The double-deck design would separate utility pipelines and wiring on the lower deck from crane and maintenance operations on the upper deck. This would allow a lesser pier width. The MHP option would be 90 ft wide by 1,560 ft long compared with the 117-ft width of the single-deck Conventional Pier option. The MHP option would have a smaller footprint (3.22 acres/1.3 hectares) than the Conventional Pier option (4.30 acres/1.7 hectares). With the MHP option, the increase in bay shading over the existing Pier 8 (2.44 acres/0.98 hectares) would be approximately 0.78 acres/0.31 hectare, as compared with approximately 1.86 acres/0.75 hectare with the Conventional Pier option. The MHP option would be moored to steel shafts and would involve minimal pile driving activities: 96 concrete foundation piles (24-inch [61 centimeter] diameter octagonal) would be driven as compared with 950 piles (including foundation and fender piles) for the Conventional Pier option. No fender piles would be driven because the MHP option would use floating foam-filled fenders and internal shock-absorbing rubber fenders between the concrete modules and the mooring shafts. Unlike a conventional pier that stands above the water on fixed piles the deck of the MHP option would float in the water similar to a vessel, leaving no open space between the deck bottom and the water surface (see Figure 4 for notional illustration only-not to scale).

Although either option for the new Pier 8 would be wider than the existing Pier 8, the new pier would be designed and constructed to ensure that vessels can navigate safely within San Diego Bay. The new pier would provide a minimum of two outer end pierside berths for modern Navy ships comparable in size to a Multi-Purpose Amphibious Assault Ship, the largest ship that would be supported by the project. The inner berths would have enough room for two additional modern Navy ships, such as guided missile destroyers. It is estimated that construction would last 10 months and is anticipated to occur from 2017 through 2018.

Table 1 below compares the details of the two construction options against the existing pier.

Table 1 Comparison of Pier 8 Replacement Options and Existing Pier 8

Specifications	Conventional Pier Option	Modular Hybrid Pier Option	Existing Pier 8 (No-Action Alternative)
Length (feet)	1,600	1,560	1,610
Width (feet)	117	90	66
Height (feet mean lower low water level)	12.0 at quaywall sloping up to 17.0 at the end	13.9 – 16.9 (varies with tides)	12.0 for entire length (approximately)
Bay Shading (acres)	4.30	3.22	2.44
Number of Piles	950	96	2,173

Days of Pile Driving	190	20	None
Total Length of Piles in Water Column (feet)	22,181	1,062	44,546
Total In-Water Surface Area (square feet)	153,411	192,093*	279,360
Change in In-Water Surface Area from Existing Pier 8	45 percent reduction	31 percent reduction	no change
Electrical Capacity: Ship-to-shore Power	Replace 14 kilovolt cables and upgrade to 4 sets of 750,000 Circular Mils 15 kilovolt cables. Support future upgrade from 480 volts to 4,160 volts to meet future power-intensive Fleet requirements.	Same as Conventional Pier Alternative.	No upgrade: remain at 480 kilovolts, unable to supply the power required for power-intensive vessels.

Legend *Surface area for MHP Alternative includes surface area of six square mooring shafts; each five feet wide; the submerged deck bottom and sides submerged to depth of 14 ft; and 96 piles. Surface areas for Conventional Pier Alternative and Existing Pier 8 include only the indicated number of piles.

EFFECTS ANALYSIS

As defined in Section 304 of the Coastal Zone Management Act (CZMA), the term "coastal zone" does not include "lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government." NBSD is owned and operated by the Navy. Although the Navy does not own the adjacent submerged lands, it does have navigational servitude (exclusive use) of them due to implementation of a security zone as shown *in National Oceanographic and Atmospheric Administration (NOAA) Nautical Chart 18773: United States West Coast San Diego Bay (2012)* (NOAA Office of Coast Survey 2012). The Navy recognizes that actions outside the coastal zone may affect land or water uses or natural resources of the coastal zone via "spill over" and, therefore, are subject to the provisions of CZMA. The Navy analyzed the impacts of the proposed project on the coastal zone by looking at reasonable foreseeable direct and indirect effects on the coastal use or resources, and reviewing relevant management program enforceable policies and the Coastal Resources Planning and Management Policies (CRPMP).

Public Access (CRPMP Section 30210 *et seq.*) and Recreation (CRPMP Sections 30220 *et seq.*)

This project would not affect public access or boater recreation. The project is located in an industrial area of NBSD where access to the project area is controlled by the Department of the Navy and restricted to military personnel, Department of Defense employees, and authorized contractors. Public access is also restricted in the waters around NBSD due to the U.S. Coast Guard (USCG) Security Zone that encompasses all piers at NBSD. Public access to the project area would remain restricted with implementation of the proposed project. The project would be

compatible with existing adjacent land uses and no changes to public access or recreational opportunities would occur. Therefore, there would be no effect to public access and recreation.

Marine Environment (CRPMP Sections 30230 *et seq*)

The project would have no long-term effects on biological productivity or water quality. A Storm Water Pollution Prevention Plan (SWPPP) would be implemented to minimize water quality degradation from demolition and construction activities by implementing site-specific Best Management Practices (BMPs), standard erosion control measures, and spill prevention and containment measures to avoid or minimize the potential for accidental releases of debris or fuels during construction. Special construction features for the replacement pier would include installation of a stormwater collection system with an oil-water separator to meet current National Pollutant Discharge Elimination System (NPDES) permit requirements.

No increase in human health risk or environmental exposure to hazardous materials or hazardous wastes would result from implementation of the project and no significant effects associated with the use, storage, or disposal of hazardous materials or hazardous wastes would occur.

All contractor-owned hazardous materials and wastes from prior jobs would be removed from Pier 8 before demolition activities begin. Hazardous materials associated with proposed demolition and construction activities would include lead-based paint chips and dust removed from deck hardware and striping; potential asbestos containing material (ACM) insulation on the steam pipeline; the oil in the transformers and switchgear to be removed from Pier 8; fuel and hydraulic fluid contained in heavy equipment, vehicles and vessels performing the overall demolition and construction tasks; and paints to be used on deck infrastructure and deck striping.

Contractors would be required to park their vehicles within an on-shore staging area. No vehicle fueling or maintenance would take place at the project site. Demolition and construction contractors involved with the project would be subject to all federal, state, and San Diego County requirements for hazardous materials and hazardous waste management, and to follow the Navy Region Southwest Hazardous Waste Management Plan (HWMP) for the San Diego Metro Area. The Storm Water Pollution Prevention Plan for Naval Base San Diego (SWPPP) contains basewide and site-specific Best Management Practices (BMPs) to eliminate activities that could release hazardous materials into the surface water. The BMPs for demolition and construction activities include berms around the electrical substations to contain potential oil leaks from the transformers; overpack containers for hazardous materials being loaded onto berthed ships; checking vehicles and equipment for leaks; and having absorbent materials on hand to control spills. Therefore, there would be no effect to the environment from oil and hazardous substances.

No dredging would occur as a part of this project. Disturbance of bottom sediments during demolition and construction would cause a temporary and spatially-limited increase in turbidity. Turbidity due to resuspension of bottom sediments during demolition activities would be short-term and localized to Pier 8 and the nearby Navy piers and unlikely to cause toxic impacts to the water column. Subject to the terms and conditions identified in the project-specific U.S. Army Corps of Engineers Section 404/Section 10 permit, the Navy would deploy precautionary measures to alleviate turbidity associated with demolition and construction activities.

The project region is located within a general area designated as Essential Fish Habitat (EFH) by two Fishery Management Plans, the Pacific Coast Groundfish and Coastal Pelagic Species. Temporary impacts to EFH species may occur from increased suspended sediments and increased noise levels from pier construction activities such as pile driving. However, EFH species are highly mobile and will likely leave the project area during demolition and construction activities and return when these activities are completed. There are no sensitive invertebrate or plant species (including eelgrass (*Zostera marina*)) occurring in the project area. In addition, no habitat for sensitive terrestrial wildlife and no nesting or foraging habitat for any sensitive bird species occurs in the project area. Therefore, no effect on sensitive biological species would occur.

Pile driving would temporarily disturb fish, marine mammals, and sea turtles in the immediate vicinity of the project site. However, fish would be able to move out of the area during project activities and return after in-water project activities are completed; therefore, no significant long-term effects would occur. Marine mammals, protected under the Marine Mammal Protection Act, and green sea turtles (GST), protected under the Endangered Species Act, may be encountered in San Diego Bay and may transit through the project area. However, the likelihood of encountering marine mammals or GST during construction is low and since they are highly mobile they would be able to detect the noise and associated in-water activities and may temporarily avoid the project area. The following avoidance and minimization measures would be implemented during pile driving activities:

- The Navy would perform a visual sweep of the bay within a 384-ft (117-meters [m]) radius prior to commencing pile driving activities, and after a break in pile driving for more than 30 minutes.

- If any marine mammals or green sea turtles are seen within this visual range, the Navy would not commence pile driving activities until 15 minutes have passed since the last such sighting, or the animal has moved out of the established range.

- If a marine mammal or green sea turtle moves within the established range while pile driving activities are occurring, such activities would cease until the animal moves out of the area.

- Prior to the start of pile driving each day, after each break of more than 30 minutes, and if any increase in the intensity is required, the Navy shall use a ramp-up procedure. The procedure involves a slow increase in the pile driving to allow any undetected animals in the area to voluntarily depart.

Given the low levels of disturbance and limited abundance of these animals in the project region, project activities are not expected to adversely affect marine mammals or sea turtles. Therefore, implementation of the Proposed Action would not have a significant effect on these species.

The project would have no long-term adverse effect on threatened or endangered species and only short-term, localized, and less than significant effects to marine habitats, invertebrates, fish, marine mammals, and sea turtles in the project vicinity.

Land Resources (CRPMP Section 30240 *et seq.*)

The project area falls under the coverage of the Naval Base San Diego Programmatic Agreement (NBSD PA) executed in May 2014 between Commanding Officer, NBSD, the Advisory Council on Historic Preservation, and the California State Historic Preservation Officer. In conformance with Stipulation 8A of the NBSD PA, the Cultural Resource Management Program (CRMP) has determined that the proposed action will not affect listed, contributing or eligible National Register of Historic Places (NRHP) properties. Consistent with 36 CFR 800.4(d)(1), the CRMP has accordingly made a determination of "no historic properties affected" for the proposed action.

Although Pier 8 is more than 50 years old, the 1999 "Inventory and Evaluation of National Register of Historic Places Eligibility for Cold War Era Buildings and Structures on Naval Station, San Diego" recommended that this pier does not meet the criteria for listing in the National Register. Similarly, the Naval Station San Diego Historic District was reevaluated in 2007 and the individually-eligible Dry Dock No. 1 lies well beyond the 100 meter area of potential effect (APE) buffer prescribed in the NBSD PA. In addition, construction lay-down/staging areas would not encroach within 100 meters of the Historic District or Dry Dock No. 1. Furthermore, because the project area is located in an area created by backfilling tidelands with excavated material, there is no potential for the buried presence of prehistoric archaeological deposits. Therefore, no effects to cultural resources would occur, and no historic properties would be affected by demolition or construction activities.

Development (CRPMP Section 30250 *et seq.*)

The replacement of Pier 8 under the Proposed Action would be compatible with surrounding piers and would not alter the visual characteristic of the area. With the Conventional Pier option, the new Pier 8 would be constructed to be approximately the same height (12.0 ft mean lower low water level at the quaywall sloping up to 17.0 ft mean lower low water level at the bayward end of the pier). The height of the MHP option would vary with the tides from 13.9 to 16.9 ft mean low lower water level. Since the MHP is a floating pier, ships that are docked at the pier would respond equally to tidal conditions and, therefore, the ship and pier deck elevation would remain constant relative to one another. The difference in height between either the Conventional Pier option or the MHP option and existing pier (ranging from approximately 0 ft to 5 ft) is minor and, when viewed as one of a suite of piers within the bay, would be compatible with surrounding piers and would not alter the visual characteristics of the area. In addition, either the Conventional Pier option or the MHP option would have the same general appearance as the existing Pier 8 and therefore, would blend in with the suite of piers that occupy the bay. The 20-ft-high security watchtower that would be constructed along with the new Pier 8 would stand higher than the parking areas near the quay wall. However, the visual setting for the tower would be large Navy vessels that would frequently be docked at the pier, and the multi-story industrial buildings that are set back from quay wall and piers. Views within the San Diego Bay area would remain consistent with the military and industrial nature of the surrounding area. Therefore, no effects to visual resources would occur as a result of the project.

The estimated emissions associated with the either the Conventional Pier option or the MHP option would be below the de minimis threshold levels for conformity. In addition, estimated

emissions would not be regionally significant, as they would be substantially less than 10 percent of the VOC, NOx, and CO emissions estimated for the San Diego Air Basin (SDAB). Therefore, either the Conventional Pier option or the MHP option would conform to the SDAB State Implementation Plan and would not trigger a conformity determination under Section 176(c) of the CAA. The Navy has prepared a Record of Non-Applicability (RONA) for CAA conformity in accordance with Navy CAA Conformity Guidance, OPNAV M-5090.1.

CONCLUSION

In accordance with the Federal Coastal Zone Management Act of 1972, as amended, Section 307 (c)(1), the Coastal Consistency Negative Determination demonstrates that the proposed action will be undertaken in a manner as to not affect coastal uses or resources. The Navy respectfully requests your concurrence. If you need additional information, or if you have any questions, please do not hesitate to contact Deb McKay at (619) 532-2284 or email at deborah.mckay@navy.mil.

Figure 1: Vicinity Plan

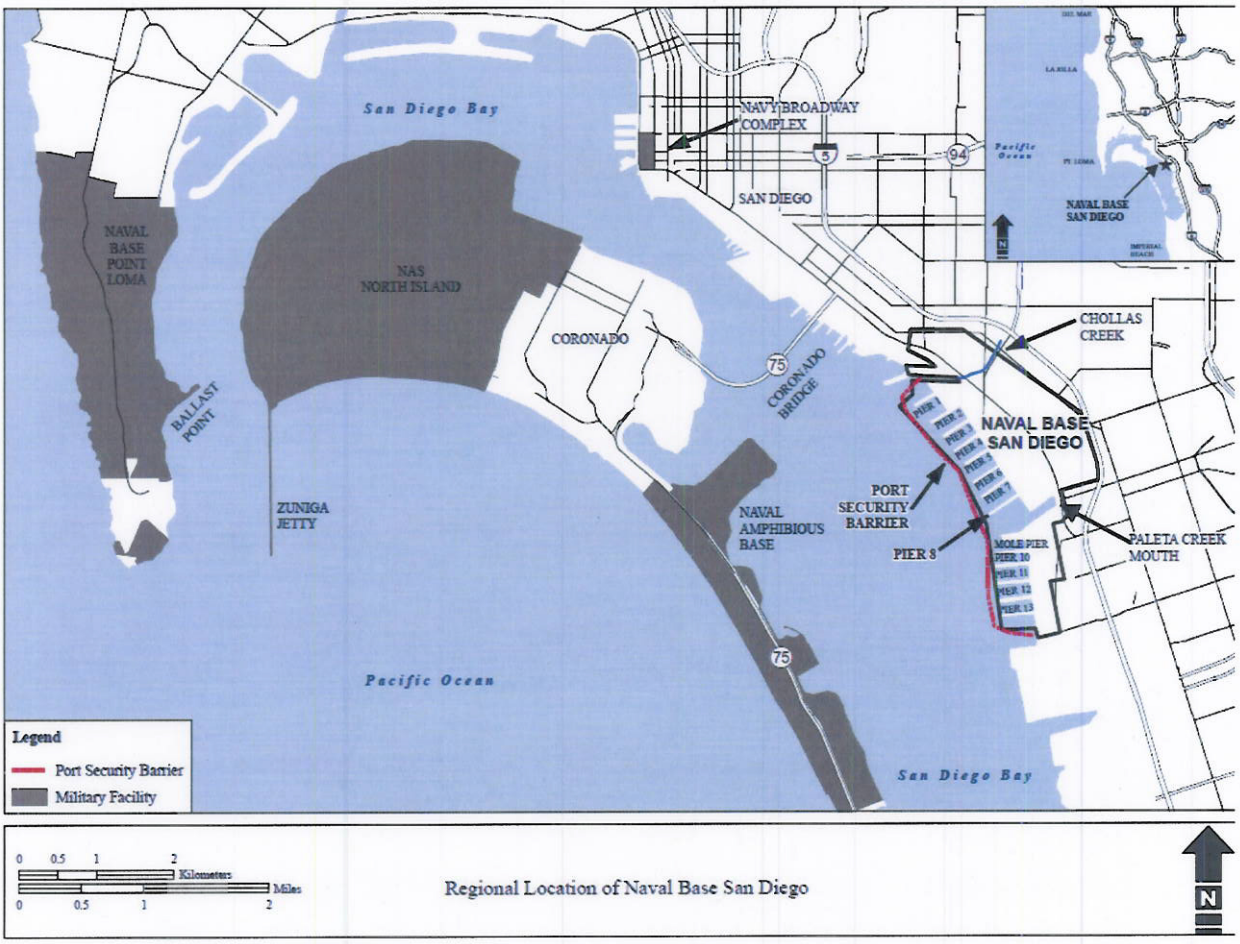


Figure 2: Map of NBSD Piers – Project Location

Figure 3: Site Plan – with Both Options

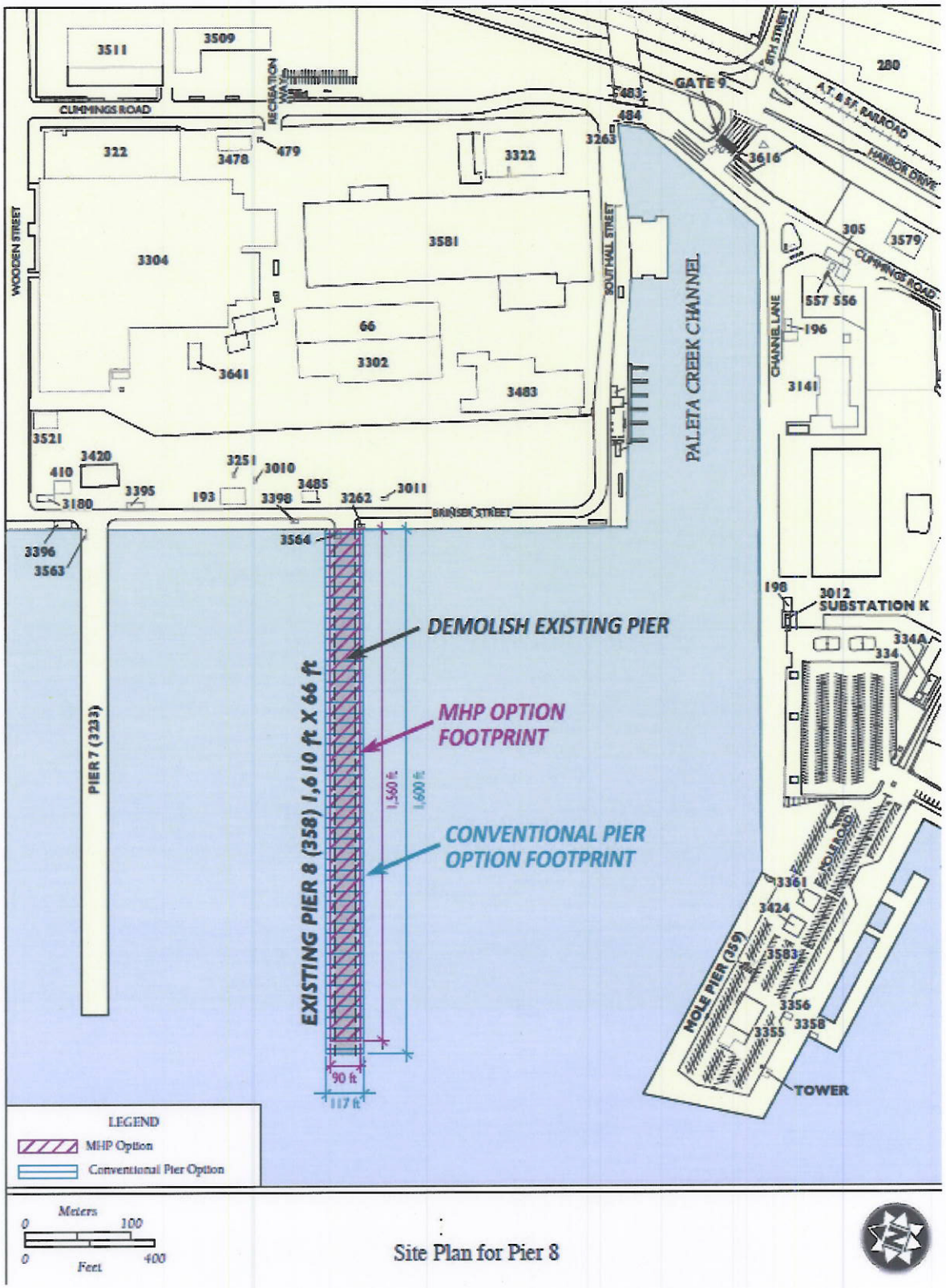
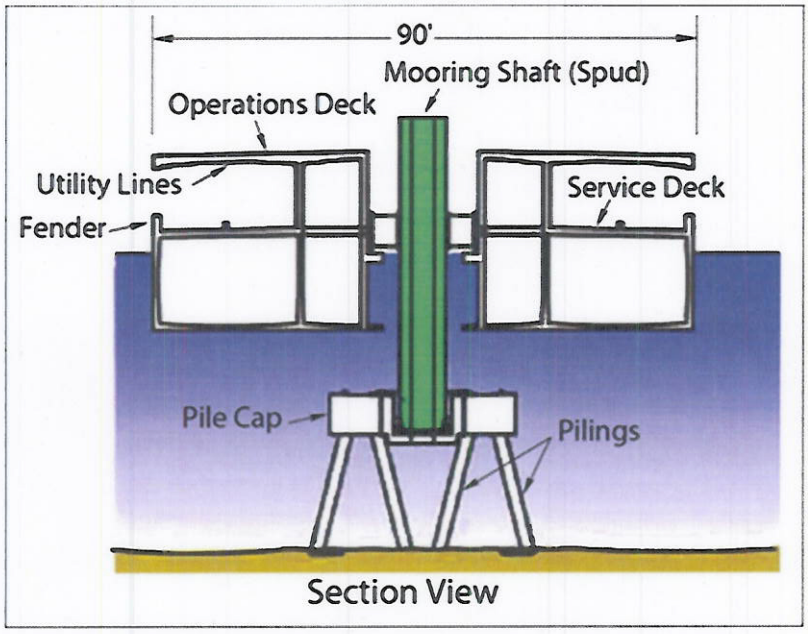


Figure 4: MHP Mooring Shaft and Pile Dolphin (cap)

(Notional Illustration Only-not to scale)



Appendix B

Water Quality Monitoring Report

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3 March 2008

Project No. 8151000100

Mr. Doug Billings
TEC Incorporated
1819 Cliff Drive, Suite F
Santa Barbara, CA 93109

Subject: Water Quality Monitoring Report P-440 Pier 8 Reconstruction and Pier 14 Demolition Project, Naval Base San Diego

Dear Mr. Billings:

Water quality in the vicinity of Piers 8 and 14 was characterized by collecting data in order to inform the National Environmental Policy Act review currently underway for the proposed project. This report describes the methods used to conduct the water quality investigation as well as the results of the survey.

Methods and Techniques

Mr. Tyler Huff and Mr. Nicholas Buhbe of AMEC Earth & Environmental undertook water quality monitoring at Naval Base San Diego on Monday, 25 February 2008. Monitoring was undertaken from the AMEC vessel *Velella* from approximately 1400 to 1600 hours. A Seabird SBE-19 CTD instrument equipped with a YSI oxygen sensor, Wetstar light transmittance sensor, and pH, temperature and pressure sensors was used to characterize the water column. AMEC's CTD was recently calibrated with respect to pH and dissolved oxygen data processing coefficients (as recommended by the manufacturer). GPS locations were recorded by an on-board GPS system.

In order to quantify the water quality near Pier 8 and Pier 14, the immediate vicinity of the piers were divided into three sub areas: East, Central and West. A CTD instrument cast was deployed in each of these three sub areas adjacent to both piers. Pier 8's deployment was conducted on the south side of the Pier, as access was restricted on the north side by US Navy vessels. Sampling adjacent to Pier 14 was conducted on the north side of the pier. Differences between the north and south sides of the piers are expected to be minimal due to the similar

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bathymetry, similar use histories, and the lack of vessel movements to/from the pier during or immediately prior to the effort. A reference water quality cast was also collected in the vicinity of San Diego Bay Main Channel Buoy 30 (offshore Pier 8).

The tidal cycle during the time of sampling was ebbing from a high tide of +3.7 feet at 1124 hours falling to a low of +1.3 feet at 1659 hours. Sunny conditions predominated with moderate winds. In the 48 hours prior to sampling, 0.16 inches of precipitation was recorded in Bonita, San Diego, California. However, the rainfall concluded at approximately noon on 24 February 2008, creating 24 hours of absence of precipitation directly prior to sampling. No storm water or plume influences were observed during sampling.

Results

A data quality review was undertaken and consisted of comparing upcast and downcast data (i.e., data collected during the descent and ascent of the CTD instrument). This type of review is undertaken to verify that the two sets of data for respective water column parameters are in agreement. For the first two casts (Pier 8 East and Central), pH and dissolved oxygen data were not in agreement and were therefore rejected (and not reported). A similar result was also observed for the Pier 8 central data, but differences were judged not of significant magnitude to reject the data. Results of the water column CTD casts are presented below in Tables 1 – 7.

Table 1. Water Column Data – Pier 8 East

Station:	Pier 8 - East*
Latitude:	32° 40' 24.2"
Longitude:	117° 07' 16"
Time:	1445

Depth (meter)	Light Transmissivity (%)	Temperature (°C)	Salinity (PSU)
1	64.4	15.3	32.5
2	65.8	15.2	32.5
3	65.0	15.2	32.5
4	64.3	15.0	32.6
5	65.8	15.0	32.7
6	67.2	15.0	32.7
7	68.7	14.9	32.7
8	70.0	14.9	32.7
9	70.4	14.9	32.7
10	71.7	14.9	32.7
11	64.0	14.9	32.7
12	67.3	14.9	32.7

* pH and dissolved oxygen concentration data were rejected due to data validity issues (see text).

Table 2. Water Column Data – Pier 8 Central

Station:	Pier 8 - Central
Latitude:	32° 40' 21.1"
Longitude:	117° 07' 22.4"
Time:	1501

Depth (meter)	Light Transmissivity (%)	Temperature (°C)	Salinity (PSU)
1	67.9	15.4	32.4
2	67.8	15.2	32.5
3	66.1	15.0	32.6
4	64.7	15.0	32.6
5	64.7	14.9	32.6
6	63.5	14.9	32.7
7	64.5	14.9	32.7
8	66.1	14.9	32.7
9	67.5	14.9	32.7
10	67.6	14.9	32.7
11	65.8	14.9	32.7
12	65.5	14.9	32.7

* pH and dissolved oxygen concentration data were rejected due to data validity issues (see text).

Table 3 – Water Column Data – Pier 8 West

Station:	Pier 8 - West
Latitude:	32° 40' 18.1"
Longitude:	117° 07' 25"
Time:	1506

Depth (meter)	Light Transmissivity (%)	pH	Temperature (°C)	Dissolved Oxygen Concentration (Mg/L)	Salinity (PSU)
1	68.8	7.9	15.3	5.43	32.6
2	70.5	7.9	15.3	5.64	32.6
3	70.5	7.9	15.3	5.56	32.6
4	70.1	7.9	15.2	5.57	32.6
5	69.1	7.9	15.2	5.57	32.6
6	67.8	7.9	15.1	5.56	32.6
7	65.6	7.9	15.1	5.55	32.7
8	64.6	7.9	15.1	5.55	32.7
9	64.8	7.9	15.0	5.55	32.7
10	65.5	7.9	14.9	5.56	32.7
11	63.5	7.9	14.9	5.57	32.7
12	61.8	7.9	14.8	5.65	32.7
13	61.5	7.9	14.8	5.63	32.7

Table 4 – Water Column Data – Pier 14 West

Station:	Pier 14 - West
Latitude:	32° 39' 37.8"
Longitude:	117° 07' 22.6"
Time:	1519

Depth (meter)	Light Transmissivity (%)	pH	Temperature (°C)	Dissolved Oxygen Concentration (Mg/L)	Salinity (PSU)
1	60.4	8.0	15.3	5.50	32.5
2	60.5	8.0	15.3	5.68	32.5
3	61.2	8.0	15.3	5.73	32.5
4	61.8	8.0	15.2	5.77	32.6
5	62.4	7.9	15.2	5.79	32.6
6	62.9	7.9	15.1	5.81	32.6
7	68.1	8.0	15.1	5.67	32.6
8	51.5	7.9	15.2	6.10	32.6
9	58.5	7.9	15.2	6.18	32.6

Table 5. Water Column Data – Pier 14 Central

Station:	Pier 14 - Central
Latitude:	32° 39' 38"
Longitude:	117° 07' 16.7"
Time:	1525

Depth (meter)	Light Transmissivity (%)	pH	Temperature (°C)	Dissolved Oxygen Concentration (Mg/L)	Salinity (PSU)
1	62.7	8.1	15.3	5.56	32.5
2	61.9	8.0	15.3	5.75	32.6
3	60.8	8.0	15.2	5.74	32.6
4	61.4	8.0	15.2	5.77	32.6
5	61.9	8.0	15.2	5.78	32.6
6	59.6	8.0	15.2	5.80	32.6
7	60.5	8.0	15.2	5.81	32.6
8	62.1	8.0	15.2	5.80	32.6
9	61.1	8.0	15.2	5.96	32.6

Table 6. Water Column Data – Pier 14 East

Station:	Pier 14 - East
Latitude:	32° 39' 38.5"
Longitude:	117 ° 07' 11.1"
Time:	1534

Depth (meter)	Light Transmissivity (%)	pH	Temperature (°C)	Dissolved Oxygen Concentration (Mg/L)	Salinity (PSU)
1	62.6	8.1	15.4	5.62	32.6
2	63.6	8.1	15.4	5.75	32.5
3	63.3	8.1	15.3	5.71	32.5
4	63.6	8.1	15.3	5.72	32.6
5	63.5	8.1	15.3	5.73	32.6
6	63.0	8.1	15.3	5.74	32.6
7	60.9	8.1	15.3	5.42	32.6
8	66.1	8.1	15.3	5.98	32.6

Table 7. Water Column – San Diego Bay Reference Location – Channel Buoy 30

Station:	S.D. Bay
Latitude:	32° 40' 08.7"
Longitude:	117° 07' 39.0"
Time:	1551

Depth (meter)	Light Transmissivity (%)	pH	Temperature (°C)	Dissolved Oxygen Concentration (Mg/L)	Salinity (PSU)
1	60.1	8.1	15.3	5.64	32.6
2	60.9	8.1	15.3	5.83	32.6
3	61.6	8.1	15.2	5.79	32.6
4	62.4	8.1	15.2	5.79	32.6
5	63.2	8.1	15.1	5.75	32.6
6	64.5	8.1	15.1	5.71	32.6
7	65.8	8.1	15.0	5.70	32.6
8	66.6	8.1	14.9	5.70	32.6
9	66.3	8.1	14.9	5.69	32.7
10	66.8	8.1	14.9	5.64	32.7
11	66.6	8.1	14.9	5.66	32.7
12	66.4	8.1	14.9	5.66	32.7

Discussion

Water quality results were generally consistent with rough expected values. At Pier 8, waters were approximately one-third of a degree Celsius warmer at the surface than at depth, a pattern consistent with results observed at the reference location. At Pier 14, no such change was apparent, likely due to the shallower bathymetry in the area. Salinities ranged between 32 and 33 parts per thousand, values slightly less saline than seawater, possibly a reflection of recent storm activity. Salinities were consistent throughout the areas sampled.

Light transmissivity ranged from 51 to 71 percent, but most values were between 60 and 65 percent, turbidity values consistent with that of coastal embayments in Southern California. The pH values ranged slightly from minimum of 7.9 to a maximum of 8.1, values consistent with a slightly basic pH typical of seawater. Dissolved oxygen concentrations ranged from 5.43 to 6.18 milligrams per liter and were lower than expected (well below the theoretical oxygen saturation concentration of 8.2 for seawater at the temperatures observed). However, values were consistent with conditions observed at the San Diego Bay reference location and above the San Diego Regional Water Quality Control Board Basin Plan objective (5 mg/L). In addition, dissolved oxygen values were compared to those of the Port of San Diego's Bay-wide Water Quality Monitoring Program, which was conducted over a period of approximately 1 year. Station 4 (located in the vicinity of the National City Marine Terminal, to the south of Pier 14) data indicated a range from 4.34 in July 2002 to 7.87 in December 2001. Values observed in this study were therefore within the range of values observed in the Port's study.

Therefore, in conclusion, the data observed in this monitoring effort indicated that water quality data at both Piers 8 and 14 at Naval Station San Diego were consistent with measurements taken at a nearby reference location and with expected values.

Should any additional information be needed, please contact me at 858-300-4321.

Regards,

Mr. Nick Buhbe
Senior Marine Scientist
AMEC Earth & Environmental, Inc.

NB/nb

7 March 2008

Project No. 8151000100

Mr. Doug Billings
TEC Incorporated
1819 Cliff Drive, Suite F
Santa Barbara, CA 93109

Subject: Water Quality Monitoring Report P-440 Pier 8 Reconstruction and Pier 14 Demolition Project, Naval Base San Diego

Dear Mr. Billings:

Per your request and in order to inform the National Environmental Policy Act review currently underway, this report is in response to your request to investigate potential turbidity effects for the proposed project at Piers 8 and 14, Naval Base San Diego. This report describes the methods used to conduct our investigation as well as the results of field surveys. The proposed project includes both removal of pier pilings and installation of replacement piles.

The proposed project will be conducted to project-specific specifications, and due to the innovative design of the project, the general rarity of these types of projects in San Diego Bay, and general lack of water quality monitoring requirements during construction activities direct background information relating to water quality during this type of project does not exist. However, turbidity data and other types of monitoring are available, and we have undertaken this data review and field study to assess potential turbidity impacts from the proposed project. Three approaches were undertaken: 1) water quality monitoring data collected during the dredging of Naval Base San Diego Pier 10 in 2002 and 2003 was reviewed; 2) AMEC undertook turbidity monitoring during ship departure to determine the longevity of turbidity plumes, and 3) background water quality data was collected in the vicinity of the proposed project site for comparison purposes. Comparisons to dredging activities and ship movement effects are both considered to be very conservative estimates of turbid effects in relation to the proposed project, since mechanical disturbance of sediments will be far less during either piling removal or installation.

1. Review of U.S. Navy P-326 Dredging Water Quality Monitoring Program Data (Pier 10)

In 2002 and 2003, the Navy dredged areas in the vicinity of Pier 10 as part of a pier replacement and upgrade project known as P-326. Monitoring was undertaken as described in California Regional Water Quality Control Board Monitoring and Reporting Program Number 2001-325, and included collection of total suspended solids (TSS) samples on a weekly basis

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during dredging activities. Several summary water quality monitoring reports (dated 19 February and 25 March 2002, and 29 April and 27 May 2003) were reviewed for the purposes of this task.

Monitoring was undertaken at three sites: an upcurrent reference site, a sample within the turbidity plume, and at a downcurrent station between 0 and 250 feet from the dredging operations. Grab samples for TSS testing were collected from mid-water column. TSS data are a measurement of the mass of solids suspended in the water column within a discrete sample. These turbidity data, while representative of dredging operations, are believed to represent a higher magnitude of impact than for the proposed project, since clam-shell dredging is much more severe in terms of sediment disturbance and mobilization. Furthermore, as the clamshell is lifted above the water surface (to a scow for offloading in the Pier 10 case), a large volume of residual (and highly turbid) water drains off the clamshell bucket. The volume of water is a much greater volume than would be expected during piling removal, and would contain suspended particulates due to entrainment of sediments.

Data collected from within the dredging plume and downcurrent of the operations varied considerably, from a maximum of 110 milligram per liter to below detectable levels (less than 1 milligram per liter). Turbidity was highly heterogeneous within the project site. In 16 out of 24 cases reviewed, TSS concentrations were highest in the dredge plume and lower at both the respective upcurrent and downcurrent monitoring stations. In the remaining cases, only one case exsited where the both upcurrent and downcurrent station turbidity data were higher than plume station data. Turbidity as a result of dredging, therefore, was observed to be limited to a small area in the vicinity of the dredge during the majority of the time, and only rarely created a sub-surface plume on a wider scale.

2. Water Column Turbidity Longevity Study

Since a piling-removal and/or placement project similar to the proposed project is not ongoing within San Diego Bay as of the time of this report, movement of a large vessel was determined to be a reasonable worst-case representation of turbidity impacts, since propeller wash of deep-draft ships entrain sediment from the bay bottom and create turbidity. The purpose of this aspect of our assessment was to sample a turbidity plume in a time series from creation through dissipation. Although applicability to the proposed project is limited due by potential confounding factors such as specific tide conditions, the discrete nature of the event (i.e., a single event as opposed to an 8-hour period of construction work), sediment particle size distributions at the site (and hence in the turbidity plume), and displacement of water from propeller wash, this scenario was deemed an appropriate surrogate for project activities.

Investigation of the departure of the cruise ship *Carnival Spirit* from the San Diego Cruise Ship Terminal was initially determined to be a suitable event for this study, but delay of the ship's scheduled departure precluded efforts on 5 March 2007 due to health and safety considerations. The study was rescheduled to coincide with the departure of the *Ryndam* from the terminal the following day at 1700 hours. The *Ryndam* is a considerably large vessel: it is 720 feet long, displaces 55,819 gross registered tons, and is capable of carrying 1,260 passengers (Holland America Cruise Line website, accessed 7 March 2008).

Upon arrival at the site, the ship was departing, and a turbidity plume was visible along the west end of the pier, apparently from the propwash of the main propellers as well as bow thrusters. Sampling was undertaken immediately from the AMEC vessel *Velella*, which followed the *Ryndam* westward as it departed. Water quality was characterized using a Seabird SBE-19 CTD instrument. The CTD instrument records data continuously in time (two data records per second), and is equipped with a Wetstar light transmittance sensor, and conductivity, temperature and pressure sensors. A light transmissometer is used to measure the amount of light passing across a 25-centimeter field: in clear water the light beam passes through and in highly turbid waters suspended particles block transmittance of the light. Resulting percent light transmission data is therefore a reflection of turbidity.

The instrument was lowered to the bottom of the bay upon the *Ryndam's* departure at approximately 1700 hours and at 15 minute intervals thereafter until approximately 1800 hours. The instrument was always lowered approximately 15 from the pier face from within a section of pier approximately 20 ft long (this comprised the study area). Effort to begin the CTD instrument deployment at the same location was made, but slight breezes, currents and/or vessel wakes often moved the sampling vessel from that location by the end of the deployment. Reference data were collected well offshore the *Star of India* at a distance from the shoreline commensurate with the end of the cruise ship terminal pier (prior to the potential for ship departure impacts) and off the end of the terminal in San Diego Bay (after 1800 hours). Data are presented in Table 1.

Considerable depth variation was encountered at the Cruise Ship Terminal due to the irregular bathymetry at the end of the pier, most likely due to long-term erosional effects of vessel propwash. The CTD instrument was deployed to a maximum of 12 meters, but as little as 10 meters in shallower areas within the study area. The tide was flooding at the time of the sampling, but currents or moving flotsam were not observed; effects of tidal currents were therefore believed to be negligible.

Data in Table 1 indicate a background condition of approximately 68 to 69 percent light transmittance at the reference locations. Light transmissivity was reduced throughout the water column upon the ship's departure (first data column, 0 minutes from departure), but at a greater magnitude near the bottom. The differential effect may be explained by proximity to the vessel propellers (the cause of water movement and suspension of sediment particles) and the fact that larger grain sizes would not be expected to be transported as far up into the water column due to their heavier mass. Data from 15 minutes following the ship's departure show a increase in percent light transmittance throughout the water column, with a greater effect (an increase in light transmittance of more than 10 percent) at the bottom of the water column. Thirty minutes following the ship's departure, percent light transmittance values throughout the water column were consistent with reference values; this was true for the remaining time series data.

In conclusion, the ship departure data indicate that the turbidity effects of the considerable disturbance caused by large vessel movements throughout the water column are limited in time to a period of less than 30 minutes.

Table 1 Time Series Percent Light Transmittance Results Following Departure of the *Ryndam* from the San Diego Cruise Ship Terminal.

Location	**Cruise Ship Terminal**					**San Diego Bay Post-Departure Reference**	***Star of India* Pre-Departure Reference**
CTD Cast	1	3	4	5	6	7	2
Time from Ship Departure (minutes)	**0**	**11**	**29**	**43**	**59**	**-**	**-**
Time (hours)	1703	1714	1732	1746	1802	1805	1509
Depth (meters):	Percent Light Transmittance					Percent Light Transmittance	
1	61.8	62.8	68.8	69.3	69.4	68.8	68.2
2	58.7	63.1	68.7	69.2	69.3	69.1	68.1
3	57.2	63.3	68.7	69.3	69.3	69.2	68.6
4	55.9	62.4	68.7	69.3	69.3	69.4	68.8
5	55.7	61.9	68.9	69.1	69.4	69.2	68.9
6	56.3	63.6	68.5	68.9	69.5	69.3	68.1
7	55.4	65.8	68.4	68.9	69.6	69.3	68.0
8	51.1	66.0	68.6	69.0	70.0	69.3	
9	49.0	63.4	68.8	68.9	70.2	69.3	
10	49.7	60.3	68.0	69.0	69.6	69.3	
11	50.3			69.1	69.2	68.6	
12	46.8			68.9			

3. Project Site Background Conditions

Background water quality monitoring at Naval Base San Diego was undertaken on Monday, 25 February 2008. Monitoring was undertaken from the AMEC vessel *Velella* from approximately 1400 to 1600 hours using the Seabird CTD instrument.

In order to quantify the turbidity near Pier 8 and Pier 14, the immediate vicinity of the piers were divided into three sub areas: East, Central and West. The CTD instrument cast was deployed in each of these three sub areas adjacent to both piers. Pier 8's deployment was conducted on the south side of the Pier, as access was restricted on the north side by US Navy vessels. Sampling adjacent to Pier 14 was conducted on the north side of the pier. Differences between the north and south sides of the piers were expected to be minimal due to the similar bathymetry, similar use histories, and the lack of vessel movements to/from the pier during or immediately prior to the effort. A reference water quality cast was also collected in the vicinity of San Diego Bay Main Channel Buoy 30 (offshore of Pier 8).

The tidal cycle during the time of sampling was ebbing from a high tide of +3.7 feet at 1124 hours falling to a low of +1.3 feet at 1659 hours. Sunny conditions predominated with moderate winds. In the 48 hours prior to sampling, 0.16 inches of precipitation was recorded in Bonita, San Diego, California. However, the rainfall concluded at approximately noon on 24 February 2008, creating 24 hours of absence of precipitation directly prior to sampling. No storm water or plume influences were observed during sampling. Results of the water column CTD casts are presented below in Tables 2 and 3.

Table 2. Pier 8 and Bay Reference Transmissivity Data

Station Latitude Longitude Date Time	Pier 8 - East 32° 40' 24.2" 117° 07' 16" 25-Feb-08 1445	Pier 8 - Central 32° 40' 21.1" 117° 07' 22.4" 25-Feb-08 1501	Pier 8 - West 32° 40' 18.1" 117° 07' 25" 25-Feb-08 1506	S.D. Bay Reference 32° 40' 08.7" 117° 07' 39.0" 25-Feb-08 1551
Depth (meters)	Percent Light Transmissivity			
1	64.4	67.9	68.8	60.1
2	65.8	67.8	70.5	60.9
3	65.0	66.1	70.5	61.6
4	64.3	64.7	70.1	62.4
5	65.8	64.7	69.1	63.2
6	67.2	63.5	67.8	64.5
7	68.7	64.5	65.6	65.8
8	70.0	66.1	64.6	66.6
9	70.4	67.5	64.8	66.3
10	71.7	67.6	65.5	66.8
11	64.0	65.8	63.5	66.6
12	67.3	65.5	61.8	66.4
13	-	-	61.5	-

Water quality results in the vicinity of the project site were generally consistent with expected values. Light transmissivity ranged from 51 to 71 percent, but most values were between 60 and 65 percent. Turbidity values were slightly lower than those observed at the San Diego Cruise Ship Terminal in the northern portion of the bay, consistent with that of the inner areas of coastal embayments in Southern California. Values were consistent with conditions observed at the San Diego Bay reference location

Therefore, in conclusion, the data observed in this monitoring effort indicated that water quality data at both Piers 8 and 14 at Naval Station San Diego were consistent with measurements taken at a nearby reference location and with expected values.

Table 3. Pier 14 and Bay Reference Transmissivity Data

Station	Pier 14 - East	Pier 14 - Central	Pier 14 - West	S.D. Bay Reference
Latitude	32° 39' 38.5"	32° 39' 38"	32° 39' 37.8"	32° 40' 08.7"
Longitude	117 ° 07' 11.1"	117° 07' 16.7"	117° 07' 22.6"	117° 07' 39.0"
Date	25-Feb-08	25-Feb-08	25-Feb-08	25-Feb-08
Time	1534	1525	1519	1551
Depth (meters)	Percent Light Transmissivity			
1	62.6	62.7	60.4	60.1
2	63.6	61.9	60.5	60.9
3	63.3	60.8	61.2	61.6
4	63.6	61.4	61.8	62.4
5	63.5	61.9	62.4	63.2
6	63.0	59.6	62.9	64.5
7	60.9	60.5	68.1	65.8
8	66.1	62.1	51.5	66.6
9	-	61.1	58.5	66.3
10	-	-	-	66.8
11	-	-	-	66.6
12	-	-	-	66.4

Conclusions

Since sediments will be physically mobilized during the proposed project, turbidity impacts are expected. These impacts are expected to be of greater magnitude as a result of pier piling removal than for pile driving operations. The difference in the magnitude of the impact is due to the physical nature of the removal process, during which sediments will be mobilized as pilings are pulled up through the water column. During pile driving operations, mechanical vibrations may mobilize sediments from the sea floor, but any mobilization of sediments would be limited to the portion of the water column in the immediate vicinity of the harbor bottom and would likely settle out rapidly in close proximity to the work location.

As stated above, resuspension of sediments due to pier piling removal is likely to cause a turbidity plume in the vicinity of the work area since sediments are likely to adhere to the pilings as they are removed and may slough off as the piling is moved upward or laterally in the water column, or during the out-of-water pile handling process. However, turbidity plumes are not expected outside the immediate vicinity of the project area since the volume of sediment adhering to pilings is expected to be minor. Data collected during the Pier 10 project indicate that any plume created would remain in close proximity to the project site under most circumstances. Furthermore, based on the ship departure turbidity data, any turbidity impacts

are likely to dissipate in a short period of time. Therefore, turbidity impacts as a result of the proposed project should be considered limited in terms of spatial extent and short-term in duration.

Should any additional information or clarification be needed, please contact me at 858-300-4321.

Regards,

Nicholas Buhbe, M.S.
Senior Marine Scientist
AMEC Earth & Environmental, Inc.

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Appendix C

Marine Biological Resources

• Draft Wharf Shading Study for the
Pier 8 Replacement and Demolition Project, Naval Base San Diego
(Merkel & Associates, Inc. 2014)

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DRAFT

WHARF SHADING STUDY FOR THE PIER 8 REPLACEMENT AND DEMOLITION PROJECT, NAVAL BASE SAN DIEGO

Prepared for:

Naval Facilities Engineering Command
Southwest Division
Contract # N62473-09-R-2604
Delivery Order No. 31
Attn: Mr. Mitch Perdue

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March 2014

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INTRODUCTION

PROPOSED PROJECT

The United States Navy (USN) is proposing to demolish one inadequate existing pier (Pier 8) and construct a new pier and associated pier utilities at Naval Base San Diego (NBSD), California (Figure 1). The new replacement Pier 8 would either be constructed as a modular hybrid pier (MHP) or a conventional pier. The MHP Alternative is based on standardized floating modules, thereby eliminating support and fender piles. The MHP Alternative would have five individual modules resulting in a structure that would be 90 feet (ft) wide by 1,560 ft long (Figure 2). The Conventional Pier Alternative would consist of a single-deck, concrete berthing pier and would be 117 ft wide by a length of 1,600 ft (Figure 2). The dimensions for the existing Pier 8 and proposed replacement alternatives are provided in Table 1.

Table 1. Dimensions of existing Pier 8 and proposed replacement alternatives.

Description	Length (ft)	Width (ft)	Area (ft^2)	Area (Acres)	Water Depth (ft MLLW)
Existing Pier 8	1,610	66	106,260	2.4	-37
MHP Alternative	1,560	90	140,400	3.2	-37
Conventional Pier Alternative	1,600	117	187,200	4.3	-37

Although the new Pier 8 would be wider than the existing Pier 8, the pier would be designed and constructed under either alternative to ensure that vessels can navigate safely within the bay. The pier would provide a minimum of two outer end pierside berths for modern Navy ships comparable in size to a multi-purpose amphibious assault ship, the largest ship that would be supported by the project. The inner berths would have enough room for two other modern Navy ships, such as guided missile destroyers. No dredging is proposed since Pier 8 is already designed as a deep draft pier (water depth > -37 ft MLLW) (Figure 3).

Replacing Pier 8 would provide the necessary infrastructure and berthing space to adequately accommodate the Navy's modern ship classes. The Proposed Action would create the infrastructure necessary to support modern Navy ship classes that have deep draft-power intensive or power intensive requirements.

Figure 1. Pier 8, Naval Base San Diego

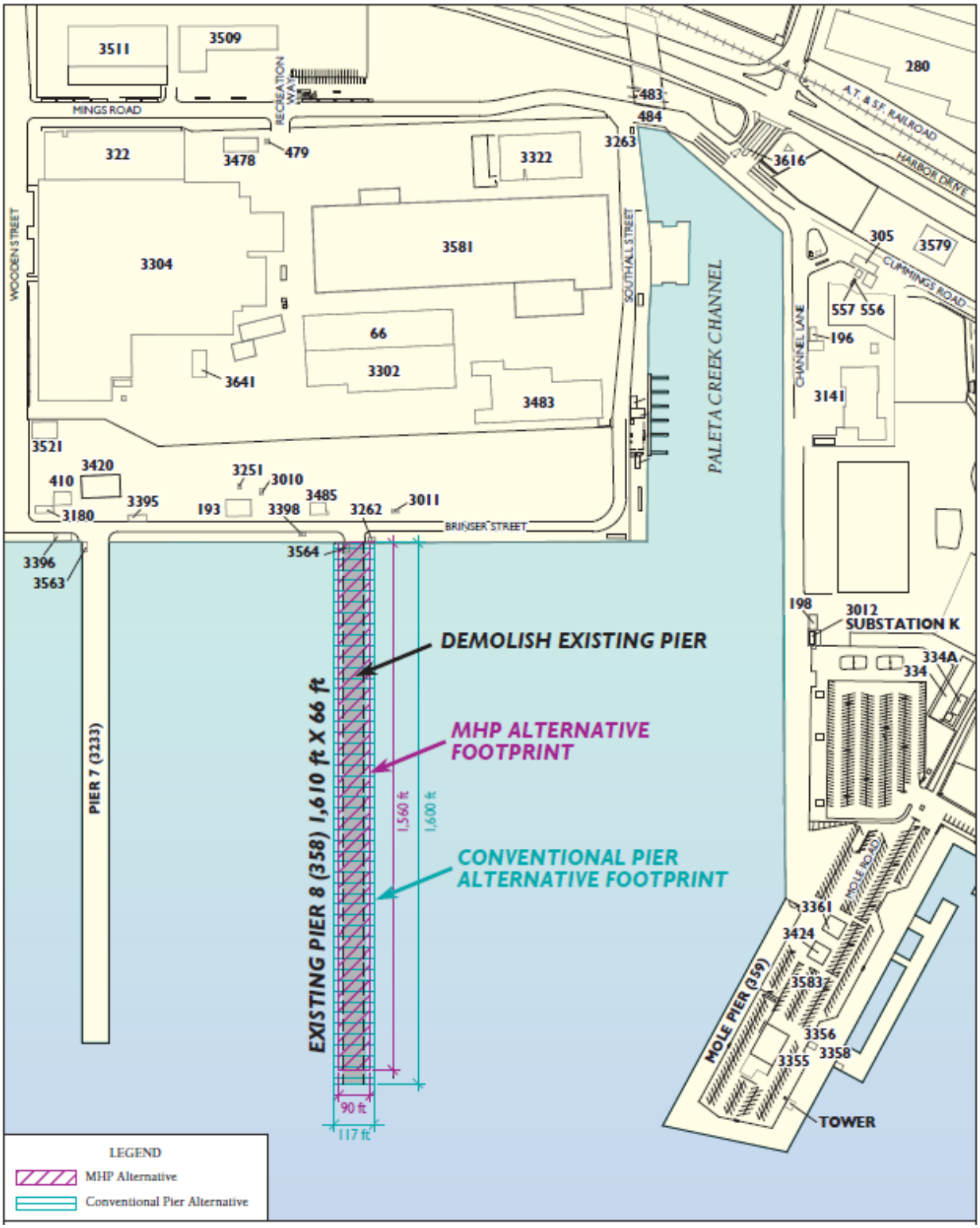


Figure 2. Existing Pier 8 and proposed MHP and Conventional Pier footprints.

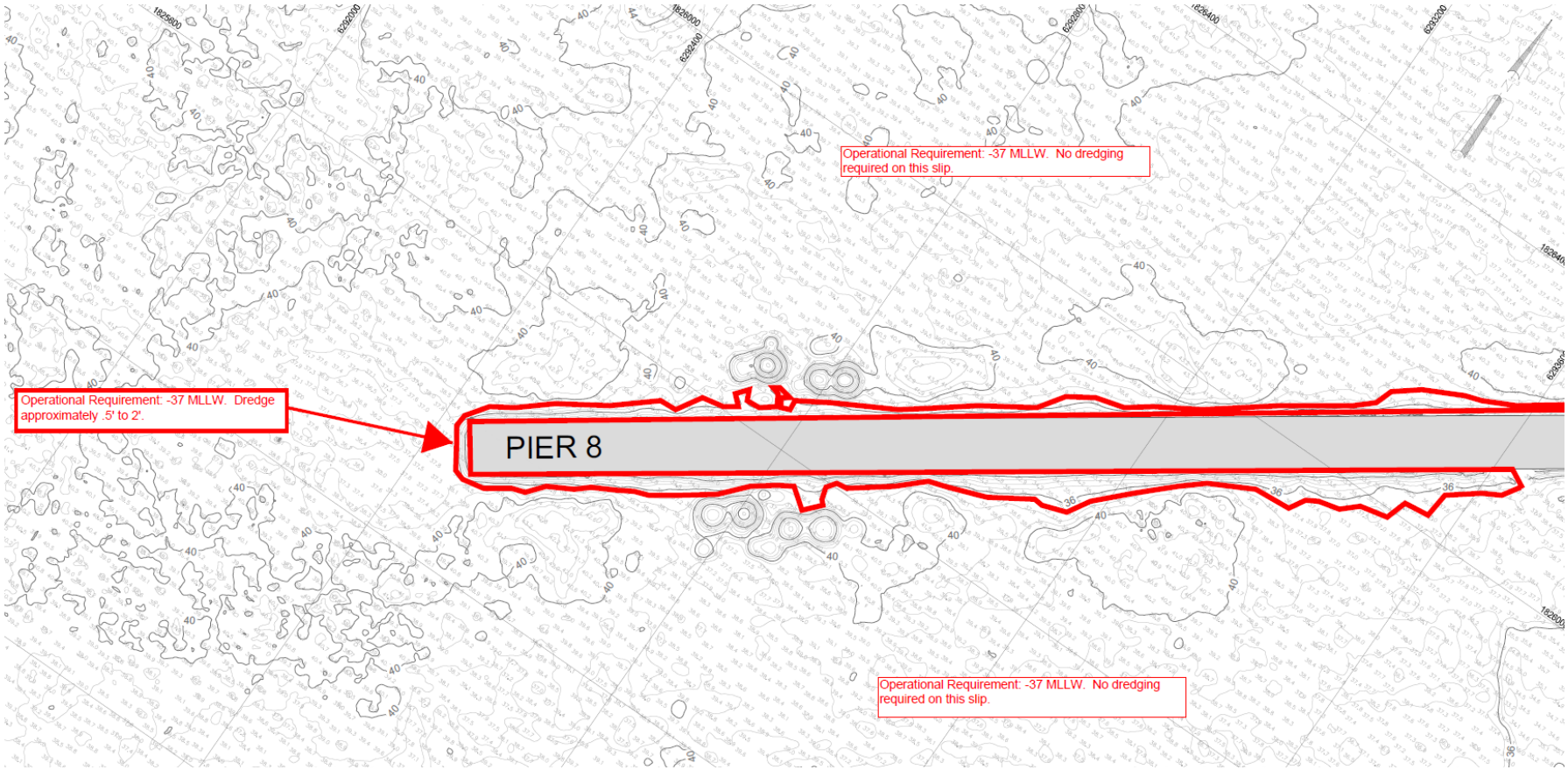


Figure 3. Bathymetry in vicinity of Pier 8, Naval Base San Diego.

WHARF SHADING BACKGROUND INFORMATION

Wharf structures are a common component of port and harbor facilities and are particularly prevalent within Naval facilities where broad equipment and personnel embarking facilities are required to support ship operations. Historically, the placement of wharves, docks, and piers has been viewed as reasonably self-mitigating or neutral with respect to impacts to fish and benthic communities. Such structures tend to provide increased three dimensional substrate and cover that locally increases productivity of encrusting benthic organisms and also serves to locally increase richness and abundance of fish over the conditions observed in more open waters (Figure 4; Merkel & Associates 2010).

However, there has been some discussion that there may be diminishing return from larger structures and that negative impacts may result which exceed the positive effects associated with structures. Biological communities under more expansive structures may be fundamentally different than those found along the fringes of the structure or around smaller structures. Intuitively, this concern has some merit. The physical environment beneath a larger structure would be expected to differ from that observed along the edges of the structure. Under large pile supported structures, light levels are lower, support piles reduce currents and wave energies, and create strongly depositional environments, and water circulation is expected to be reduced.

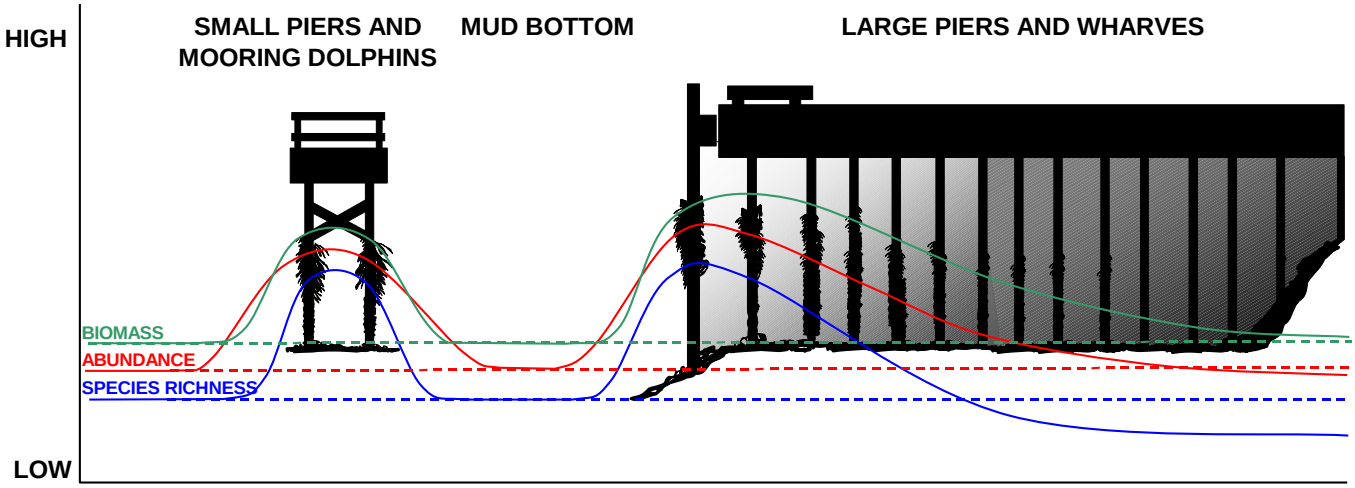


Figure 4. Qualitative biological metrics for small and larger piers.

National Marine Fisheries Service (NMFS 2012) provides a summary of both direct and indirect impacts associated with overwater structures. Overwater structures and associated activities can impact the ecological functions of habitat through the alteration of habitat controlling factors. These alterations can, in turn, interfere with habitat processes supporting the key ecological functions of spawning, rearing, and refugia. The matrix presented in Table 2 identifies the potential mechanisms of impact overwater structure can pose to nearshore habitats. Whether any of these impacts occur and to what degree they occur at any one site depends upon the nature of site-specific habitat controlling factors and the type, characteristics, and use patterns of a given overwater structure located at a specific site (Nightingale and Simenstad 2001).

Table 2. Overwater structure nearshore habitat impact mechanisms (from Nightingale and Simenstad 2001).

Habitat Controlling Factors	Overwater Structure and Activities	Direct Impacts	Indirect Impacts
Light Regime	• Piers/Docks • Wharves/Marinas • Floats/Moored Vessels • Pilings	• Reduced light levels • Altered ambient light • patterns	• Limited plant growth and recruitment • Altered plant and animal assemblages • Altered animal behavior
Wave Energy Regime	• Piers/Docks • Wharves/Marinas • Floats/Moored Vessels • Pilings	• Altered wave and tidal energy patterns	• Altered plant and animal assemblages • Altered substrate type • Altered sediment transport and distribution
Substrate	• Propeller and anchor scour • Floats and moored vessels (grounding) • Piling install/removal	• Substrate disturbance and smothering	• Altered plant and animal assemblages • Altered substrate type • Altered sediment transport and distribution
Water Quality	• Discharges from marinas/wharves • Boat and upland runoff • Piling install/removal	• Increased Nonindigenous species • Increased toxics • Increased nutrients and bacterial introductions	• Altered plant and animal assemblages • Limited growth and recruitment • Exotic species replacement of natives

SAN DIEGO BAY BACKGROUND INFORMATION

Specific differences exist in areas of wharfs that differ from open bay environments include shading of the water column and seafloor by structures, decrease in water circulation as a result of pile fields and berthed vessels, and increased sediment deposition due to reduced circulation. Conversely, wharfs increase vertical structure, provide hard surfaces for primary and secondary substrate colonizers in areas that typically lack hard surfaces, and increase presence of substrate in upper water column environments, allowing for increased primary production along the wharf margins where wharf shading is not a prevalent issue. As encrusting organisms fall to the bottom from hard structures or shed waste, there is a benthic enrichment that occurs below structures.

To evaluate the biologic conditions expected to develop under a proposed wharf structure at Naval Air Station North Island (NASNI), a preliminary study was made of comparable conditions occurring elsewhere in San Diego Bay (Merkel & Associates 1999). Surveys were conducted during both the

winter and summer seasons at the end of Pier 13 at NBSD and the CVN Pier 700 on NASNI. At each of the surveyed piers, three sampling regions were established, and included:

1. The exposed region outside of any pier cover along the face of the pier;
2. The shade region beneath the pier approximately 10m from the face where light levels were such that objects could be seen, but fine details could not be distinguished, and;
3. The dark region located approximately 30m from the face of the pier and 10m from each side of the NBSD pier (the presence of berthed ships further shades the sides of the pier).

Within each of the three regions, surveys were conducted along transects located approximately 3m below the surface and along the bottom in approximately 10m of water. Transects ran parallel to the width of the pier, approximately 20m. However, the two transects in the dark sampling region ran perpendicular to the other transects to avoid the twilight areas along the pier edges in order to ensure complete darkness within that sampling region. All studies were conducted using SCUBA, and divers slowly swam the length of each transect and recorded the numbers and species of all fish encountered. In addition, within each of the three regions, three sediment core samples were collected along the bottom transect at an approximate depth of 10m. Each sample was rinsed through a 1.0 mm sieve and organisms from each sample were transferred to Whir-Pak bags, and preserved with a 10% formalin:seawater mixture. After approximately one week, benthic samples were transferred in the laboratory from the formalin solution into 70% isopropyl alcohol and stained with rose bengal. All individuals in each replicate sample were identified to family and counted. Pier pilings were closely examined along each transect to note visual differences in the composition of encrusting communities. A video camera was used to document pile communities and allow for later review. No scrapings were taken and no detailed analysis of community composition was made.

Results indicated that an infaunal community persisted under pile supported structures within San Diego Bay and that, for this study, a numerically greater number of organisms were found in the infauna under the piers than outside of the piers (Merkel & Associates 1999). Fish were found in all areas across a light gradient extending from the face of the pile supported structures to the darkest regions beneath the structures. The species counts and fish abundance did not appear to appreciably differ across this gradient, except for the lack of pelagic schooling fish being found beneath the structures. The pile community observed under the pier was reduced in richness from that found along the outer edges of the pier, however a developed pile community existed in all areas. Another study conducted at the National City Marine Terminal noted that the major difference in pile-associated biota was that no algae were present on the shaded piles and that the thickness of the epibiota on the shaded piles was estimated to be approximately 50% of that on the exposed piles (San Diego Unified Port District 1999). It should be noted that the Merkel & Associates 1999 study was not a comprehensive study, and conclusions differ from those of Able and Duffy-Anderson (2005) which noted that under-pier areas were poor-quality habitats because they supported low fish abundances, inhibit feeding, and suppress growth. However, the Able and Duffy-Anderson (2005) study was conducted in relatively shallow water looking at shading effects and growth on specific fish species, and therefore results may not be directly comparable.

STUDY OBJECTIVES

The project proposes to demolish the existing Pier 8 and construct a new replacement pier. The new pier is proposed to be similar in length, but much wider (and therefore a larger area) than the existing pier (Table 1), and similar to other "newer" piers at NBSD. The objective of the current study was to supplement the Merkel & Associates 1999 study by incorporating new technologies and methodologies to characterize similar communities that were previously studied (i.e., fish, benthic

infauna, and epifauna), and to predict the potential community structure of the new pier. The habitats within NBSD that were surveyed included:

- Open water deep subtidal habitat (open area between piers)
- Smaller pier structure (approximately 60 ft wide)
- Larger pier structure (approximately 120 ft wide)

Recognizing that the study area is a heavily industrialized area, it was determined that sampling pristine reference areas (i.e., areas unaffected by industrial activities) would not provide value in making comparisons and impact assessments. While they may not be directly comparable, data from previous studies were used to determine community structure for relatively undisturbed deep subtidal habitats in San Diego Bay. As a reference in the current study, the industrialized harbor area between piers served as a better tool for evaluation of community changes, as these areas would be equivalent to the habitat lost to pier expansion.

METHODS

PROJECT PERSONNEL

Merkel & Associates, Inc. (M&A) conducted the study in June 2013, and key project personnel are listed in Table 3.

Table 3. Key project personnel.

Organization	Name	Title	Office Phone	Cell Phone
NFECSW Coastal IPT	Mitch Perdue	Project Manager	619-556-7594	619-726-5688
U.S. Navy	Paul Patricio	Waterfront Operations	619-556-2772	
Merkel & Associates	Lawrence Honma	M&A Project Manager; Site Safety Supervisor	858-560-5465	858-229-1444

STUDY DESIGN

The study area included Pier 8 (small pier), Pier 2 (large pier), and the waters adjacent to each pier (Figure 5). Similar to the M&A 1999 study, four sampling regions were established at each pier and included:

1. The exposed region outside of any pier cover along the face of the pier;
2. The shade region beneath the pier approximately 15 to 30 ft from the pier face
3. The darkest regions located along the centerline of the pier, and;
4. The waters adjacent to each pier.

Within each of the regions, surveys were conducted along transects located approximately 10 ft below the surface and along the bottom (Figure 6). The study utilized a variety of methodologies, to various degrees of success, and included interferometric sidescan sonar, Remotely Operated Vehicle (ROV), low-light video camera, and SCUBA.

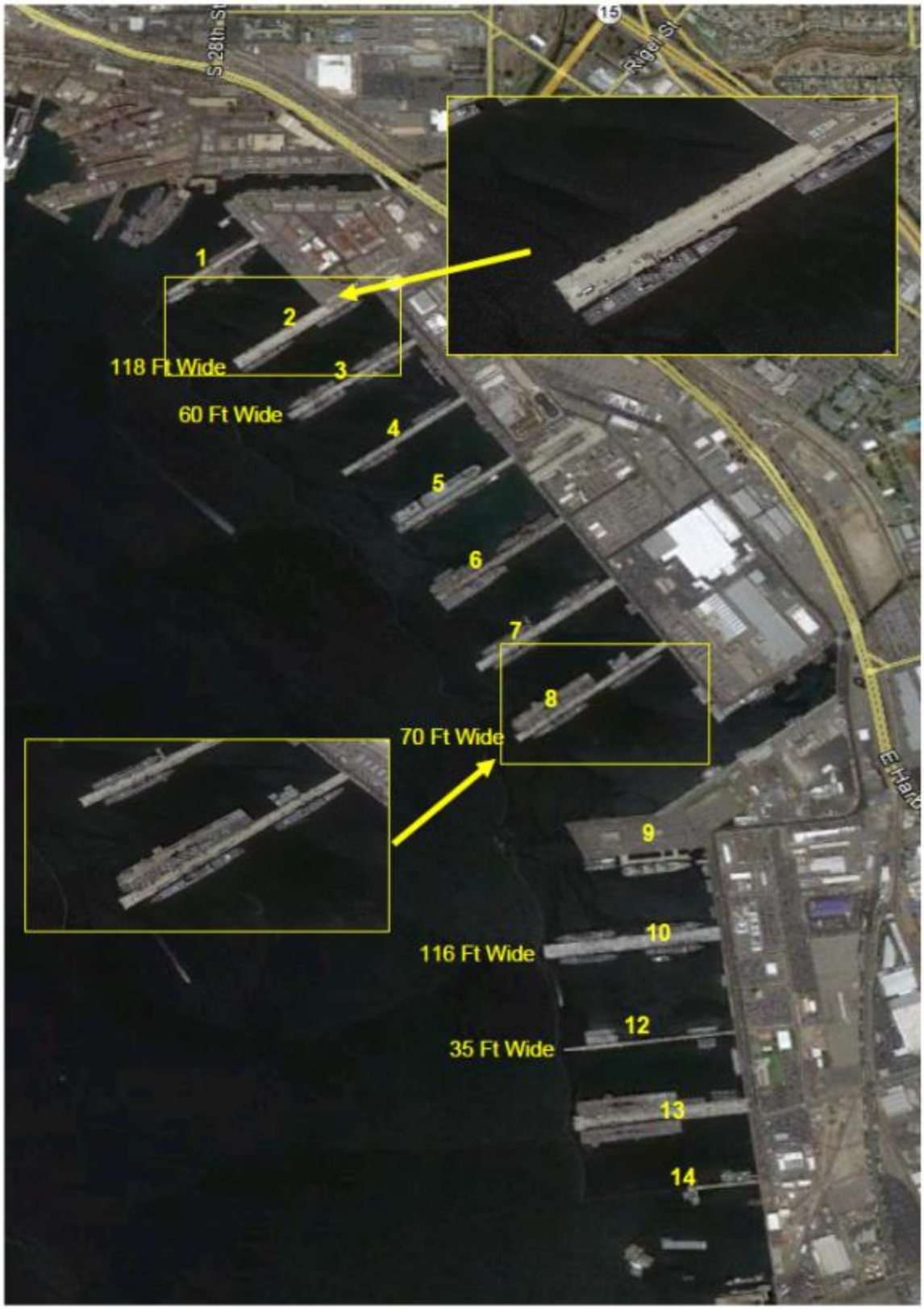


Figure 5. Pier 2 and Pier 8, Naval Base San Diego.

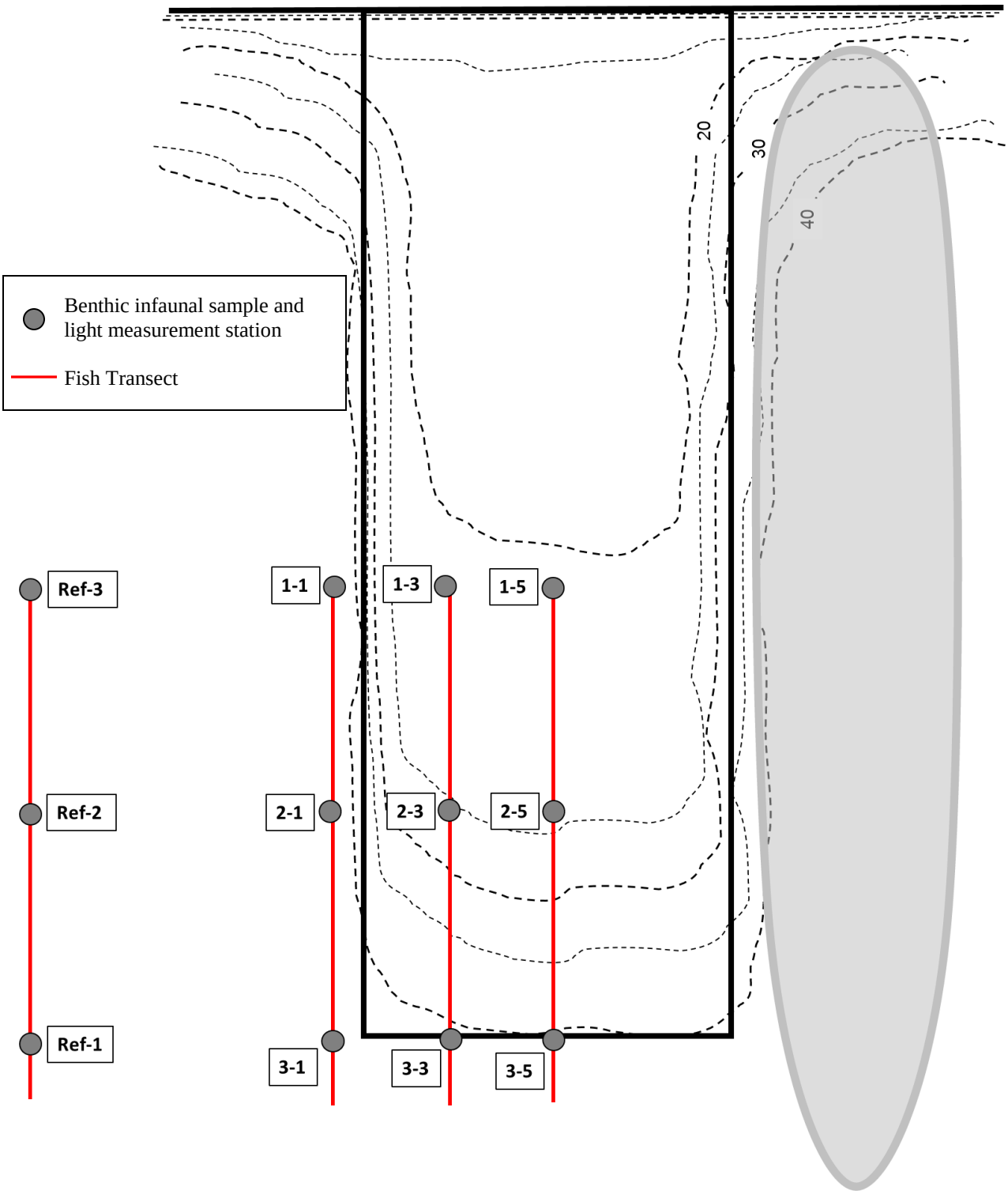


Figure 6. Sampling design schematic.

Ambient Light Measurements

Ambient light measurements were collected through the water column (surface, mid-water, and bottom) at each benthic station (Figure 6). Results were averaged by sampling region and depth, and compared to percent of ambient (reference) condition.

Fish Community

Similar to previous surveys, divers slowly swam the length of each 100 meter transect (approx. 330 ft) and recorded the numbers and species of all fish encountered. A flashlight was used to aid in fish identification within the shade and dark regions. Only fish within an approximate distance of 10 ft from the centerline of the transect were counted. Fish surveys included a search of all microhabitats represented on the transect including open water, on and around piles, as well as on the bottom, where such areas are present. Species composition and abundance of fishes were compared among the regions and between small and large piers to note any patterns or differences.

Benthic Infaunal Community

Benthic infaunal communities were examined to determine if there were notable differences in this fish forage resource across a gradient from the exposed to the dark region. Within each of the three regions, three sediment core samples (46 cm^2) were collected along the bottom transect. Each sample was rinsed through a 1.0 mm sieve and organisms from each sample were transferred to jars, and preserved with a 10% formalin-seawater mixture. After approximately one week, benthic samples were transferred in the laboratory from the formalin solution into 70% isopropyl alcohol. All individuals in each replicate sample were identified to lowest practicable taxon and counted. Organisms were grouped by phylum and weighed to determine the wet weight biomass of each phylum. Wet weight was determined by first transferring an entire sample (or phylum), including alcohol, onto a paper towel and quickly blotting excess liquid from the animals. Organisms were then transferred to a tared weighing dish and weighed to the nearest 0.001g using an analytical balance. Species richness and composition of benthic invertebrate species were compared among the three regions and between small and large piers.

Encrusting Pile Community

A comprehensive assessment of the pier piling community was not proposed for this study. Other, more comprehensive studies have been conducted in San Diego Bay (e.g., SDUPD 1999), and provide general community structure and species composition. For this study, pier pilings were closely examined along each transect to note visual differences in the composition of encrusting communities. An underwater camera and/or video camera were also used to document pile communities and allow for later review. No scrapings were taken and no detailed analyses of community composition were made.

HEALTH AND SAFETY

All on-water and diving operations met U.S. Army Corps of Engineers EM385 1-1 and Occupational Safety and Health Administration (OSHA) CFR 1910 Subpart T health and safety requirements. Additional safety requirements mandated by the Navy regarding scientific diving included the use of redundant 30 ft^3 air sources, a fully equipped standby diver, and a dive supervisor. All appropriate health and safety documents and security notices were completed and approved prior to

implementation, and present on site. In addition, daily on-site communications with Navy security were maintained.

RESULTS

Several items to note is the design and elevation of the pier decking for Pier 2 and Pier 8, which factor into the results, and include:

- Pier 2 (large pier) has a higher deck with fewer pilings and trusses (Figure 7). It is estimated that the underside of the decking is approximately 10 ft above the water at low tide, and approximately 4 ft above the water at high tide. This higher design and broadly offset bumper placement (i.e., vessels remain farther away from pier) increases ambient light levels below the pier.

- Pier 8 (small pier) has a lower deck and numerous pilings (Figure 8). The bottom of the decking is submerged at high tide, and approximately 6 ft above the water at low tide. This lower design required that sampling occur at a lower tide.

- For safety purposes, no vessels were present during the sampling. The presence of vessels may reduce ambient light conditions under the pier depending on the time of day; however, large mooring fenders are also present along the pier which ensures that vessels standoff away from the piers, which may allow for light to filter under the piers.

NOTE ON SAMPLING METHODOLOGIES EMPLOYED

Given the limitations of conducting visual surveys under low to no light conditions, and possible avoidance response when underwater lights are used, other methods were attempted to better qualitatively and quantitative assess the fish community, most had varying degrees of success, and is briefly discussed in the following text.

One approach considered using underwater cameras and having the diver remain still for a period of several minutes prior to taking a picture. Unexpectedly, the lighting, while reduced under the pier, was not considered zero visibility as was encountered during the 1999 M&A study. It was still possible to determine fish species by viewing the profile/outline, and wide-angle underwater photographs were not possible under ambient conditions. Therefore, while the method was attempted, it did not assist in data collection. Similarly, an ROV was also considered, but given the numerous obstructions (i.e., pilings) and lighting necessary for the cameras to operate, it was determined that it would not assist in data collection. Lastly, a low-light video camera was lowered through the water column from a kayak; however, given the limited depth of field (i.e., range), no useable data were obtained.

Another method that was implemented including using sidescan sonar alongside the piers to detect any schooling fishes underneath the piers. While there appeared to be a school of fish detected during the survey, the resolution was poor due to all the pier pilings, and it was not possible to identify the species, only the limited presence of schooling fish around the piers, but not in the open reference areas.

Figure 7. Pier 2 end-view (top) and side view (bottom).

Figure 8. Pier 8 side view (top) and close-up (bottom).

PHYSICAL SITE CONDITIONS

The survey area is within a working Naval facility and consists of hard structures including bulkhead wall, piers, and pier pilings. The bottom habitat is unvegetated mud bottom (Figure 9), and the slope of the bottom is relatively steep along the bulkhead wall and pier face, from a depth of approximately -15 ft MLLW underneath the pier to a depth of approximately -37 ft MLLW at the bayward edge of the piers (Figure 9). The area adjacent to the pier contained some debris items and shell hash, while underneath the pier, shell hash was present but not as concentrated as the area along the slope (Figure 9).

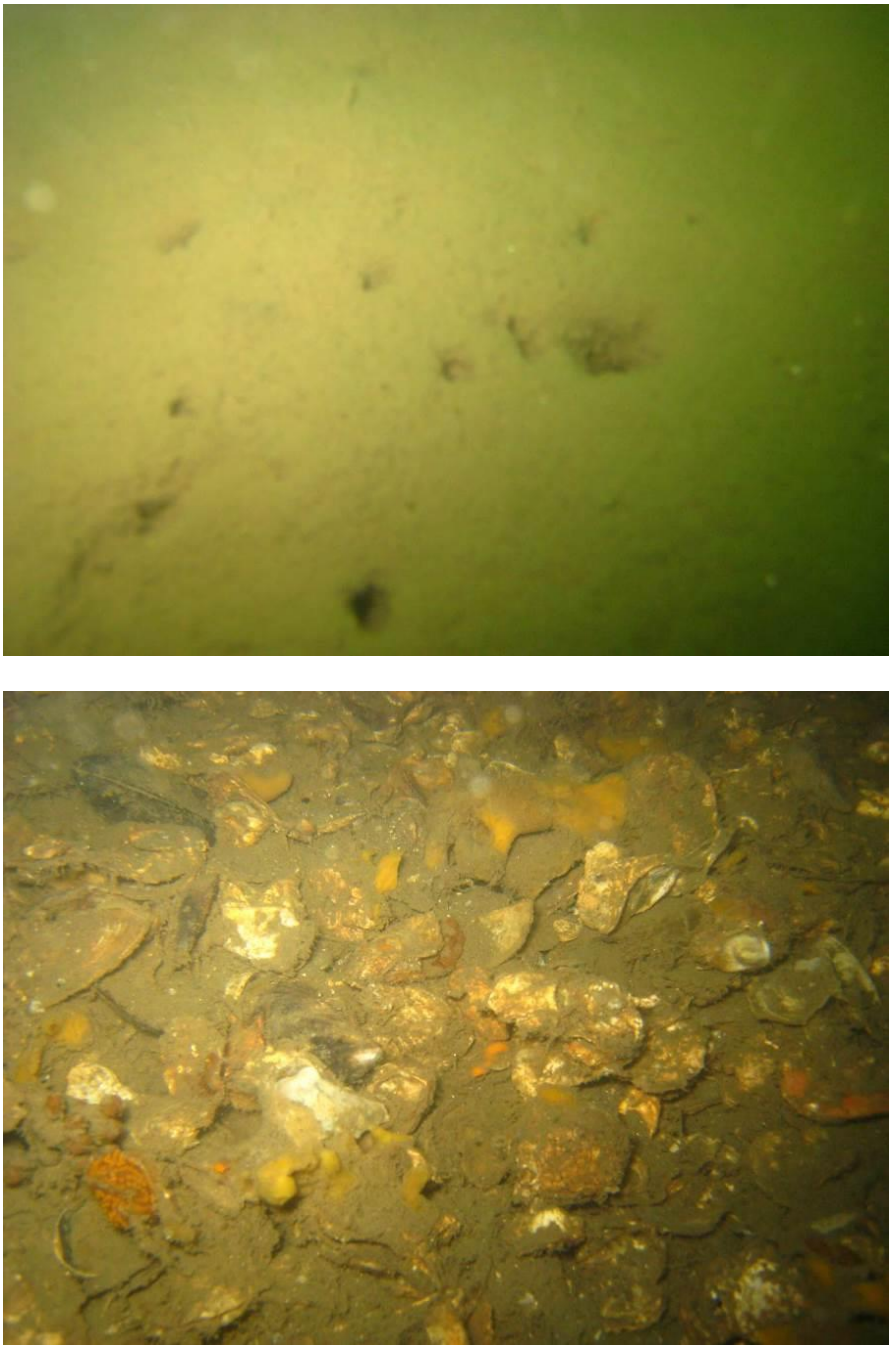
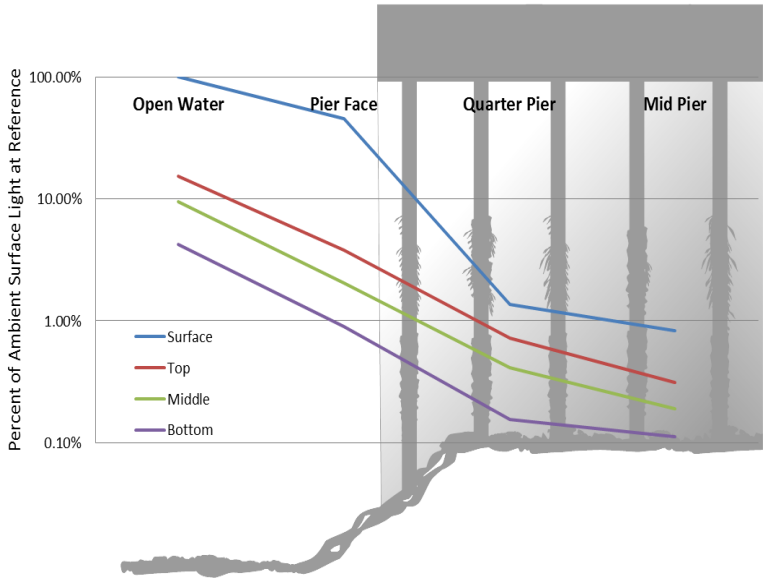


Figure 9. Unvegetated mud bottom (top) and shell hash adjacent to pier (bottom).

AMBIENT LIGHT CONDITIONS

As expected, light measurements adjacent to and underneath the piers were lower than reference (ambient) conditions, and similarly decreased as one moved further under the pier or deeper in the water column. When examined at Pier 2 using surface light at the open water reference site as a standard, this light reduction is easily seen. A logarithmic scale is necessary to effectively observe the levels of light reduction across all sampled areas. Bottom light intensity under the middle of the pier was only 0.11% that of the light reaching the water surface at the reference site.



When light levels were analyzed as a percent reduction from the open water reference area at the same depth strata (top water, mid-depth, and bottom), the reduction in light intensity was fairly consistent for both Pier 2 (large pier) and Pier 8 (small pier). Regardless of pier size, ambient light decreased to approximately 20 percent of ambient along the pier face and further decreased to approximately 4 percent of ambient at the quarter pier width and 2 percent of ambient at the mid-line of the pier (Table 4 and Figure 10). Despite the larger surface area (i.e., greater shaded area), light measurements under the large pier were similar to the small pier, and it is believed this was due to construction design and tidal level during sampling.

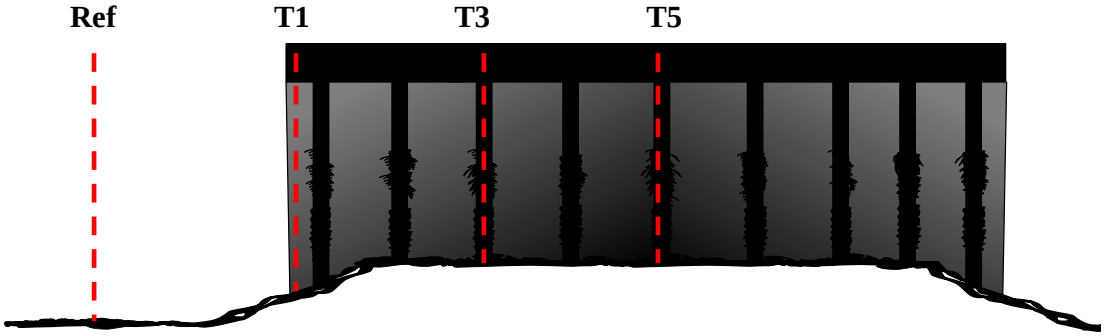
As noted, the decking on the large pier was approximately 10 ft above the water at low tide, and approximately 4 ft above the water at high tide, while the bottom of the decking on the small pier was submerged at high tide, and approximately 6 ft above the water at low tide (Figure 11). All sampling occurred at low tide, and it would be expected that results would differ more substantially between piers, had the sampling occurred at high tide, when surface light levels would be expected to be more dissimilar between the piers.

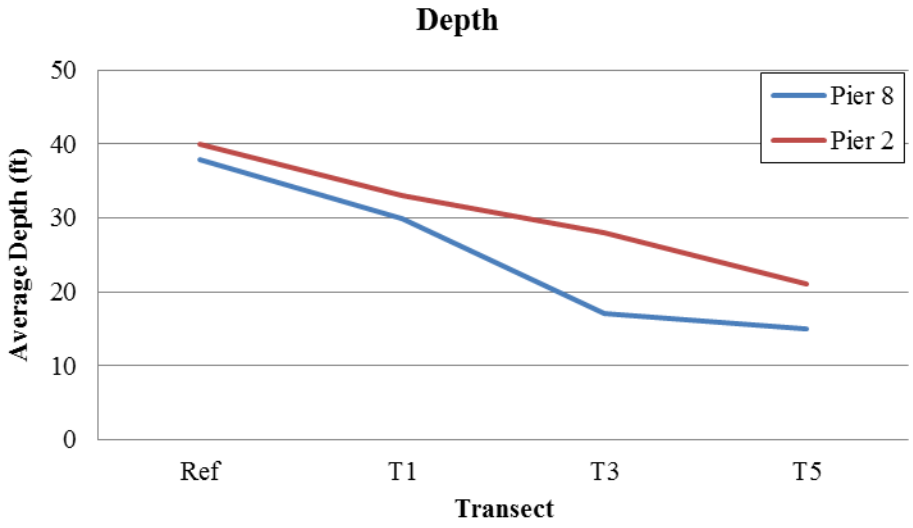
Also as noted, vessels were not present during the sampling for safety purposes, and the presence of vessels would be expected to reduce light levels, although large mooring fenders are present along the piers which ensures that vessels standoff away from the piers, and may allow for light to filter under the piers. This lack of vessel presence is a key difference between the observed light levels during the present survey and those observed in the 1999 M&A surveys when the central portion of the pier was completely dark. During the 1999 surveys, vessels were tied to both sides of the pier, thus significantly reducing surface light both at the edge and beneath the pier. Further, at the time of the 1999 survey, there was substantially less than a meter of space between the pier bottom and the surface of the water, further limiting availability of surface light to the center of the pier.

Table 4. Average light measurements at Pier 8 and Pier 2 along transects compared to percent of ambient (reference site) at same survey depth level.

Pier 8 – Small Pier								
Depth Level	**Ref**		**T1**		**T3**		**T5**	
	Depth (ft)	**% Ambient**	**Depth (ft)**	**% Ambient**	**Depth (ft)**	**% Ambient**	**Depth (ft)**	**% Ambient**
T	5	100%	5	13%	5	1%	4	0%
M	15	100%	15	21%	12	4%	9	2%
B	31	100%	26	25%	19	7%	14	4%
Mean light measurement			20%		4%		2%	
Pier 2 – Large Pier								
Depth Level	**Ref**		**T1**		**T3**		**T5**	
	Depth (ft)	**% Ambient**	**Depth (ft)**	**% Ambient**	**Depth (ft)**	**% Ambient**	**Depth (ft)**	**% Ambient**
T	5	100%	5	25%	5	5%	5	2%
M	15	100%	15	21%	10	4%	10	2%
B	30	100%	24	21%	17	4%	17	3%
Mean light measurement			22%		4%		2%	

Notes: T – Top; M – Mid-depth; B – Bottom survey depth level
T1 – Adjacent to Pier
T3 - Approximately 15 to 30 ft from the pier face
T5 – Along centerline of the pier





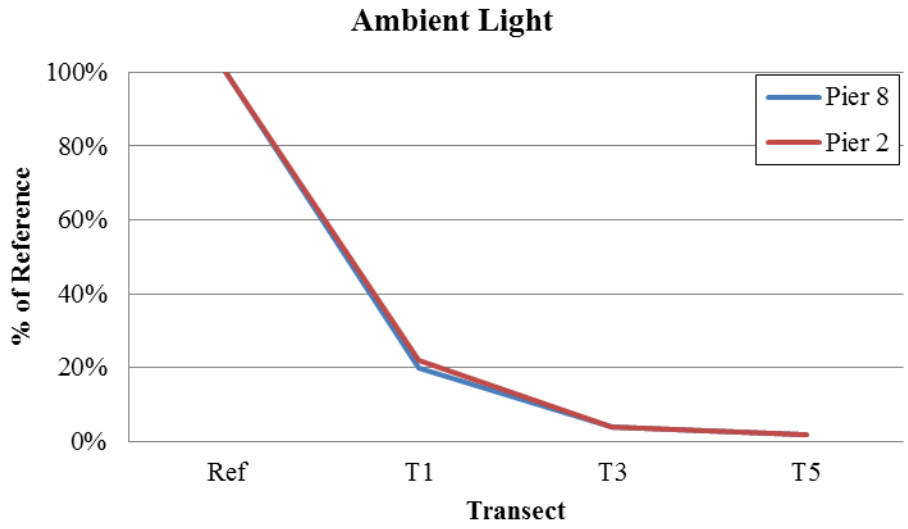


Figure 10. Average depth (top) and light measurements (bottom) along transects at Pier 8 and Pier 2.

Figure 11. Pier 2 (top) and Pier 8 (bottom) at low tide. Inset – Pier 8 at high tide.

FISH COMMUNITY

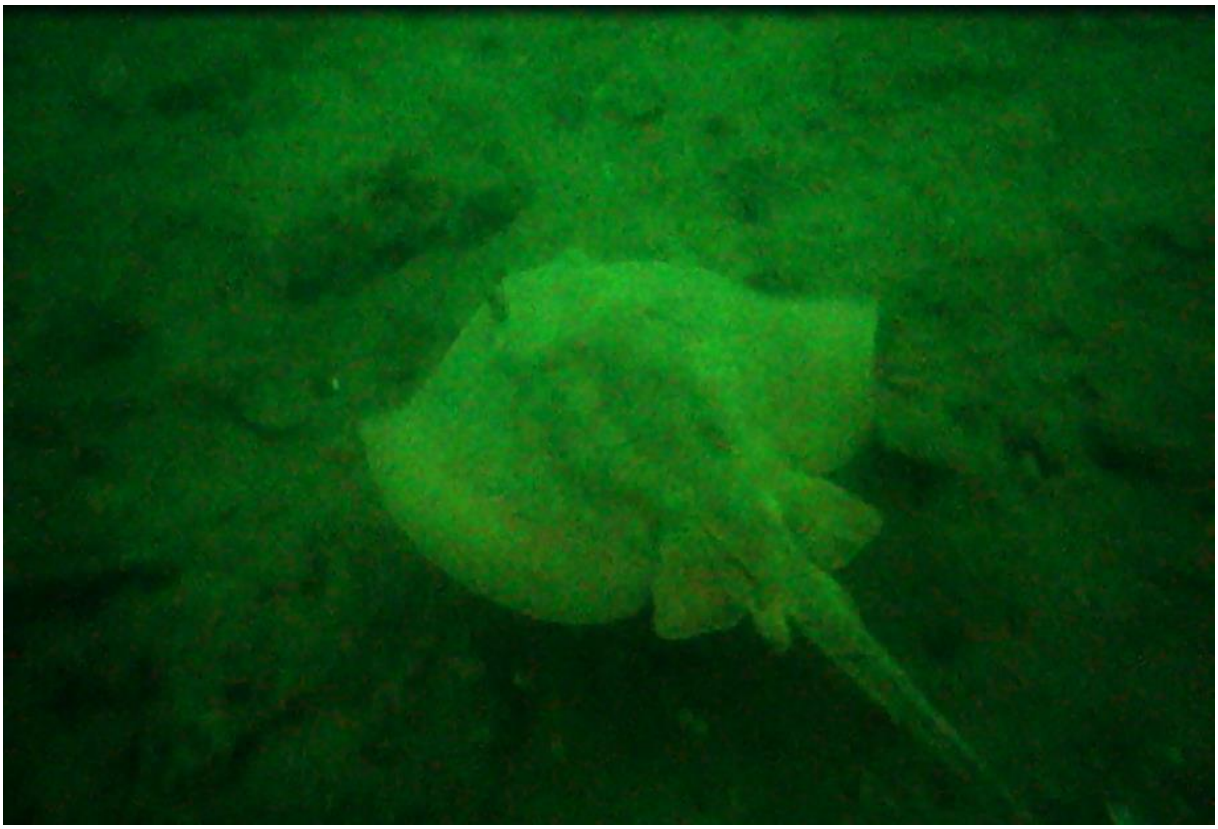
While lighting was reduced under the pier, it would not be considered zero visibility as was encountered during the 1999 M&A study, and it was possible to detect fishes during the survey and generally identify them based on outline or profile. Note that positive fish detection and species identification was sometimes hampered by light levels in combination with typical underwater visibility for south San Diego Bay which was estimated to be approximately 5 to 10 ft. As a result, it is anticipated that lower detection and identification rates occurred with reduced light under the piers.

Generally, few to no fish were observed along transects away from the piers (Table 5). The only fish observed along the reference transects was at Pier 2 and was one black croaker (*Cheilotrema saturnum*), which was present in association with a tug bummer tire that was the only structure occurring on the surveyed reference transects. Fishes observed in all regions of the piers include spotted bay bass (*Paralabrax maculatofasciatus*), kelp bass (*P. clathratus*), barred sand bass (*P. nebulifer*), and round rays (*Urobatis halleri*) (Figure 12). Spiny lobster were also observed adjacent to and underneath the piers (Figure 12). Other species that were generally present adjacent to the piers, and were also associated with the boom surrounding the piers included slough anchovy (*Anchoa delicatissima*) and giant kelpfish (*Heterostichus rostratus*) (Figure 13). Fishes observed primarily underneath the piers included black croaker (*Cheilotrema saturnum*), white seabass (*Atractoscion nobilis*), yellowfin croaker (*Umbrina roncador*), sargo (*Anisotremus davidsoni*), and small, cryptic species such as midshipman (*Porichthys* spp.) and bay blenny (*Hypsoblennius gentilis*) that were only detecting upon viewing video (Figure 14). Since video transects were not conducted, it is likely, that the abundance of these smaller species is greatly underestimated. While no statistical tests were conducted, fish richness and abundance were similar between large and small piers, and substantially higher than reference areas (Figure 15).

Table 5. Organisms observed during fish transects along transects at Pier 8 and Pier 2.

		Pier 8 – Small Pier				Pier 2 – Large Pier			
Common Name	**Scientific Name**	**Ref**	**T1**	**T3**	**T5**	**Ref**	**T1**	**T3**	**T5**
Spotted Bay Bass	*Paralabrax maculatofasciatus*		12	5	7		3	4	
Barred Sand Bass	*Paralabrax nebulifer*		4	3	2		2	1	9
Kelp Bass	*Paralabrax clathratus*		2	1					
Black Croaker	*Cheilotrema saturnum*				26	1*		17	
Round Ray	*Urobatis halleri*		3	2	4		2	5	2
Yellowfin Croaker	*Umbrina roncador*								3
White Sea Bass	*Atractoscion nobilis*						1		1
Midshipman	*Porichthys* sp.								1
Sargo	*Anisotremus davidsoni*							6	
Slough Anchovy	*Anchoa delicatissima*		500+**				500+**		
Giant Kelpfish	*Heterostichus rostratus*		2**				5**		
Bay Blenny	*Hypsoblennius gentilis*								2
Spiny Lobster	*Panulirus interruptus*						2		4

*next to tire on mud
**adjacent to boom



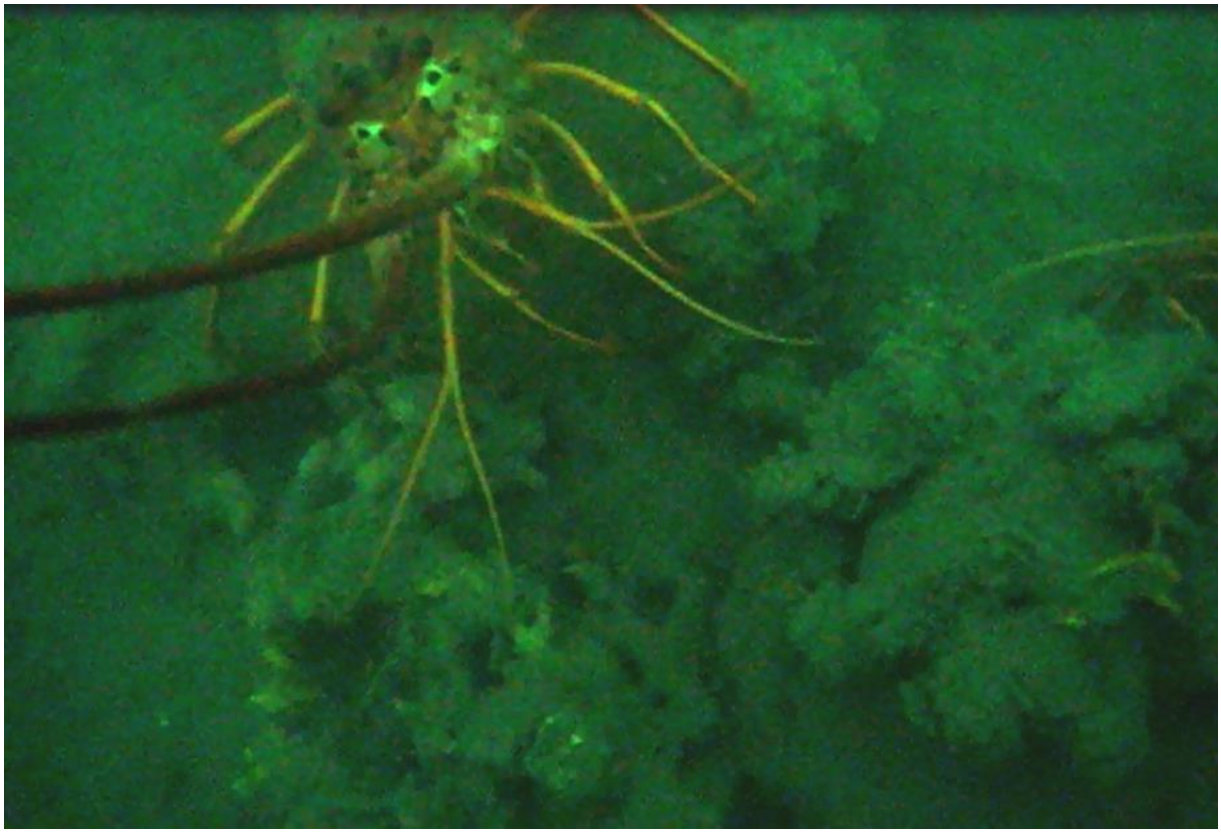


Figure 12. Round ray (top) and spiny lobster (bottom) adjacent to pier.

Figure 13. Giant kelpfish (top) and slough anchovy (bottom) near boom adjacent to pier.

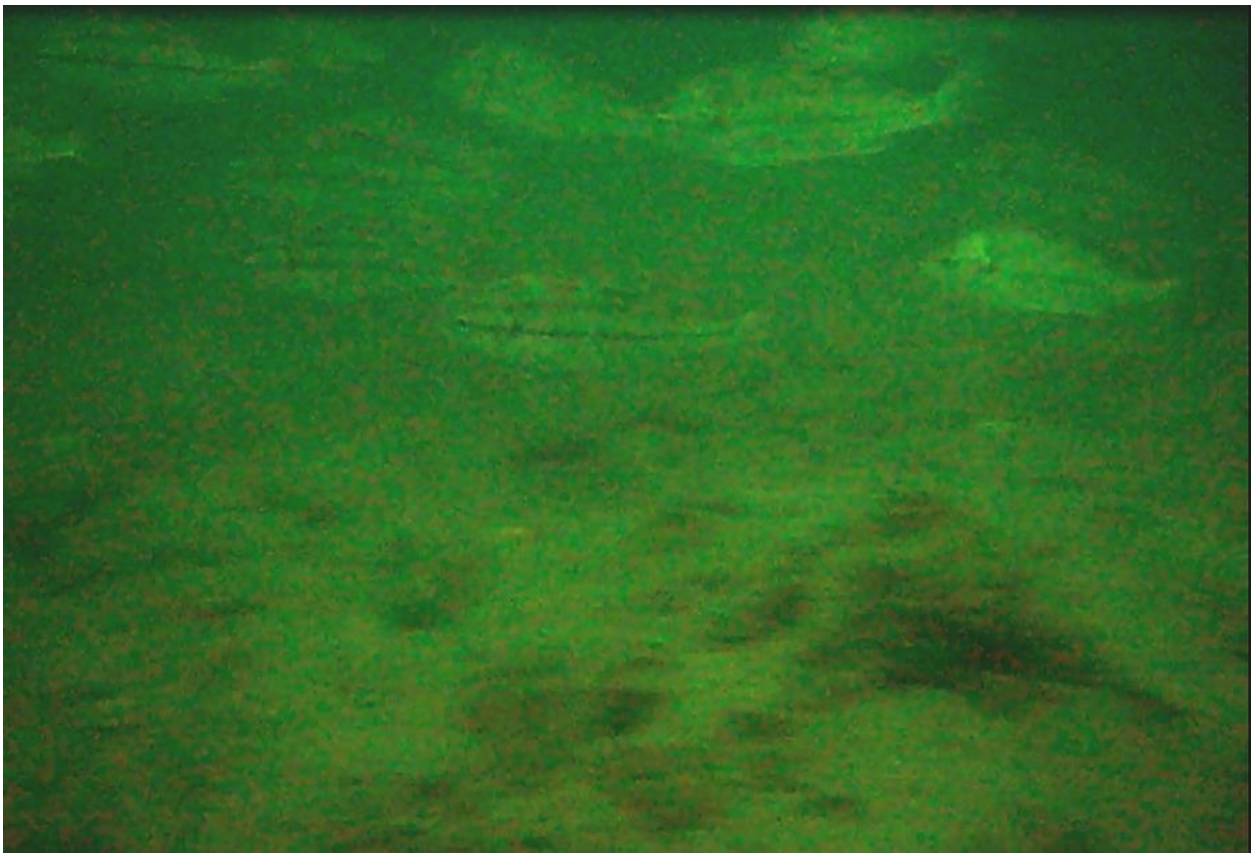
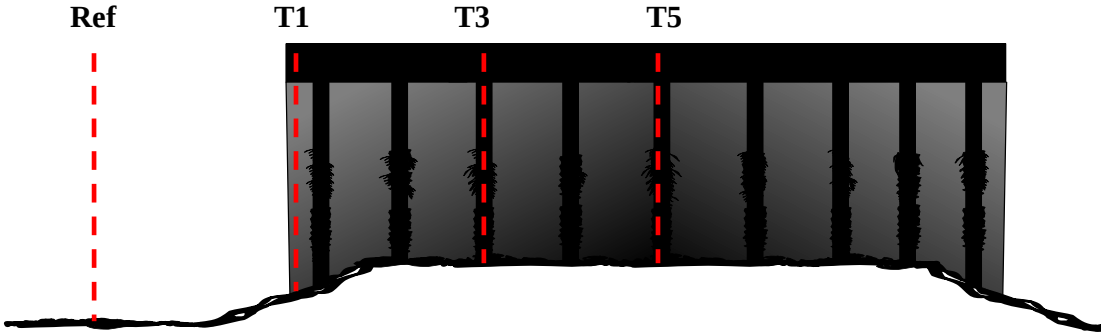


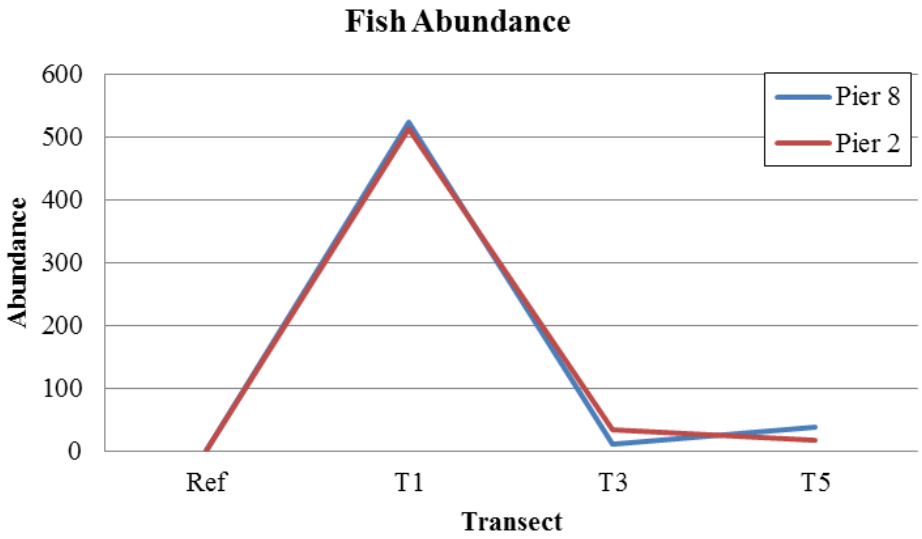
Figure 14. School of juvenile black croaker underneath the pier.

California scorpionfish (*Scorpaena guttata*) are likely to be associated with the pile communities, although none were observed during the survey and this species tends to be more common in northern San Diego Bay than the more southerly portions of the Bay. California scorpionfish is managed by the National Marine Fisheries Service under the Pacific Groundfish Fishery Management Plans (NMFS 2008).

BENTHIC INFAUNA COMMUNITY

Abundance and biomass of benthic infauna was generally higher at Pier 2 (large pier) compared to Pier 8 (small pier), and both were higher than reference areas (Tables 6 and 7; Figure 16). The results displayed the expected patterns; however, no significant differences were detected among the treatments using a one-way analysis of variance (ANOVA), except for the biomass data between Pier 2 and the Pier 8 reference area (Appendix A). Polychaete worms, crustaceans, and molluscs were the most abundant taxa (Table 6), while polychaetes worms, flatworms, and tunicates constituted the highest biomass (Table 7).





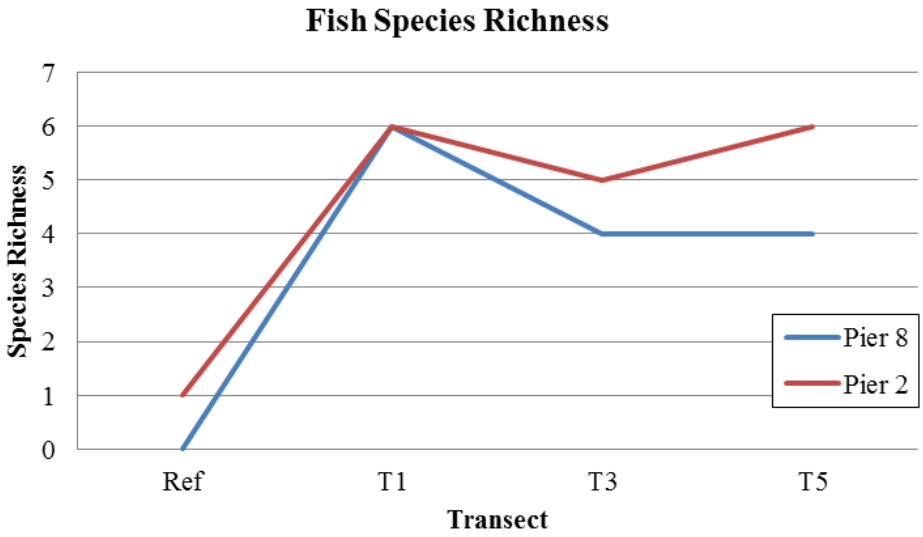


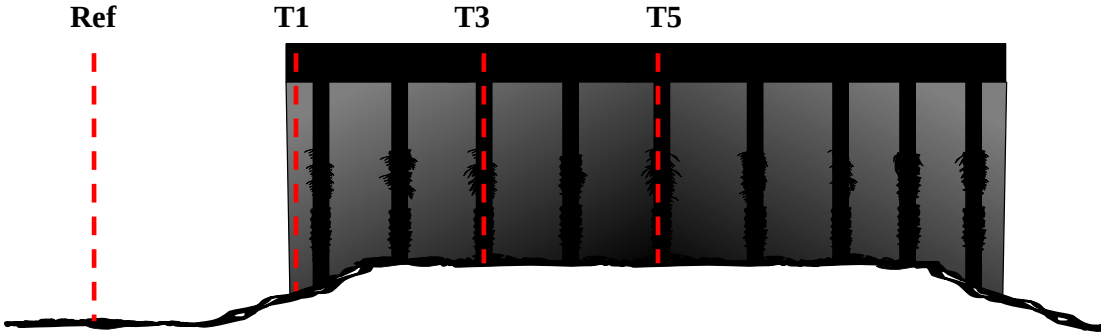
Figure 15. Fish abundance (top) and species richness (bottom) along transects.

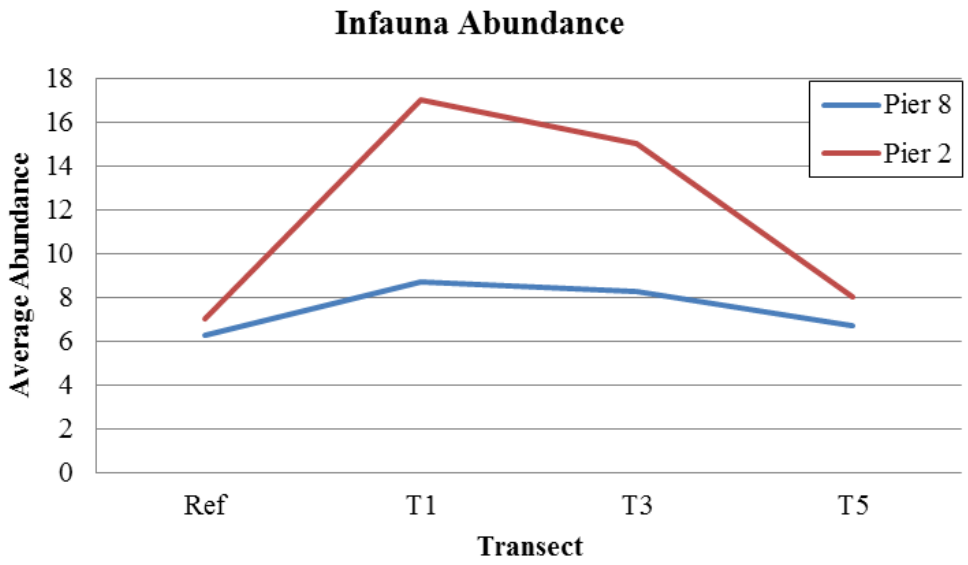
Table 6. Average abundance of benthic infauna for sampling regions at Pier 8 and Pier 2.

	Pier 8 – Small Pier				Pier 2 – Large Pier			
Phylum	**Ref**	**T1**	**T3**	**T5**	**Ref**	**T1**	**T3**	**T5**
Annelida	5.0	6.0	5.3	3.3	4.0	10.3	7.3	3.7
Arthropoda	0.3	1.3	1.7	0.7	1.0	2.3	2.7	2.0
Chordata	0.0	0.0	0.0	0.3	0.0	0.3	0.3	0.3
Cnidaria	0.0	0.0	0.0	0.7	0.3	0.3	0.3	0.0
Echinodermata	0.0	0.7	0.7	0.7	0.3	0.0	1.0	1.0
Ectoprocta	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Mollusca	0.7	0.7	0.3	0.7	1.0	3.3	2.7	1.0
Nemertea	0.3	0.0	0.3	0.0	0.3	0.3	0.3	0.0
Platyhelminthes	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Average	6.3	8.7	8.3	6.7	7.0	17.0	15.0	8.0

Table 7. Average biomass (milligrams) of benthic infauna for sampling regions at Pier 8 and Pier 2.

	Pier 8 – Small Pier				Pier 2 – Large Pier			
Phylum	**Ref**	**T1**	**T3**	**T5**	**Ref**	**T1**	**T3**	**T5**
Annelida	29	205	404	355	79	528	629	150
Arthropoda	10	15	37	3	4	12	5	6
Chordata	3	3	1	150	13	150	208	176
Cnidaria	14	1	39	15	2	6	19	9
Echinodermata	0	0	0	4	1	0	0	0
Ectoprocta	0	0	0	0	0	0	0	0
Mollusca	0	0	0	1	0	0	0	0
Nemertea	0	1	2	0	0	0	0	0
Platyhelminthes	0	0	0	35	0	0	971	201
Average	56	224	483	565	98	696	1,833	542





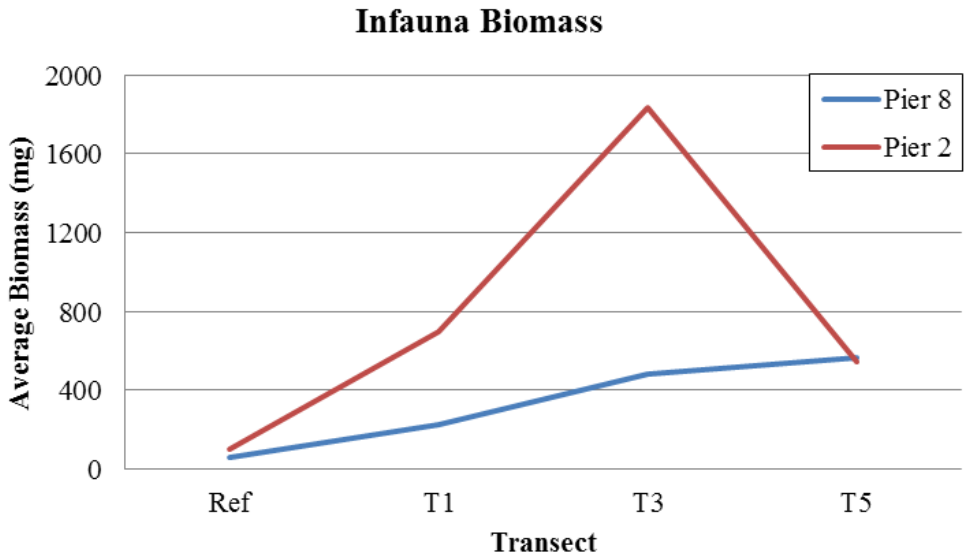


Figure 16. Benthic infuana abundance (top) and species richness (bottom) along transects.

PILING COMMUNITY

A comprehensive assessment of the pier piling community was not conducted for this study as other comprehensive studies have been conducted in south San Diego Bay (e.g., SDUPD 1999), and provide general community structure and species composition, and is anticipated to have similar species assemblages.

For this study, pier pilings were examined along each transect to note visual differences in the composition of encrusting communities. Within the intertidal zone (+6 to -2 ft MLLW), the piles supported a less diverse assemblage compared to the subtidal zone, and were dominated by oysters (*Crassostrea gigas*, *Ostrea lurida*), mussels (*Mytilus* spp.), and barnacles (*Balanus* spp., *Chthalamus* spp.) (Figure 17). No attached algae were observed on the pilings.

Below the intertidal zone, epibiota attached to the pilings included a variety of sponges, hydroids, and tunicates (Figure 18), and the thickness of the epibiota ranged from approximately 3 cm (1 in) to approximately 20 cm (8 in), with the percent cover ranging from approximately 10 to 100 percent. Common species of sponges observed on the pilings at the National City Marine Terminal included *Haliclona bowerbankia*, *Hymeniacidon sinapium*, and *Lucetta losangelensis* (SDUPD 1999). Several species of solitary and compound ascidians also present included *Ciona savignyi*, *Styela canopus*, and *Styela plicata*. Compound ascidians included a grey and white massed species believed to be *Aplidium* spp. and *Botrylloides diegonsis* (SDUPD 1999). Orange gorgonians (*Adelogorgia phyllosclera*) were infrequently observed during the current survey (Figure 18). Algal species were noted on the booms adjacent to the pier, but not on the pilings. *Undaria pinnatifida* is a non-native, invasive kelp species that has been observed in south San Diego Bay, but was not detected during this survey. When established, *U. pinnatifida* occurs in dense, vigorous stands and forms a thick canopy over the native biota (IUCN Invasive Species Specialist Group 2007). The area adjacent to the pier contained some debris items and shell hash, while underneath the pier shell hash was present but not as concentrated as the area along the slope (Figure 19).

Figure 17. Piling in the intertidal zone at Pier 2.

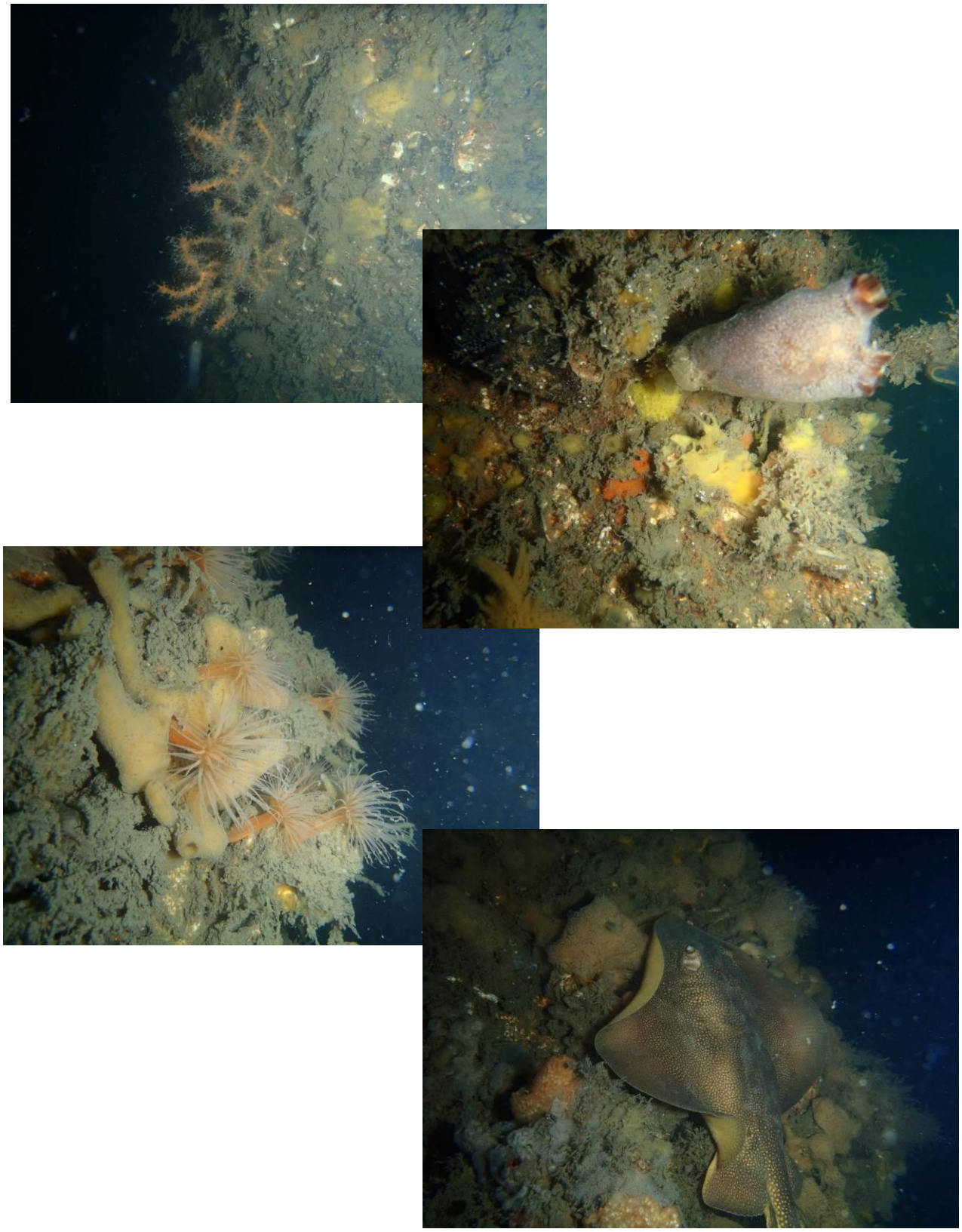


Figure 18. Pilings in the subtidal zone both Pier 2 and Pier 8.

Figure 19. Substrate underneath piers.

DISCUSSION

SAN DIEGO BAY ESSENTIAL FISH HABITAT

Under the provisions of the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Federal Register 1997), the amendments require the delineation of Essential Fish Habitat (EFH) for all managed species. EFH has been designated over all tidal marine waters in southern California. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with the NMFS regarding the potential effects of their actions on EFH, and respond in writing to the NMFS's recommendations.

The ichthyofauna in San Diego Bay has been previously studied (Pondella and Williams 2009, Merkel & Associates 2000, Allen 1999, Hoffman 1994; Figure 20). These studies have identified 78 species of fish in San Diego Bay. The following analysis makes extensive use of Allen's (1999) data set because it is both recent and comprehensive (surveys were completed quarterly for five and a half years, at four stations throughout San Diego Bay, utilizing six sampling gear types) with a total of 78 species identified. The other studies reviewed for this analysis are utilized primarily to confirm the presence of fish species and to identify any additional species not captured by Allen.

Of these 78 species observed in San Diego Bay, six are managed by the NMFS under two Fishery Management Plans (FMPs)-the Coastal Pelagics and Pacific Groundfish Management Plans (Table 3) (NMFS 1998a, 1998b). Four of the five fish managed under the Coastal Pelagics FMP are represented in San Diego Bay. The northern anchovy and pacific sardine are the most abundant pelagics identified by Allen, ranking 1st and 4th in abundance and 3rd and 10th in biomass, respectively (Table 8). Together, these two species accounted for 46.3% of the total abundance and 11.6% of the total biomass of fish enumerated by Allen (1999). The pacific mackerel and jack mackerel are the other two coastal pelagics of potential concern in the project area. These two species were much lessabundant than the northern anchovy and pacific sardine and were ranked by Allen as 32nd and 52nd in total abundance and 24th and 73rd in total biomass, respectively. Together the two species accounted for less than 1% of total abundance and biomass of fish captured (Allen 1999).

Of the 89 species managed under the Pacific Groundfish FMP (NMFS 2008), two have been found in San Diego Bay during the studies analyzed for this assessment: California scorpionfish and English sole. These species were observed only rarely in San Diego Bay during the five and a half years of Allen's study, ranking 41st and 76th by abundance and 24th and 73rd by biomass, respectively (Table 8). Together these two species accounted for less than 0.5% of the total abundance and biomass of fish captured (Allen 1999). Suitable soft bottom habitat for English sole has been well sampled within San Diego Bay and the paucity of capture of English sole is likely a reflection of the general low level occurrence of this species within San Diego Bay. Conversely, the low level of capture of California scorpionfish, is most likely related to a combination of both limited occurrence of suitable habitat and the difficulty of capture of this species within its preferred structured hard bottom habitat. This belief is based on the common detection of this species on artificial reefs and Zuniga Jetty, located at Naval Air Station North Island (Pondella et al. 2006). Observations over many years of diver survey suggest that scorpionfish are less common further into San Diego Bay than nearer the mouth of the Bay. California scorpionfish have been observed further into the Bay within structured habitats such as piers and riprap revetment, including on the cyclopean seawall of the Tenth Avenue Marine Terminal (TAMT), on the Coronado Bridge piles, and on the pendant wall at the J Street Marina (K. Merkel, pers. obs.).

HABITAT DESIGNATION OF PROPOSED PROJECT AREA

Using the habitat designation provided in the San Diego Bay Integrated Natural Resources Management Plan (INRMP) (Navy and SDUPD 2010), the habitat associated with the proposed study area includes deep subtidal habitat. Deep subtidal habitat includes the surface water, water column and sediments in areas greater than 20 ft in depth. This habitat constitutes about 4,440 acres (1,797 ha) (34%) of the Bay. It is associated primarily with navigational channels. Except for a few areas in north bay that have no dredging record, all deep subtidal habitat has been dredged since the 1940s; most areas were dredged in the 1960s or more recently. Within this habitat type, various categories may also be present, and an example includes artificial hard substrate (e.g., rip-rap revetment, concrete bulkhead walls, and piers). A summary of fish species within these habitats is provided in the following sections.

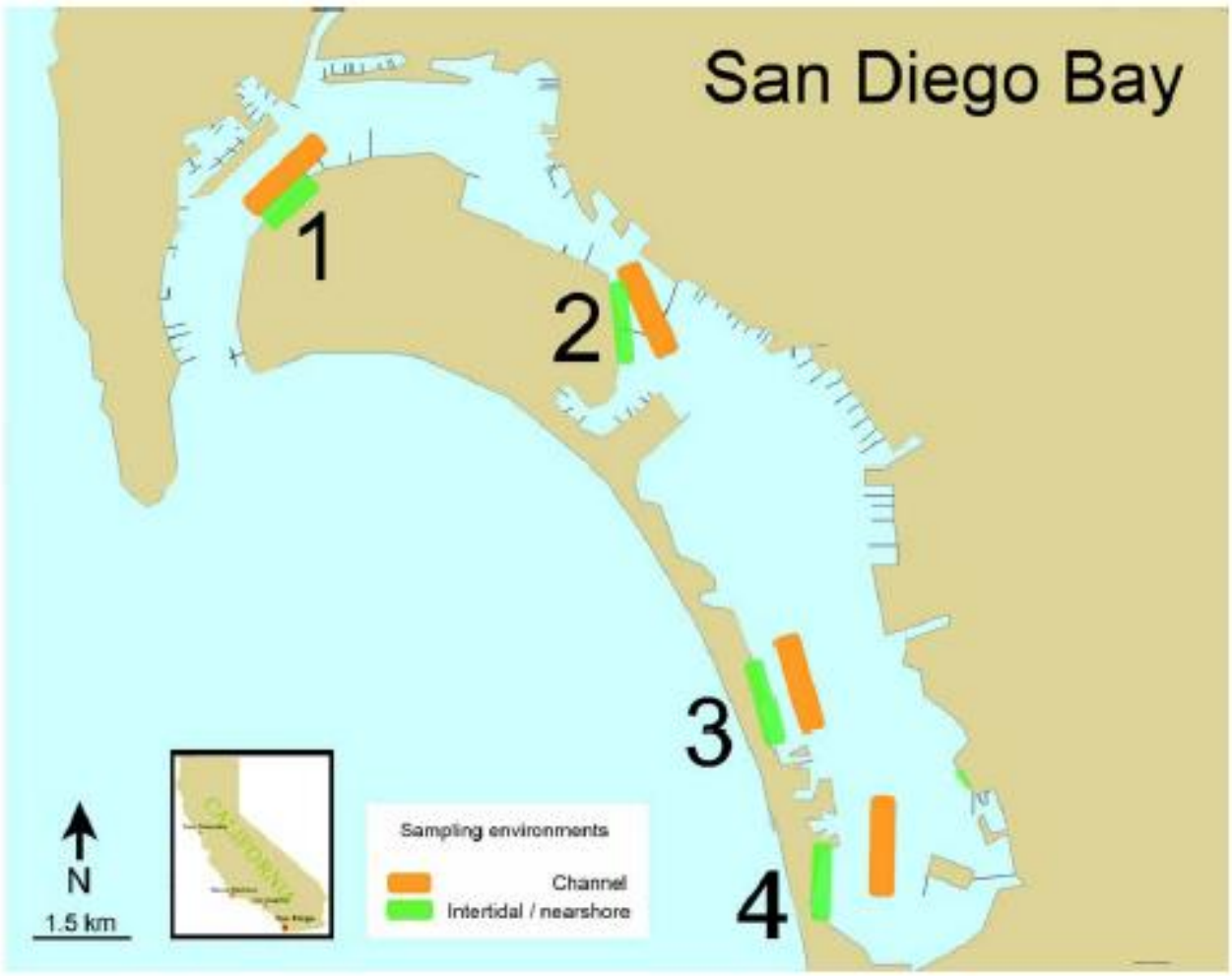


Figure 20. Fish sampling locations of the North (1), North-Central (2), South- Central (3) and South (4) Ecoregions in San Diego Bay. From Pondella and Williams 2009.

Table 8. Table of NMFS managed fish species previously found in San Diego Bay. Rank refers to the relative rankings among 78 fish species observed by Allen (1999). Ranks are total abundance and biomass, respectively.

Common Name	Scientific Name	Rank	
		Abundance	Biomass
Coastal Pelagics FMP			
Northern Anchovy	*Engraulis mordax*	1st	3rd
Pacific Sardine	*Sardinops sagax*	4th	10th
Pacific Mackerel	*Scomber japonicus*	32nd	17th
Jack Mackerel	*Trachurus symmetricus*	52nd	29th
Pacific Groundfish FMP			
California Scorpionfish	*Scorpaena gutatta*	41st	24th
English Sole	*Parophrys vetulus*	76th	73rd

Fishes Associated with Deep Subtidal Habitats

The group of fish species taken in deep subtidal habitats (>20 ft below MLLW) is listed in Table 9. This species list is based on all samples taken during the period 1994 through 1997 (Allen 1999), and the surveys performed from 1994 to1999 and again in 2005 found that fish inhabiting open water had numerical and biomass densities which were the lowest of all sampled habitats (Allen 1999, VRG 2006).

Table 9. San Diego Bay fish species taken in deep subtidal habitats.[1]

Scientific Name	Common Name	Scientific Name	Common Name
Heterodontus francisi	California horn shark	*Xenistius californiensis*	salema
Mustelus californicus	gray smoothhound	*Seriphus politus*	queenfish
Rhinobatus productus	shovelnose guitarfish	*Atractoscion nobilis*	white sea bass
Myliobatis californica	bat ray	*Cheilotrema saturnum*	black croaker
Urolophus halleri	round stingray	*Genyonemus lineatus*	white croaker
Sardinops sagax caeruleux	pacific sardine	*Roncador stearnsii*	spotfin croaker
Engraulis mordax	northern anchovy	*Umbrina roncador*	yellowfin croaker
Anchoa compressa	deepbody anchovy	*Cymatogaster aggregata*	shiner surfperch
Anchoa delicatissima	slough anchovy	*Embiotoca jacksoni*	black surfperch
Synodus lucioceps	California lizardfish	*Phanerodon furcatus*	white surfperch
Porichthys myriaster	specklefin midshipman	*Mugil cephalus*	striped mullet
Porichthys notatus	plainfin midshipman	*Oxyjulis californica*	senorita
Hyporhamphus rosae	California halfbeak	*Halichoeres semicinctus*	rock wrasse
Strongylura exilis	California needlefish	*Hypsoblennius gentilis*	bay blenny
Atherinopsis californiensis	jacksmelt	*Heterostichus rostratus*	giant kelpfish
Atherinops affinis	topsmelt	*Scomber japonicus*	Pacific mackerel
Syngnathus californiensis	kelp pipefish	*Citharichthys stigmaeus*	speckled sand dab
Hippocampus ingens	Pacific seahorse	*Xysteurys liolepis*	fantail sole
Syngnathus leptorhynchus	bay pipefish	*Symphurus atricauda*	California tonguefish
Syngnathus auliscus	barred pipefish	*Hypsopsetta guttulata*	diamond turbot
Scorpaena guttata	spotted scorpionfish	*Paralichthys californicus*	California halibut
Leptocottus armatus	staghorn sculpin	*Pleuronectes vetulus*	English sole
Paralabrax clathratus	kelp bass	*Pleuronichthys coenosus*	CO turbot
Paralabrax maculatofasciatus	spotted sand bass	*Pleuronichthys ritteri*	spotted turbot
Paralabrax nebulifer	barred sand bass	*Pleuronichthys verticalis*	hornyhead turbot

[1] Based on Data for 1994–1997 (Allen 1999)

Fishes Associated with Artificial, Man-Made Habitats

Fishes associated with artificial or man-made habitats have not been studied extensively in San Diego Bay. The species list shown in Table 10 was compiled by reviewing data from a large series of ecological studies conducted to develop environmental impact statements for projects throughout the Bay and focused reef surveys (Navy and SDUPD 2010, Pondella et al. 2006). The species listed in Table 10 also occur in natural San Diego Bay habitats, as well as areas that have been modified by the presence of rock riprap, concrete bulkheads, piers, marina floats, and a wide variety of other artificial habitats.

Table 10. San Diego Bay fish species associated with artificial, man-made habitats.

Scientific Name	Common Name	Scientific Name	Common Name
Platyrhinoidis triseriata	thornback	*Medialuna californiensis*	halfmoon
Rhinobatus productus	shovelnose guitarfish	*Cymatogaster aggregata*	shiner surfperch
Urolophus halleri	round stingray	*Damalichthys vacca*	pile surfperch
Sardinops sagax caeruleux	Pacific sardine	*Embiotoca jacksoni*	black surfperch
Engraulis mordax	northern anchovy	*Hyperprosopon argenteum*	walleye surfperch
Anchoa compressa	deepbody anchovy	*Phanerodon furcatus*	white surfperch
Anchoa delicatissima	slough anchovy	*Rhacochilus toxotes*	rubberlip surfperch
Porichthys myriaster	specklefin midshipman	*Hypsoblennius gentilis*	bay blenny
Atherinops affinis	topsmelt	*Hypsoblennius jenkensi*	mussel blenny
Syngnathus leptorhynchus	bay pipefish	*Paraclinus integripinnis*	reef finspot
Scorpaena guttata	spotted scorpionfish	*Gibbonsia elegans*	spotted kelpfish
Leptocottus armatus	staghorn sculpin	*Gibbonsia montereyensis*	crevice kelpfish
Paralabrax clathratus	kelp bass	*Heterostichus rostratus*	giant kelpfish
Paralabrax maculatofasciatus	spotted sand bass	*Clevelandia ios*	arrow goby
Paralabrax nebulifer	barred sand bass	*Ilypnus gilberti*	cheekspot goby
Anisotremus davidsoni	sargo	*Lepidogobius lepidus*	bay goby
Seriphus politus	queenfish	*Quietula ycauda*	shadow goby
Cheilotrema saturnum	black croaker	*Scomber japonicus*	Pacific mackerel
Genyonemus lineatus	white croaker	*Hypsopsetta guttulata*	diamond turbot
Umbrina roncador	yellowfin croaker	*Paralichthys californicus*	California halibut
Girella nigricans	opaleye		

HABITAT CONTROLLING FACTORS AND CONCLUSIONS

The construction of a new conventional pier to replace the inadequate existing pier would result in the modification of approximately 2.1 acres of open water habitat to waters affected by overwater structure (Table 1). This change would affect approximately 0.05% of the available deep unvegetated subtidal habitat in San Diego Bay (Navy and SDUPD 2010). Presumably, the replacement pier would be similar in construction and size as the "newer" piers (i.e., higher decking with fewer piles), and therefore, over time, biological conditions would also be expected to be similar to those found at Pier 2 in the present investigations.

While only one individul black croaker (*Cheilotrema saturnum*) was observed associated with a tire located in the bare mud bottom reference areas, other demersal fish species including spotted sand bass (*Paralabrax maculatofasciatus*), round stingrays (*Urobatis halleri*), barred sand bass (*P. nebulifer)*, specklefin midshipman (*Porichthys myriaster*), and gobies (Family Gobiidae) are likely to use this habitat (Navy and SDUPD 2010), although at relatively lower densities compared to other habitats. Invertebrates were also sparse, although the mud bottom showed numerous signs of burrowing invertebrate activities, likely from bivalves (*Chione* spp., *Macoma nasuta*), the amphipod (*Grandidierella japonica*), bay ghost shrimp (*Callianassa californiensis*), burrowing anemones (*Harenactis attenuata*), and tube-dwelling anemones (*Pachycerianthus fimbriatus*). Other invertebrates occasionally seen in these habitats are the opisthobranch, *Navanax inermis*, slender sea pen (*Stylatula elongata*), as well as calcareous bryozoans and soft bryozoans such as the non-native *Zoobotryon verticillatum* (Navy and SDUPD 2010). The very fine silty sediments found within the Naval Station would be expected to significantly limit the occurrence of many species requiring firm or stable bottom conditions.

Pier and wharf pilings provide habitat for an assemblage of organisms known as the fouling community. This community appears to attract schooling fish, which feed on the attached invertebrates and algae, and obtain refuge from predation (Glasby 1999). The species present and the overall complexity of the fouling community on pier pilings are dependent upon a number of factors including tidal elevation and inundation time, light availability, wave exposure, and size and shape of the pilings themselves (Connell and Glasby 1999, Connell 2001). While several studies indicate that man-made structures do not support the same complexity of organisms as do natural reefs, it is apparent that pier pilings do provide habitat value for fouling communities and associated fish assemblages (Clynick 2008). Piles exposed to greater circulation and higher light levels tend to support the most complex and productive communities. This is the case within the study area for piles near the ends of the piers and on exposed sides, which appear to support more diverse encrusting communities. Whether an artificial structure provides benefit or detriment to community assemblages are based not only on the structure characteristics but also the baseline habitat conditions into which the structure would be introduced.

While the discussion of diminishing returns from a larger structure does have merit, it appears that the proposed increase does not constitute a large enough change to affect light levels, currents, wave energies, and water circulation, and that despite the increase in surface area, no apparent biological difference between small and large pier were observed; although presumably a larger pier could provide more habitat than a smaller pier. The history of pier replacement at Naval Station San Diego has been to replace piers with low decks with piers that are higher off the water and which are supported by few pilings. The result of this replacement methodology has been to reduce the influence of structures on circulation patterns and light penetration beneath the piers, even though the piers themselves increase in size.

A summary of the results from this study were assessed based on the habitat controlling factors noted in Nightingale and Simenstad (2001), and provided in Table 11. The results from this study further support the conclusion that overwater structures provide increased three dimensional substrate and cover that locally increases productivity of encrusting and benthic organisms and also serves to locally increase richness and abundance of fish and infauna over the conditions observed in more open waters (Merkel & Associates 2010).

Table 11. Summary of habitat controlling factors and potential effects associated with conversion of small pier to larger pier at NAVSTA San Diego.

Habitat Controlling Factors	Conversion of existing small pier to larger pier
Light Regime	• Conversion of approximately 1.9 acres of open water habitat to overwater structure and associated habitat (or approximately 0.05% of the available deep unvegetated subtidal habitat in San Diego Bay). • Despite increase in surface area, light levels adjacent to and underneath small and large piers similar. • New design may actually increase light levels underneath pier at low tide.
Wave Energy Regime	• No anticipated change in currents or wave energy since the reduction in the number of piles and higher decking may result in similar effect or may possibly increase circulation beneath the pier structure.
Substrate	• Conversion of approximately 0.05% of available deep subtidal habitat to overwater structure. • Given the same or increased water flow, sedimentation pattern anticipated to be similar or reduced with larger pier.
Water Quality	• Anticipated reduction in number of piles may decrease attachment areas for nonindigenous species. • Anticipated modernization and infrastructure may decrease inputs to water column.

The M&A 2010 investigations outlined a conceptual model of how common community metrics of biomass, abundance, and species richness would be expected to change around pier structures. The present study confirms that the model holds true at Piers 2 and 8. The addition of structure in the otherwise unstructured habitat of the waters of NAVSTA San Diego, serve to increase fish and invertebrate richness, abundance, and biomass over that otherwise occurring in open waters and soft silty bottom habitats of the base.

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APPENDIX A

RESULTS OF ONE-WAY ANALYSIS OF VARIANCE FOR BENTHIC INFAUNA DATA

Macrofauna Counts (Density per sample unit)
Summary:

Sample	No. of observations	Minimum	Maximum	Range	Sum	Mean	Standard error of the mean
N | Pier 2	9	9.000	104.000	95.000	360.000	40.000	11.999
N | Pier 2 Ref	3	8.000	23.000	15.000	46.000	15.333	4.333
N | Pier 8	9	6.000	59.000	53.000	238.000	26.444	5.819
N | Pier 8 Ref	3	10.000	22.000	12.000	45.000	15.000	3.606

All variables displayed a normal distribution, except Pier 2, but acceptable for ANOVA assumptions.

ANOVA results:

Analysis of variance:

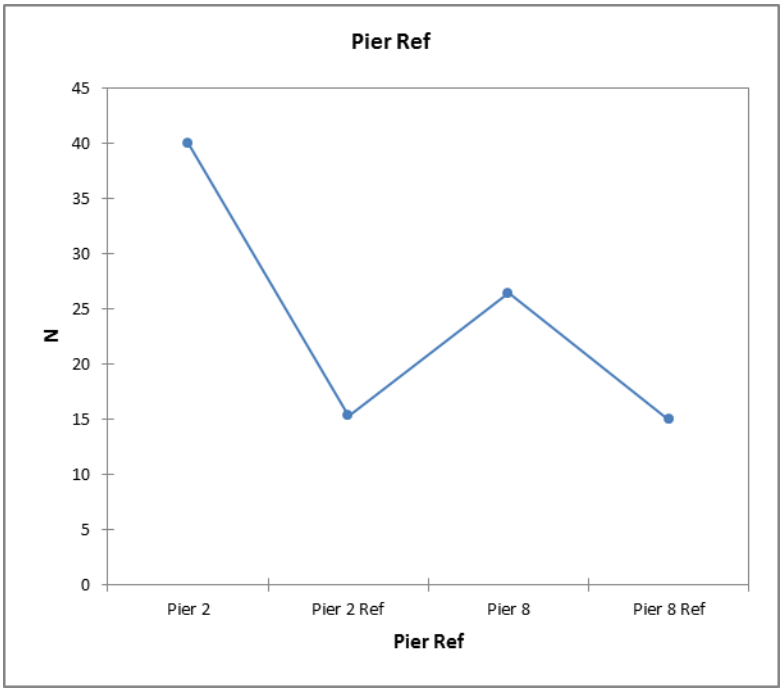
Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	2294.069	764.690	1.177	0.343
Error	20	12994.889	649.744		
Corrected Total	23	15288.958			

Computed against model Y=Mean(Y)

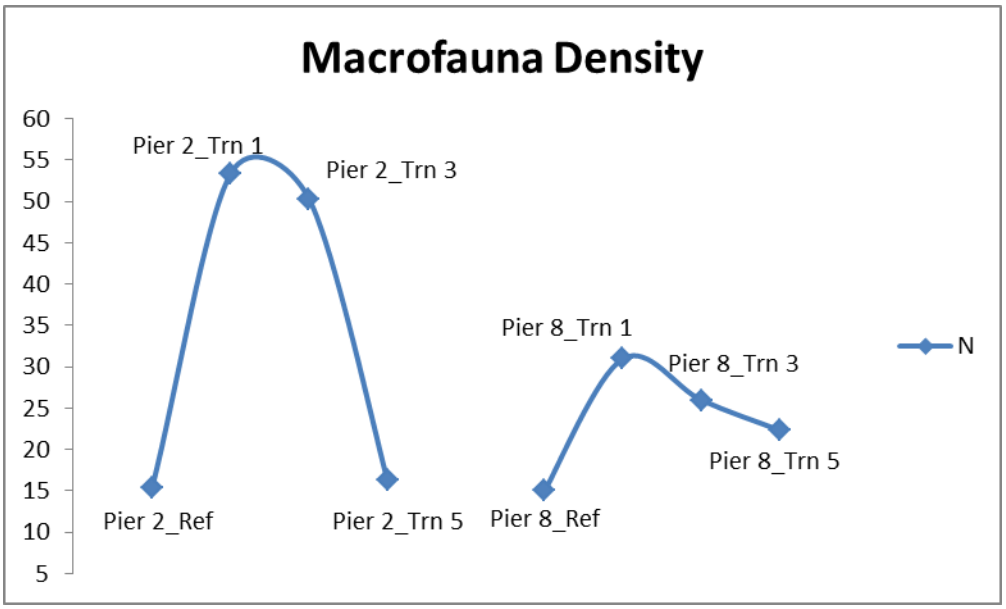
Pier Ref / Tukey (HSD) / Analysis of the differences between the categories with a confidence interval of 95%:

Contrast	Difference	Standardized difference	Critical value	Pr > Diff	Significant
Pier 2 vs Pier 8 Ref	25.000	1.471	2.799	0.472	No
Pier 2 vs Pier 2 Ref	24.667	1.452	2.799	0.484	No
Pier 2 vs Pier 8	13.556	1.128	2.799	0.677	No
Pier 8 vs Pier 8 Ref	11.444	0.673	2.799	0.906	No
Pier 8 vs Pier 2 Ref	11.111	0.654	2.799	0.913	No
Pier 2 Ref vs Pier 8 Ref	0.333	0.016	2.799	1.000	No
Tukey's d critical value:			3.958		

Macrofauna counts means plot



Macrofauna counts pier density profile



Species richness summary

Sample	No. of observations	Minimum	Maximum	Range	Sum	Mean	Standard error of the mean
S | Pier 2	9	6.000	26.000	20.000	120.000	13.333	2.357
S | Pier 2 Ref	3	4.000	10.000	6.000	21.000	7.000	1.732
S | Pier 8	9	4.000	15.000	11.000	71.000	7.889	1.124
S | Pier 8 Ref	3	5.000	8.000	3.000	19.000	6.333	0.882

All variables displayed a normal distribution therefore ANOVA was used to test for differences.

ANOVA results:

Analysis of variance:

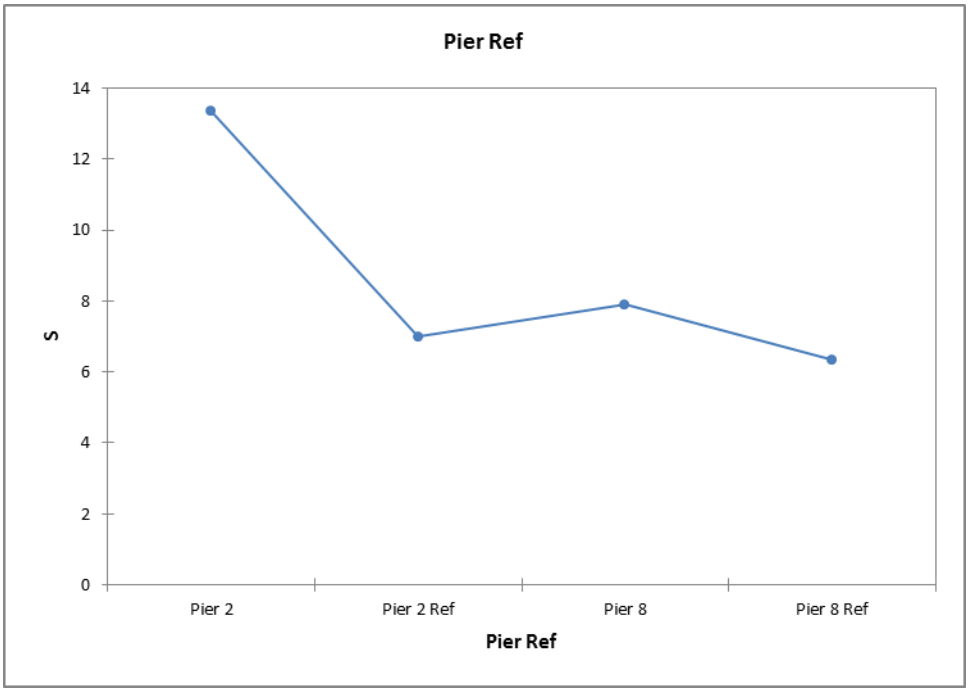
Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	204.069	68.023	2.649	0.077
Error	20	513.556	25.678		
Corrected Total	23	717.625			

Computed against model Y=Mean(Y)

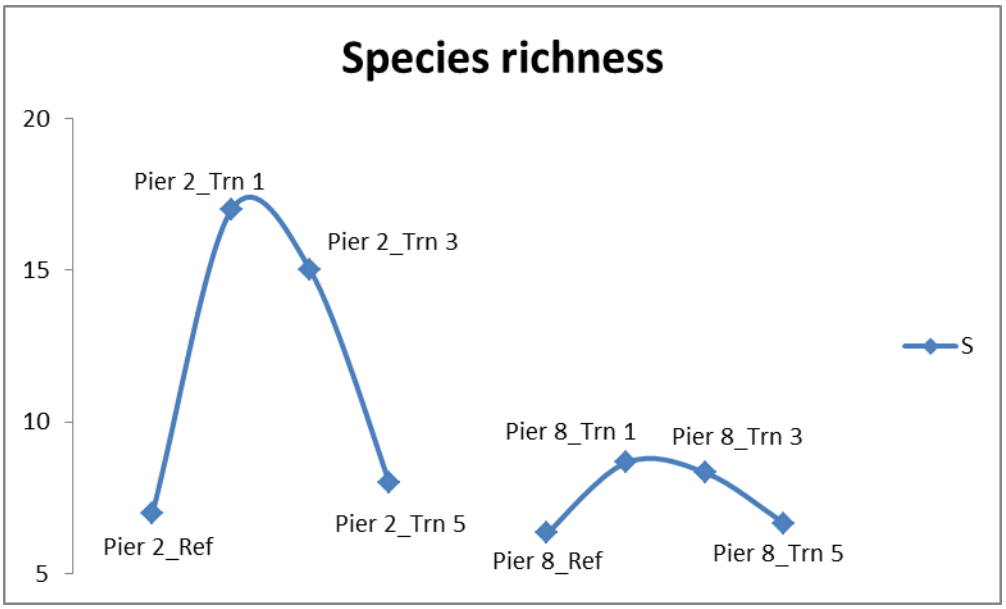
Pier Ref / Tukey (HSD) / Analysis of the differences between the categories with a confidence interval of 95%:

Contrast	Difference	Standardized difference	Critical value	Pr > Diff	Significant
Pier 2 vs Pier 8 Ref	7.000	2.072	2.799	0.196	No
Pier 2 vs Pier 2 Ref	6.333	1.875	2.799	0.270	No
Pier 2 vs Pier 8	5.444	2.279	2.799	0.137	No
Pier 8 vs Pier 8 Ref	1.556	0.460	2.799	0.967	No
Pier 8 vs Pier 2 Ref	0.889	0.263	2.799	0.993	No
Pier 2 Ref vs Pier 8 Ref	0.667	0.161	2.799	0.998	No
Tukey's d critical value:			3.958		

Species richness means plot



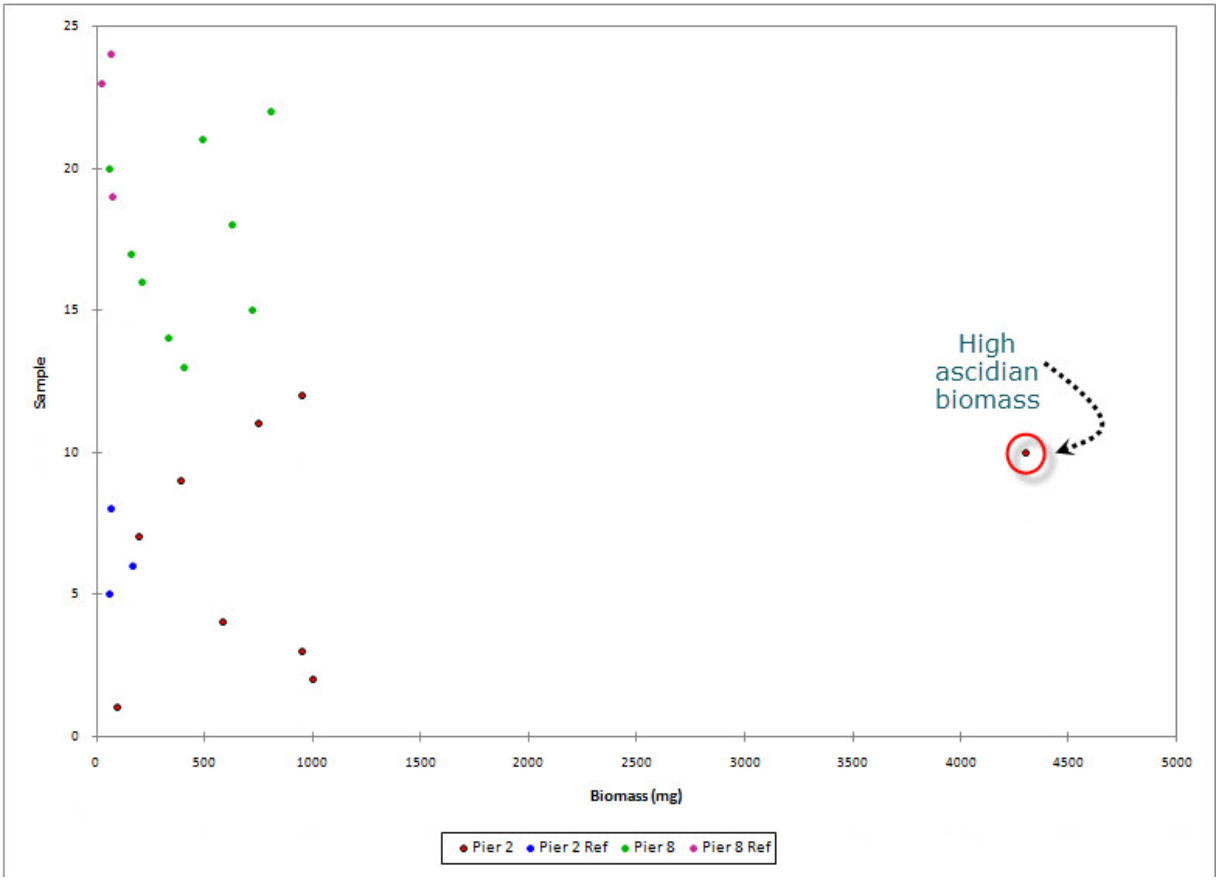
Species richness pier profile



Macrofauna Biomass (mg)

Before performing statistics a Cleveland plot was produced to detect possible outliers, one sample in Pier 2 showed a high ascidian biomass, therefore this sample was omitted from statistical analysis.

Biomass Cleveland plot



Biomass summary:

Descriptive statistics (Quantitative data):

Sample	No. of observations	Minimum	Maximum	Range	Sum	Mean	Standard error of the mean
Biomass (mg) | Pier 2	8	92.900	999.300	906.400	4912.600	614.075	126.095
Biomass (mg) | Pier 2 Ref	3	61.600	166.800	105.200	295.100	98.367	34.248
Biomass (mg) | Pier 8	9	58.100	810.500	752.400	3814.700	423.856	86.623
Biomass (mg) | Pier 8 Ref	3	24.800	78.000	53.200	169.400	56.467	16.172

All variables displayed a normal distribution therefore ANOVA was used to test for differences.

ANOVA results:

Analysis of variance:

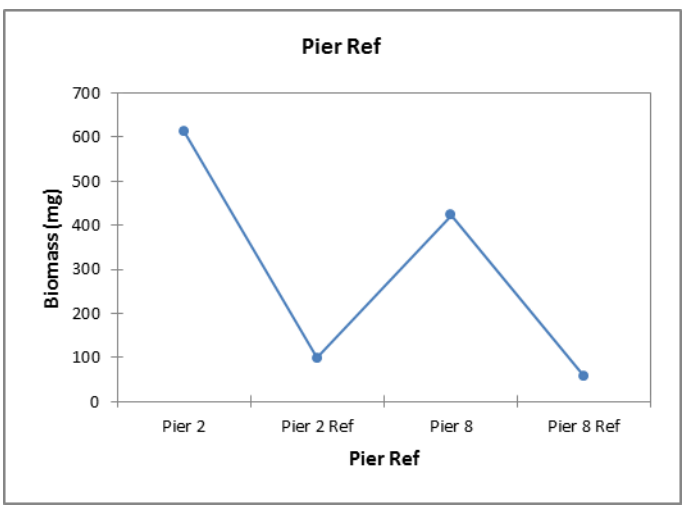
Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	998737.166	332912.389	4.395	0.016
Error	19	1439258.391	75750.442		
Corrected Total	22	2437995.557			

Computed against model Y=Mean(Y)

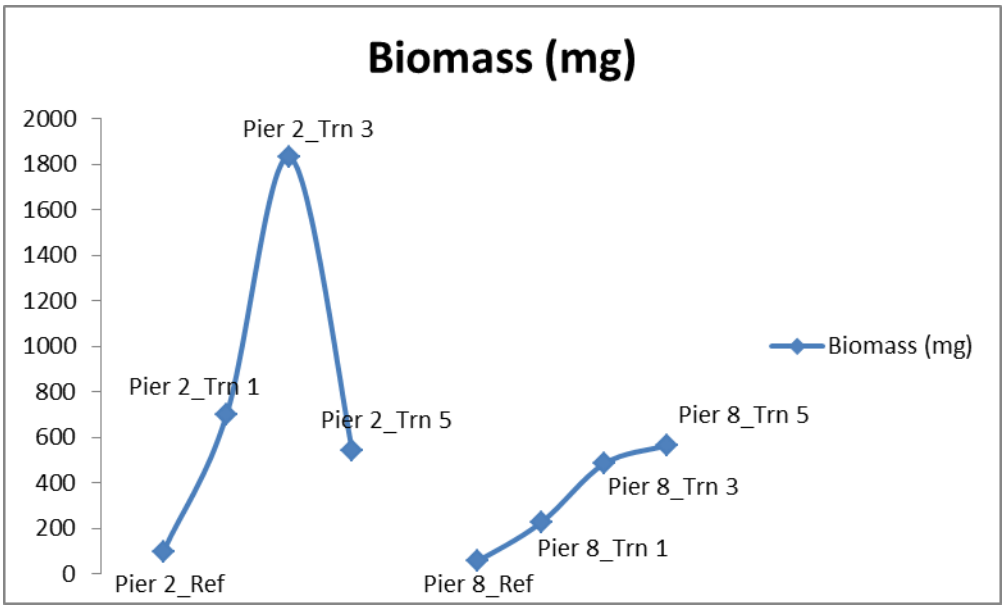
Pier Ref / Tukey (HSD) / Analysis of the differences between the categories with a confidence interval of 95%:

Contrast	Difference	Standardized difference	Critical value	Pr > Diff	Significant
Pier 2 vs Pier 8 Ref	557.608	2.993	2.812	0.035	Yes
Pier 2 vs Pier 2 Ref	515.708	2.768	2.812	0.055	No
Pier 2 vs Pier 8	190.219	1.422	2.812	0.501	No
Pier 8 vs Pier 8 Ref	367.389	2.002	2.812	0.222	No
Pier 8 vs Pier 2 Ref	325.489	1.774	2.812	0.316	No
Pier 2 Ref vs Pier 8 Ref	41.900	0.186	2.812	0.998	No
Tukey's d critical value:			3.977		

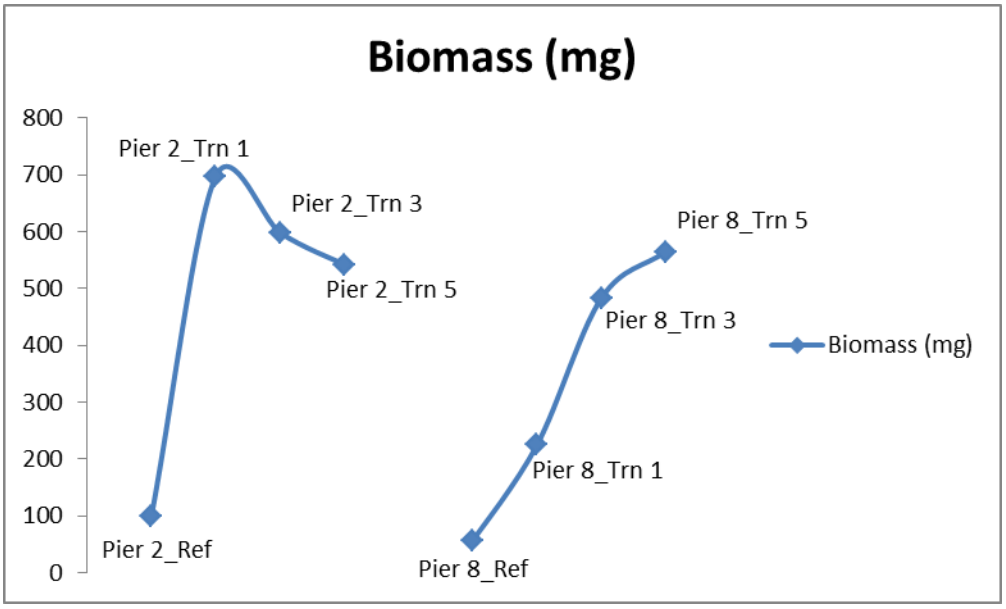
Biomass means plot



Biomass pier profile (including high ascidian biomass sample)



Biomass pier profile (excluding high ascidian biomass sample)



Appendix D

Record of Non-Applicability (RONA) and Air Quality Data

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RECORD OF NON-APPLICABILITY (RONA) FOR CLEAN AIR ACT CONFORMITY

NAVAL BASE SAN DIEGO PIER 8 REPLACEMENT

SAN DIEGO AIR BASIN

INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* in the 30 November 1993, Federal Register (40 Code of Federal Regulations [CFR] Parts 6, 51, and 93). The U.S. Navy published *Clean Air Act (CAA) General Conformity Guidance* in OPNAVINST 5090.1C (Appendix F) dated 30 October 2007. These publications provide implementing guidance to document CAA Conformity Determination requirements.

Federal regulations state that no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license to permit, or approve any activity that does not conform to an applicable implementation plan. It is the responsibility of the Federal agency to determine whether a Federal action conforms to the applicable implementation plan, before the action is taken (40 CFR Part 1, Section 51.850[a]).

The general conformity rule applies to federal actions proposed within areas which are designated as either nonattainment or maintenance areas for a National Ambient Air Quality Standard (NAAQS) for any of the criteria pollutants. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Emissions of pollutants for which an area is in attainment are exempt from conformity analyses.

The project would occur within the San Diego Air Basin (SDAB) portion of Naval Base San Diego (NBSD). This portion of the SDAB is currently in marginal nonattainment of the 8-hour ozone (O_3) NAAQS and is a maintenance area for carbon monoxide (CO) NAAQS. The SDAB attains the NAAQS for all other criteria pollutants. Therefore, only project emissions of CO and O_3 (or its precursors, volatile organic compounds [VOCs] and oxides of nitrogen [NO_x]) are analyzed for conformity rule applicability.

The annual *de minimis* levels for this region are 100 tons of VOC, NO_x, and CO, as listed in Table 1. Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels (40 CFR Part 1, Section 51.853[b]) and are not regionally significant (totals less than 10 percent of projected regional emissions for that pollutant) (40 CFR Part 1, Section 93.153).

Table 1. Conformity *de minimis* Levels for Criteria Pollutants in the San Diego Air Basin

Criteria Pollutant	*De minimis* Level (tons/year)
Carbon Monoxide (CO)	100
Volatile Organic Compounds (VOC)	100
Oxides of Nitrogen (NO_x)	100

PROPOSED ACTION

Action Proponent: The U.S. Navy proposes to demolish an inadequate existing pier (Pier 8), and replace Pier 8 with a new conventional pier. The project would create the infrastructure necessary to support modern Navy ship classes with deep-draft and power intensive or power-intensive requirements.

Location: Naval Base San Diego, Pier 8.

Proposed Action Name**:** Pier 8 Replacement, NBSD.

Proposed Action & Emissions Summary: The Proposed Action involves the demolition of existing Pier 8, and construction of a new Pier 8 and associated pier utilities. The new replacement Pier 8 would be constructed as a conventional pier. The Conventional Pier Alternative would consist of a single-deck, concrete berthing pier and would be 117 ft wide by a length of 1,600 ft. Although the new Pier 8 would be wider than the existing Pier 8, the pier would be designed and constructed to ensure that vessels can navigate safely within the bay.

Conventional Pier Alternative Emissions:

Annual emissions from all demolition and construction activities were calculated by assuming that the demolition phase would consist of approximately 11 months and the construction phase would be completed within approximately 10 months. The Conventional Pier Alternative would involve pile driving activities to install 950 piles (516 foundation and 434 fender) and on-site construction activities. Operational activities associated with ship berthing were analyzed as part of the adoption process for the Commander Navy Region Southwest (CNRSW) Region Port Operations Shore Infrastructure Plan (RSIP) and Chief of Naval Operations Strategic Laydown Plan 2013 (SLD 2013), therefore, operational activities are not addressed in this analysis.

Estimated demolition and construction emissions due to implementation of the Conventional Pier Alternative are shown in Table 2. Based on the air quality analysis for the Conventional Pier Alternative, the maximum estimated emissions would be below conformity *de minimis* levels (Table 2).

Table 2. Estimated Emissions Resulting from Implementation of the Conventional Pier Alternative

Component	Emissions (tons per year)		
	CO[2]	VOCs[1]	NO_x[1]
Pier 8 Demolition Emissions			
Piling Removal	0.39	0.10	1.16
Deck Removal	1.13	0.29	3.38
Debris Removal	1.01	0.27	2.76
Truck Trips - Demolition	0.30	0.09	0.55
Worker Trips - Demolition	0.92	0.04	0.08
Support Vessels	0.44	0.04	4.77
Pier 8 Replacement Emissions			
Piling Installation	1.26	0.32	3.82
Deck Installation	2.53	0.70	6.63
Shoreline Excavation	0.62	0.16	1.85
Truck Trips - Construction	0.93	0.28	1.76
Worker Trips - Construction	0.88	0.04	0.07
Support Vessels	1.84	0.16	19.79
Subtotal[3]	**12.23**	**2.49**	**46.62**
de minimis threshold	100	100	100
Exceeds *de minimis* threshold?	No	No	No

Notes: [1] SDAB is a marginal nonattainment area for the 8-hour federal O_3 standard; VOCs and NO_x are precursors to the formation of O_3.

[2] SDAB is considered a maintenance area for the federal CO standard and is in attainment of the federal NO_2, SO_2, PM_{10} and $PM_{2.5}$ standards.

[3] Numbers in table may not add precisely due to rounding and decimal places.

PROPOSED ACTION EXEMPTION(S)

The Proposed Action is located within a nonattainment and maintenance area; therefore, the Proposed Action is **not** exempt from General Conformity Rule Requirements.

ATTAINMENT AREA STATUS AND EMISSIONS EVALUATION CONCLUSION

The SDAB is a marginal nonattainment area for the 8-hour federal O_3 standard; VOCs and NO_x are precursors to the formation of O_3. The SDAB is considered a maintenance area for the federal CO standard.

Emissions associated with the Conventional Pier Alternative were calculated using data presented in Chapter 2 of the EA, general air quality assumptions, and emission factors compiled from the following sources: *OFFROAD Emission Factors*; *CARB EMFAC2007* Model; and Emission Factors from *Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data.*

The U.S. Navy concludes that *de minimis* thresholds for applicable criteria pollutants would not be exceeded nor would the project be regionally significant (i.e. greater than 10 percent of the air basins's emission budgets) as a result of implementation of the Proposed Action. Therefore, the Navy concludes that further Conformity Determination procedures are not required, resulting in this Record of Non-Applicability. .

RONA APPROVAL

To the best of my knowledge, the information presented in this RONA is correct and accurate, and I concur in the finding that implementation of the Conventional Pier Alternative, does not require a formal CAA Conformity Determination.

Date: 5-24-16

Signature F. D. Williams

Ambient Air Quality Standards

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Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)[8]	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)[8]	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[9]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[10]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[10]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[11,12]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles[13]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[11]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page …

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the U.S. EPA.

8. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

9. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

10. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

11. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

12. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

13. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Attachment A

Construction Emissions Calculations

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Construction Emissions Summary
Pier 8 Replacement EA

Proposed Action - Conventional Pier	Emission (tons/year)					
	CO	VOC	NOx	SOx	PM10	PM2.5
Pier 8 Demolition Emissions						
Pilling Removal	0.39	0.10	1.16	0.00	0.06	0.05
Deck Removal	1.13	0.29	3.38	0.00	0.16	0.14
Debris Removal	1.01	0.27	2.76	0.00	0.15	0.13
Truck Trips - Demolition	0.29	0.09	0.55	0.00	0.01	0.01
Worker Trips - Demolition	0.91	0.04	0.08	0.00	0.01	0.01
Support Vessels	0.44	0.04	4.77	0.00	0.12	0.12
Conventional Pier Construction						
Piling Installation	1.26	0.32	3.82	0.00	0.18	0.16
Deck Installation	2.53	0.70	6.63	0.00	0.39	0.35
Shoreline Excavation	0.62	0.16	1.85	0.00	0.09	0.08
Truck Trips - Construction	0.93	0.28	1.76	0.00	0.02	0.02
Worker Trips - Construction	0.88	0.04	0.07	0.00	0.01	0.01
Support Vessels	1.84	0.16	19.79	0.01	0.49	0.49
Subtotal	**12.23**	**2.49**	**46.61**	**0.03**	**1.68**	**1.56**

Notes:Numbers may not add precisely due to rounding and decimal places

	Emission (tons/year)					
	CO	VOC	NOx	SOx	PM10	PM2.5
Pier 8 Demolition Emissions						
Pilling Removal	0.39	0.10	1.16	0.00	0.06	0.05
Deck Removal	1.13	0.29	3.38	0.00	0.16	0.14
Debris Removal	1.01	0.27	2.76	0.00	0.15	0.13
Truck Trips - Demolition	0.29	0.09	0.55	0.00	0.01	0.01
Worker Trips - Demolition	0.92	0.04	0.08	0.00	0.01	0.01
Support Vessels	0.44	0.04	4.77	0.00	0.12	0.12
MHP Construction						
Piling Installation	0.13	0.03	0.40	0.00	0.02	0.02
Deck Installation	0.76	0.21	1.99	0.00	0.12	0.11
Shoreline Excavation	0.62	0.16	1.85	0.00	0.09	0.08
Truck Trips - Construction	0.05	0.02	0.10	0.00	0.00	0.00
Worker Trips - Construction	0.33	0.02	0.03	0.00	0.00	0.00
Support Vessels	4.30	0.37	46.27	0.03	1.15	1.13
Subtotal	**10.37**	**1.63**	**63.34**	**0.05**	**1.88**	**1.80**

Notes:Numbers may not add precisely due to rounding and decimal places

Modular Hybrid Pier Alternative - within 3 nautical miles of San Diego Air Basin	Emission (tons/year)					
	CO	VOC	NOx	SOx	PM10	PM2.5
Pier 8 Demolition Emissions						
Pilling Removal	0.39	0.10	1.16	0.00	0.06	0.05
Deck Removal	1.13	0.29	3.38	0.00	0.16	0.14
Debris Removal	1.01	0.27	2.76	0.00	0.15	0.13
Truck Trips - Demolition	0.29	0.09	0.55	0.00	0.01	0.01
Worker Trips - Demolition	0.92	0.04	0.08	0.00	0.01	0.01
Support Vessels	0.44	0.04	4.77	0.00	0.12	0.12
MHP Construction						
Piling Installation	0.13	0.03	0.40	0.00	0.02	0.02
Deck Installation	0.76	0.21	1.99	0.00	0.12	0.11
Shoreline Excavation	0.62	0.16	1.85	0.00	0.09	0.08
Truck Trips - Construction	0.05	0.02	0.10	0.00	0.00	0.00
Worker Trips - Construction	0.33	0.02	0.03	0.00	0.00	0.00
Support Vessels	0.62	0.05	6.66	0.00	0.16	0.16
Subtotal	**6.69**	**1.32**	**23.73**	**0.02**	**0.90**	**0.83**

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Heavy Equipment Demolition
Pier 8 Replacement EA

				Emission Factors								Emissions						Emission, tons (total)					
Equipment	FUEL	HP	Load Factor	CO (lb/bhp-hr)	VOC (lb/bhp-hr)	NOX (lb/bhp-hr)	SOX (lb/bhp-hr)	PM10 (lb/bhp-hr)	No of Equipment	Hrs Per Day	Days in Service	CO lbs/day	VOC lbs/day	NOX lbs/day	SOX lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO tons (total)	VOC tons (total)	NOX tons (total)	SOX tons (total)	PM10 tons (total)	PM2.5 tons (total)
Piling Removal																							
Air Compressor	DIESEL	50	48	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	4	63	1.48	0.42	3.70	0.00	0.29	0.26	0.047	0.013	0.117	0.000	0.009	0.008
Barge Crane - 250 ton	DIESEL	314	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	63	6.13	1.54	18.55	0.01	0.86	0.77	0.193	0.049	0.584	0.000	0.027	0.024
Wharf Crane - 150 ton	DIESEL	247	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	63	4.82	1.21	14.59	0.01	0.68	0.60	0.152	0.038	0.460	0.000	0.021	0.019
												12.43	**3.18**	**36.85**	**0.02**	**1.83**	**1.63**	**0.39**	**0.10**	**1.16**	**0.00**	**0.06**	**0.05**
Deck Removal																							
Air Compressor	DIESEL	50	48	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	4	84	1.48	0.42	3.70	0.00	0.29	0.26	0.062	0.018	0.156	0.000	0.012	0.011
Loader	DIESEL	147	54	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	84	3.78	0.95	11.44	0.01	0.53	0.47	0.159	0.040	0.480	0.000	0.022	0.020
Barge Crane - 150 Ton	DIESEL	314	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	2	84	3.07	0.77	9.28	0.01	0.43	0.38	0.129	0.032	0.390	0.000	0.018	0.016
Dump Truck	DIESEL	489	59	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	84	13.74	3.46	41.57	0.02	1.93	1.72	0.577	0.145	1.746	0.001	0.081	0.072
Wharf Crane	DIESEL	247	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	84	4.82	1.21	14.59	0.01	0.68	0.60	0.203	0.051	0.613	0.000	0.029	0.025
												26.88	**6.82**	**80.58**	**0.05**	**3.87**	**3.44**	**1.13**	**0.29**	**3.38**	**0.00**	**0.16**	**0.14**
Debris Removal																							
Air Compressor	DIESEL	50	48	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	4	84	1.48	0.42	3.70	0.00	0.29	0.26	0.062	0.018	0.156	0.000	0.012	0.011
Dump Truck	DIESEL	489	59	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	84	13.74	3.46	41.57	0.02	1.93	1.72	0.577	0.145	1.746	0.001	0.081	0.072
Excavator	DIESEL	56	58	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	4	84	2.00	0.57	5.01	0.00	0.40	0.35	0.084	0.024	0.211	0.000	0.017	0.015
Generator	DIESEL	45	74	1.10E-02	3.97E-03	1.52E-02	1.08E-05	1.68E-03	2	4	84	2.94	1.06	4.05	0.00	0.45	0.40	0.123	0.044	0.170	0.000	0.019	0.017
Loader	DIESEL	147	54	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	2	4	84	3.78	0.95	11.44	0.01	0.53	0.47	0.159	0.040	0.480	0.000	0.022	0.020
												23.93	**6.46**	**65.78**	**0.04**	**3.60**	**3.20**	**1.01**	**0.27**	**2.76**	**0.00**	**0.15**	**0.13**
TOTAL												**63.25**	**16.45**	**183.21**	**0.11**	**9.30**	**8.28**	**2.53**	**0.66**	**7.31**	**0.00**	**0.37**	**0.33**

Assumptions:

* Assumes pier removal would occur over the course of 11 months.
* Pier Removal assumes 3 months (63 days without weekend or holidays).
* Deck Removal assumes 4 months (84 days without weekend or holidays).
* Debris Removal assumes 4 months (84 days without weekend or holidays).

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Construction of Conventional Pier
Pier 8 Replacement EA

				Emission Factors								Emissions						Emission, tons (total)					
Equipment	FUEL	HP	Load Factor	CO (lb/bhp-hr)	VOC (lb/bhp-hr)	NOX (lb/bhp-hr)	SOX (lb/bhp-hr)	PM10 (lb/bhp-hr)	No of Equipment	Hrs Per Day	Days in Service	CO lbs/day	VOC lbs/day	NOX lbs/day	SOX lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO tons (total)	VOC tons (total)	NOX tons (total)	SOX tons (total)	PM10 tons (total)	PM2.5 tons (total)
Piling Installation																							
Barge Crane - 150 Ton	DIESEL	314	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	190	6.13	1.54	18.55	0.01	0.86	0.77	0.582	0.147	1.762	0.001	0.082	0.073
Impact Hammer	DIESEL	300	50	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	190	7.14	1.80	21.61	0.01	1.01	0.89	0.679	0.171	2.053	0.001	0.096	0.085
												13.27	**3.34**	**40.17**	**0.02**	**1.87**	**1.66**	**1.26**	**0.32**	**3.82**	**0.00**	**0.18**	**0.16**
Deck Installation																							
Air Compressor	DIESEL	50	48	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	8	200	2.95	0.84	7.41	0.00	0.58	0.52	0.295	0.084	0.741	0.000	0.058	0.052
Barge Crane - 150 Ton	DIESEL	314	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	200	6.13	1.54	18.55	0.01	0.86	0.77	0.613	0.154	1.855	0.001	0.086	0.077
Concrete Truck	DIESEL	210	20	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	200	2.00	0.50	6.05	0.00	0.28	0.25	0.200	0.050	0.605	0.000	0.028	0.025
Concrete Pump Truck	DIESEL	210	20	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	200	2.00	0.50	6.05	0.00	0.28	0.25	0.200	0.050	0.605	0.000	0.028	0.025
Fork Lift	DIESEL	83	30	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	2	8	200	3.07	0.87	7.69	0.00	0.61	0.54	0.307	0.087	0.769	0.000	0.061	0.054
Generator	DIESEL	33	74	1.10E-02	3.97E-03	1.52E-02	1.08E-05	1.68E-03	2	8	200	4.31	1.55	5.94	0.00	0.65	0.58	0.431	0.155	0.594	0.000	0.065	0.058
Wharf Crane - 150 ton	DIESEL	247	41	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	200	4.82	1.21	14.59	0.01	0.68	0.60	0.482	0.121	1.459	0.001	0.068	0.060
												25.28	**7.02**	**66.28**	**0.04**	**3.95**	**3.51**	**2.53**	**0.70**	**6.63**	**0.00**	**0.39**	**0.35**
Shoreline Excavation																							
Air Compressor	DIESEL	50	48	7.69E-03	2.18E-03	1.93E-02	1.08E-05	1.52E-03	1	8	20	1.48	0.42	3.70	0.00	0.29	0.26	0.015	0.004	0.037	0.000	0.003	0.003
Dump Trucks	DIESEL	489	59	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	4	8	20	54.96	13.84	166.29	0.10	7.73	6.88	0.550	0.138	1.663	0.001	0.077	0.069
Excavator	DIESEL	250	58	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	8	6.90	1.74	20.89	0.01	0.97	0.86	0.028	0.007	0.084	0.000	0.004	0.003
Generator	DIESEL	45	74	1.10E-02	3.97E-03	1.52E-02	1.08E-05	1.68E-03	1	8	8	2.94	1.06	4.05	0.00	0.45	0.40	0.012	0.004	0.016	0.000	0.002	0.002
Loader	DIESEL	147	54	5.95E-03	1.50E-03	1.80E-02	1.08E-05	8.38E-04	1	8	8	3.78	0.95	11.44	0.01	0.53	0.47	0.015	0.004	0.046	0.000	0.002	0.002
												70.05	**18.01**	**206.38**	**0.12**	**9.98**	**8.88**	**0.62**	**0.16**	**1.85**	**0.00**	**0.09**	**0.08**
TOTAL												**108.61**	**28.38**	**312.83**	**0.19**	**15.79**	**14.06**	**4.41**	**1.18**	**12.29**	**0.01**	**0.66**	**0.59**

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Construction of MHP
Pier 8 Replacement EA

							Emissions						Emission, tons (total)					
Equipment	FUEL	HP	Load Factor	No of Equipment	Hrs Per Day	Days in Service	CO lbs/day	VOC lbs/day	NOX lbs/day	SOX lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO tons (total)	VOC tons (total)	NOX tons (total)	SOX tons (total)	PM10 tons (total)	PM2.5 tons (total)
Piling Installation																		
Barge Crane - 150 Ton	DIESEL	314	41	1	8	20	6.13	1.54	18.55	0.01	0.86	0.77	0.061	0.015	0.186	0.000	0.009	0.008
Impact Hammer	DIESEL	300	50	1	8	20	7.14	1.80	21.61	0.01	1.01	0.89	0.071	0.018	0.216	0.000	0.010	0.009
							13.27	**3.34**	**40.17**	**0.02**	**1.87**	**1.66**	**0.13**	**0.03**	**0.40**	**0.00**	**0.02**	**0.02**
Deck Installation																		
Air Compressor	DIESEL	50	48	2	8	60	2.95	0.84	7.41	0.00	0.58	0.52	0.089	0.025	0.222	0.000	0.018	0.016
Barge Crane - 150 Ton	DIESEL	314	41	1	8	60	6.13	1.54	18.55	0.01	0.86	0.77	0.184	0.046	0.557	0.000	0.026	0.023
Concrete Truck	DIESEL	210	20	1	8	60	2.00	0.50	6.05	0.00	0.28	0.25	0.060	0.015	0.182	0.000	0.008	0.008
Concrete Pump Truck	DIESEL	210	20	1	8	60	2.00	0.50	6.05	0.00	0.28	0.25	0.060	0.015	0.182	0.000	0.008	0.008
Fork Lift	DIESEL	83	30	2	8	60	3.07	0.87	7.69	0.00	0.61	0.54	0.092	0.026	0.231	0.000	0.018	0.016
Generator	DIESEL	33	74	2	8	60	4.31	1.55	5.94	0.00	0.65	0.58	0.129	0.047	0.178	0.000	0.020	0.017
Wharf Crane - 150 ton	DIESEL	247	41	1	8	60	4.82	1.21	14.59	0.01	0.68	0.60	0.145	0.036	0.438	0.000	0.020	0.018
							25.28	**7.02**	**66.28**	**0.04**	**3.95**	**3.51**	**0.76**	**0.21**	**1.99**	**0.00**	**0.12**	**0.11**
Shoreline Excavation																		
Air Compressor	DIESEL	50	48	1	8	20	1.48	0.42	3.70	0.00	0.29	0.26	0.015	0.004	0.037	0.000	0.003	0.003
Dump Trucks	DIESEL	489	59	4	8	20	54.96	13.84	166.29	0.10	7.73	6.88	0.550	0.138	1.663	0.001	0.077	0.069
Excavator	DIESEL	250	58	1	8	8	6.90	1.74	20.89	0.01	0.97	0.86	0.028	0.007	0.084	0.000	0.004	0.003
Generator	DIESEL	45	74	1	8	8	2.94	1.06	4.05	0.00	0.45	0.40	0.012	0.004	0.016	0.000	0.002	0.002
Loader	DIESEL	147	54	1	8	8	3.78	0.95	11.44	0.01	0.53	0.47	0.015	0.004	0.046	0.000	0.002	0.002
							70.05	**18.01**	**206.38**	**0.12**	**9.98**	**8.88**	**0.62**	**0.16**	**1.85**	**0.00**	**0.09**	**0.08**
TOTAL							**108.61**	**28.38**	**312.83**	**0.19**	**15.79**	**14.06**	**1.51**	**0.40**	**4.24**	**0.00**	**0.23**	**0.20**

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Construction Trips Demolition
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles Per Day	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/start)[a]	NO_X Running Exhaust (g/mi)	NO_X Start-Up (g/start)[a]	VOCs Running Exhaust (g/mi)	VOCs Start-Up (g/start)[a]	VOCs Hot-Soak (g/trip)	VOCs Resting Loss (g/hr)	VOCs Running Evaporative (g/mi)	VOCs Diurnal Evaporative (g/hr)	SOx Running Exhaust (g/mi)	SOx Start-Up (g/start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/start)[a]	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)	Emissions, lbs/day CO	NOx	VOCs	SOx	PM10	PM2.5	Days of Demo	Emissions, tons per year CO	NOx	VOCs	SOx	PM10	PM2.5
Demolition																																	
Transport Trucks	Heavy-duty truck, diesel	4	15	26	11.383		21.608		3.438						0.025		0.141		0.036	0.028	2.52	4.78	0.76	0.01	0.05	0.04	231	0.29112	0.55263	0.08793	0.000639	0.0052429	0.00519
TOTAL																					**2.52**	**4.78**	**0.76**	**0.01**	**0.05**	**0.04**		**0.29**	**0.55**	**0.09**	**0.00**	**0.01**	**0.01**

ASSUMPTIONS:

* Assuming 26 miles round trip per vehicle (distance to Miramar Landfill =
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F

* Assume 11 months for demolitions debris disposal (231 days without weekends or holidays)

Debris Generation:

			Truck Trips, total
Concrete Debris Pier 8	201286.8	cubic feet	373
Steel Debris Pier 8	720	tons	24
Asphalt Debris Pier 8	2700	cubic feet	5
		Total =	**402**

Truck Trips:

Assume each truck holds 20 cubic yards of debris

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Construction Truck Trips Conventional Pier
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles Per Day	Speed (mph)	VMT (mi/vehicle-day)	CO		NO_x		VOCs						SOx		PM10				Emissions, lbs/day							Emissions, tons per year					
					Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Hot-Soak (g/trip)	Resting Loss (g/hr)	Running Evaporat-ive (g/mi)	Diurnal Evapora-ive (g/hr)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	CO	NOx	VOCs	SOx	PM10	PM2.5	Days of Delivery	CO	NOx	VOCs	SOx	PM10	PM2.5
Conventional Pier																																	
Transport Trucks	Heavy-duty truck, diesel	71	15	40	11.383		21.608		3.438						0.025		0.141		0.036	0.028	71.15	135.07	21.49	0.16	1.28	1.27	26	0.92501	1.7559	0.27938	0.002	0.0167	0.01649
TOTAL																					**71.15**	**135.07**	**21.49**	**0.16**	**1.28**	**1.27**		**0.93**	**1.76**	**0.28**	**0.00**	**0.02**	**0.02**

ASSUMPTIONS:

* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F
* Assume 1 month for deliveries

Construction Materials		**Truck Trips, total**
Concrete Structural Piles	516 piles	258
Fender Piles	434 piles	217
Construction Materials	Concrete mixer	1368
	Total =	**1843**

Emissions Summary Construction Truck Trips MHP
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles Per Day	Speed (mph)	VMT (mi/vehicle-day)	CO		NO_X		VOCs						SOx		PM10				Emissions, lbs/day							Emissions, tons per year					
					Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Hot-Soak (g/trip)	Resting Loss (g/hr)	Running Evaporat-ive (g/mi)	Diurnal Evaporat-ive (g/hr)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	CO	NOx	VOCs	SOx	PM10	PM2.5	Days of Delivery	CO	NOx	VOCs	SOx	PM10	PM2.5
MHP Construction																																	
Transport Trucks	Heavy-duty truck, diesel	4	15	40	11.383		21.608		3.438						0.025		0.141		0.036	0.028	4.02	7.62	1.21	0.01	0.07	0.07	26	0.052198	0.09909	0.0158	0.00011	0.00094	0.00093
TOTAL																					**4.02**	**7.62**	**1.21**	**0.01**	**0.07**	**0.07**		**0.05**	**0.10**	**0.02**	**0.00**	**0.00**	**0.00**

ASSUMPTIONS:

* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F
* Assume 1 month for deliveries

Construction Materials		**Truck Trips, total**
Concrete Structural	96 piles	32
Concrete	concrete mixers	58
	Total =	**90**

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Worker Vehicle Trips Conventional Pier
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Workers Per Construct-ion Phase	Speed (mph)	VMT (mi/ vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/ start)[a]	NO_x Running Exhaust (g/mi)	NO_x Start-Up (g/ start)[a]	VOCs Running Exhaust (g/mi)	VOCs Start-Up (g/ start)[a]	VOCs Hot-Soak (g/trip)	VOCs Resting Loss (g/hr)	VOCs Running Evapora-tive (g/mi)	VOCs Diurnal Evapora-tive (g/hr)	SOx Running Exhaust (g/mi)	SOx Start-Up (g/ start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/ start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Emissions, lbs/day CO	NOx	VOCs	SOx	PM10	PM2.5	Days	Emissions, tons per trip CO	NOx	VOCs	SOx	PM10	PM2.5
Demolition	Light-duty truck, catalyst	25	35	40	3.019	11.792	0.27	0.586	0.056	0.867	0.177	0.026	0.047	0.061	0.004	0.002	0.01	0.015	0.008	0.013	7.96	0.66	0.38	0.01	0.07	0.07	230	0.9149	0.0759	0.044127	0.001039	0.00805	0.0079691 7
Conventional Pier Construction	Light-duty truck, catalyst	25	35	40	3.019	11.792	0.27	0.586	0.056	0.867	0.177	0.026	0.047	0.061	0.004	0.002	0.01	0.015	0.008	0.013	7.96	0.66	0.38	0.01	0.07	0.07	222	0.88308	0.0732	0.042593	0.001003	0.00777	0.00769199
TOTAL																					**15.91**	**1.32**	**0.77**	**0.02**	**0.14**	**0.14**		**1.80**	**0.15**	**0.09**	**0.00**	**0.02**	**0.02**

ASSUMPTIONS:

* Assume 11 months for demolition
* Assume 10 months total for Conventional Pier construction
* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Worker Vehicle Trips MHP
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Workers Per Construct-ion Phase	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/ start)[a]	NO_X Running Exhaust (g/mi)	NO_X Start-Up (g/ start)[a]	VOCs Running Exhaust (g/mi)	VOCs Start-Up (g/ start)[a]	VOCs Hot-Soak (g/trip)	VOCs Resting Loss (g/hr)	VOCs Running Evaporative (g/mi)	VOCs Diurnal Evaporative (g/hr)	SOx Running Exhaust (g/mi)	SOx Start-Up (g/ start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/ start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Emissions, lbs/day CO	NOx	VOCs	SOx	PM10	PM2.5	Days	Emissions, tons per trip CO	NOx	VOCs	SOx	PM10	PM2.5
Demolition	Light-duty truck, catalyst	25	35	40	3.019	11.792	0.27	0.586	0.056	0.867	0.177	0.026	0.047	0.061	0.004	0.002	0.01	0.015	0.008	0.013	7.96	0.66	0.38	0.01	0.07	0.07	231	0.91888	0.07621	0.044319	0.00104	0.008085	0.008004
MHP Construction	Light-duty truck, catalyst	25	35	40	3.019	11.792	0.27	0.586	0.056	0.867	0.177	0.026	0.047	0.061	0.004	0.002	0.01	0.015	0.008	0.013	7.96	0.66	0.38	0.01	0.07	0.07	84	0.33414	0.02771	0.016116	0.00038	0.00294	0.00291
TOTAL																					**15.91**	**1.32**	**0.77**	**0.02**	**0.14**	**0.14**		**1.25**	**0.10**	**0.06**	**0.00**	**0.01**	**0.01**

ASSUMPTIONS:

* Assume 11 months for demolition
* Assume 4 months total for MHP construction
* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F

Emissions Summary Tugboats Conventional Pier
Pier 8 Replacement EA

											Emission Factors						Hourly Emission Rates (lb/hr)					Annual Emission Rates (ton/yr)				
Equipment Type	**Operation/ Location**	**power rating or fuel usage**	**units**	**Load %**	**No. of units**	**Fuel Type**	**hrs per day**	**Days/ year**	**hrs/ year**	**Fuel Consumption (g/kW-hr)**	**PM10**	**NOx**	**CO**	**SO2**	**VOC ***	**Emission factor units**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**
Support Boat	Demolition support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.4	0.0	4.8	0.0	0.1
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	202	404	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	6.91	0.60	74.38	0.06	1.84	1.4	0.1	15.0	0.0	0.4
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.4	0.0	4.8	0.0	0.1
Total Emissions																MAX Daily:	**11.25**	**0.97**	**121.12**	**0.09**	**3.00**	**1.84**	**0.16**	**19.79**	**0.01**	**0.49**

SOURCE:

Load factors based on recommdations in EPA420-R-00-002, Table 5-2, assumed for maneuvering.
Auxiliary loads from Table 5-2, kW
Emission Factors from Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data, USEPA, Feb 2000, EPA420-R-00-002, page 5-3.
Emission factors from AP-42 1.3 for Fuel Oil Combustion - No 6 Oil Industrial Fired Boilers
* VOC emissions are actuallyTHC for Marine Vessels

0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.15	% Nitrogen content of the Fuel Oil used for the boilers
0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.944	kg/l density of residual oil, from AP-42 Appendix A

Notes:Numbers may not add precisely due to rounding and decimal places

Emissions Summary Tugboats MHP
Pier 8 Replacement EA

											Emission Factors						Hourly Emission Rates (lb/hr)					Annual Emission Rates (ton/yr)				
Equipment Type	**Operation/Location**	**power rating or fuel usage**	**units**	**Load %**	**No. of units**	**Fuel Type**	**hrs**	**Days/year**	**hrs/year**	**Fuel Consumption (g/kW-hr)**	**PM10**	**NOx**	**CO**	**SO2**	**VOC ***	**Emission factor units**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**
Support Boat	Demolition Support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.4	0.0	4.8	0.0	0.1
Tugboats	Transit from Module drydock	3,183	kW	85.0%	1	California Diesel	120	9	1080	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	6.91	0.60	74.38	0.06	1.84	3.7	0.3	40.2	0.0	1.0
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	62	124	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	6.91	0.60	74.38	0.06	1.84	0.4	0.0	4.6	0.0	0.1
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	32	64	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.1	0.0	1.5	0.0	0.0
Total Emissions																MAX Daily:	**18.16**	**1.57**	**195.50**	**0.15**	**4.84**	**4.30**	**0.37**	**46.27**	**0.03**	**1.15**

within 3 nm of SDAB

Equipment Type	**Operation/Location**	**power rating or fuel usage**	**units**	**Load %**	**No. of units**	**Fuel Type**	**hrs**	**Days/year**	**hrs/year**	**Fuel Consumption (g/kW-hr)**	**PM10**	**NOx**	**CO**	**SO2**	**VOC ***	**Emission factor units**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**	**CO**	**VOC**	**NOx**	**SO2**	**PM10**
Support Boat	Demolition Support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.4	0.0	4.8	0.0	0.1
Tugboats	Transit from Module drydock	3,183	kW	85.0%	1	California Diesel	15	1	15	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	6.91	0.60	74.38	0.06	1.84	0.1	0.0	0.6	0.0	0.0
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	62	124	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	6.91	0.60	74.38	0.06	1.84	0.4	0.0	4.6	0.0	0.1
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	32	64	222.33	0.26	10.61	0.99	0.01	0.09	g/kW-hr	4.34	0.37	46.74	0.03	1.16	0.1	0.0	1.5	0.0	0.0
Total Emissions																MAX Daily:	**18.16**	**1.57**	**195.50**	**0.15**	**4.84**	**0.62**	**0.05**	**6.66**	**0.00**	**0.16**

Assuming 5 knots within 5 nm of San Diego Mainland

SOURCE:

Load factors based on recommdations in EPA420-R-00-002, Table 5-2, assumed for maneuvering.
Auxiliary loads from Table 5-2, kW
Emission Factors from Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data, USEPA, Feb 2000, EPA420-R-00-002, page 5-3.
Emission factors from AP-42 1.3 for Fuel Oil Combustion - No 6 Oil Industrial Fired Boilers
* VOC emissions are actuallyTHC for Marine Vessels

0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.15	% Nitrogen content of the Fuel Oil used for the boilers
0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.944	kg/l density of residual oil, from AP-42 Appendix A

* Assume transit from as far as Tacoma, WA; transport emissions based on 5 trips, 9 days/trip

Notes:Numbers may not add precisely due to rounding and decimal places

Construction Emissions Summary: Emission Factors
Pier 8 Replacement EA

Emission Factors

Commercial Marine Vessel Emissions

Pollutant	Exponent (x)	Intercept (b)	Coefficient (a)
PM	1.5	0.2551	0.0059
NOX	1.5	10.4496	0.1255
NO2	1.5	15.5247	0.18865
SO2	0	0	2.3735
CO	1	0	0.8378
HC	1.5	0	0.0667
CO2	1	648.6	44.1

Emission Factor equation is in the form:

Emissions Rate (g/kW-hr) = a * (Fractional Load of Engine Power)$^{-x}$ + b

For SO2, the equation is:
Emissions Rate (g/kW-hr) = a * (Fuel Sulfur Flow in g/kW-hr) + b = a * (fuel consumption in g/kW-hr) * (% sulfur in fuel/100) + b
Requires an estimate of the % sulfur in the fuel.

Fuel Consumption Estimation equation:
Fuel Consumption (g/kW-hr) = 14.12/(Fractional Load) + 205.717

Emission Factor Source: Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data,
USEPA, February 2000, EPA420-R-00-002, page 5-3.

Notes:Numbers may not add precisely due to rounding and decimal places

Greenhouse Gas Emissions Calculations

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Greenhouse Gas Emissions Summary
Pier 8 Replacement EA

Proposed Action - Conventional Pier	Emission (metric tons/year)			CO_2e
	CO2	CH4	N2O	
Pier 8 Demolition Emissions				
Pilling Removal	71.85	0.01	0.07	
Deck Removal	171.70	0.02	0.16	
Debris Removal	152.26	0.02	0.14	
Truck Trips - Demolition	66.39	0.00	0.05	
Worker Trips - Demolition	100.87	0.01	0.01	
Support Vessels	285.54			
Conventional Pier Construction				
Piling Installation	291.64	0.03	0.19	
Deck Installation	588.59	0.09	0.58	
Shoreline Excavation	86.54	0.01	0.07	
Truck Trips - Construction	210.95	0.01	0.17	
Worker Trips - Construction	91.70	0.01	0.01	
Support Vessels	1,185.43			
Subtotal	**3,303.48**	**0.21**	**1.45**	**3,757.26**

Modular Hybrid Pier Alternative	Emission (metric tons/year)			CO_2e
	CO2	CH4	N2O	
Pier 8 Demolition Emissions				
Pilling Removal	71.85	0.01	0.07	
Deck Removal	171.70	0.02	0.16	
Debris Removal	152.26	0.02	0.14	
Truck Trips - Demolition	66.39	0.00	0.05	
Worker Trips - Demolition	100.87	0.01	0.01	
Support Vessels	285.54			
MHP Construction				
Piling Installation	30.70	0.00	0.02	
Deck Installation	176.58	0.03	0.18	
Shoreline Excavation	86.54	0.01	0.07	
Truck Trips - Construction	11.90	0.00	0.01	
Worker Trips - Construction	36.68	0.00	0.00	
Support Vessels	2,771.43			
Subtotal	**3,962.44**	**0.10**	**0.70**	**4,181.61**

Modular Hybrid Pier Alternative - within 3nm of SDAB	Emission (metric tons/year)			CO_2e
	CO2	CH4	N2O	
Pier 8 Demolition Emissions				
Pilling Removal	71.85	0.01	0.07	
Deck Removal	171.70	0.02	0.16	
Debris Removal	152.26	0.02	0.14	
Truck Trips - Demolition	66.39	0.00	0.05	
Worker Trips - Demolition	100.87	0.01	0.01	
Support Vessels	285.54			
MHP Construction				
Piling Installation	30.70	0.00	0.02	
Deck Installation	176.58	0.03	0.18	
Shoreline Excavation	86.54	0.01	0.07	
Truck Trips - Construction	11.90	0.00	0.01	
Worker Trips - Construction	36.68	0.00	0.00	
Support Vessels	399.20			
Subtotal	**1,590.22**	**0.10**	**0.70**	**1,809.38**

Notes:

Conversion to metric tons = 1 short ton = 0.90718474 metric tons

$CO_{2e} = (CO_2*1)+ (CH_4*21)+(N_2O*310)$

Conventional Pier Emissions as a % of U.S. Emissions =	0.0000578%
MHP Emissions as a % of U.S. Emissions =	0.0000643%

Notes: Numbers may not add precisely due to rounding and decimal places

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GHG Emissions Summary Heavy Equipment Demolition
Pier 8 Replacement EA

				Emission Factors						Emissions			Emission, metric tons (total)		
Equipment	FUEL	HP	Load Factor	CO2 (lb/hr)	CH4 (lb/hr)	N2O (lb/hr)	No of Equipment	Hrs Per Day	Days in Service	CO2 lbs/day	CH4 lbs/day	N2O lbs/day	CO2 tons (total)	CH4 tons (total)	N2O tons (total)
Piling Removal															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	2	4	63	178.40	0.08	0.18	5.098	0.002	0.005
Barge Crane - 250 ton	DIESEL	314	41	1.80E+02	1.64E-02	1.68E-01	2	4	63	1,440.00	0.13	1.35	41.150	0.004	0.038
Wharf Crane - 150 ton	DIESEL	247	41	1.12E+02	1.12E-02	1.18E-01	2	4	63	896.00	0.09	0.94	25.605	0.003	0.027
										2,514.40	**0.30**	**2.47**	**71.85**	**0.01**	**0.07**
Deck Removal															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	2	4	84	178.40	0.08	0.18	6.797	0.003	0.007
Loader	DIESEL	147	54	1.01E+02	1.10E-02	9.16E-02	2	4	84	808.00	0.09	0.73	30.787	0.003	0.028
Barge Crane - 150 Ton	DIESEL	314	41	1.12E+02	1.12E-02	1.18E-01	2	2	84	448.00	0.04	0.47	17.070	0.002	0.018
Dump Truck	DIESEL	489	59	2.72E+02	2.25E-02	2.20E-01	2	4	84	2,176.00	0.18	1.76	82.910	0.007	0.067
Wharf Crane	DIESEL	247	41	1.12E+02	1.12E-02	1.18E-01	2	4	84	896.00	0.09	0.94	34.140	0.003	0.036
										4,506.40	**0.49**	**4.09**	**171.70**	**0.02**	**0.16**
Debris Removal															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	2	4	84	178.40	0.08	0.18	6.797	0.003	0.007
Dump Truck	DIESEL	489	59	2.72E+02	2.25E-02	2.20E-01	2	4	84	2,176.00	0.18	1.76	82.910	0.007	0.067
Excavator	DIESEL	56	58	7.36E+01	1.26E-02	7.98E-02	2	4	84	588.80	0.10	0.64	22.435	0.004	0.024
Generator	DIESEL	45	74	3.06E+01	1.01E-02	2.92E-02	2	4	84	244.80	0.08	0.23	9.327	0.003	0.009
Loader	DIESEL	147	54	1.01E+02	1.10E-02	9.16E-02	2	4	84	808.00	0.09	0.73	30.787	0.003	0.028
										3,996.00	**0.53**	**3.55**	**152.26**	**0.02**	**0.14**
TOTAL										**11,016.80**	**1.32**	**10.10**	**395.81**	**0.05**	**0.36**

Assumptions:

* Assumes pier removal would occur over the course of 11 months and that pier 8 & 14 demolition would occur simultaneously.
* Pier Removal assumes 3 months (63 days without weekend or holidays).
* Deck Removal assumes 4 months (84 days without weekend or holidays).
* Debris Removal assumes 4 months (84 days without weekend or holidays).

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Conventional Pier Construction
Pier 8 Replacement EA

				Emission Factors						Emissions			Emission, metric tons (total)		
Equipment	FUEL	HP	Load Factor	CO2 (lb/hr)	CH4 (lb/hr)	N2O (lb/hr)	No of Equipment	Hrs Per Day	Days in Service	CO2 lbs/day	CH4 lbs/day	N2O lbs/day	CO2 tons (total)	CH4 tons (total)	N2O tons (total)
Piling Installation															
Barge Crane - 150 Ton	DIESEL	314	41	1.12E+02	1.12E-02	1.18E-01	1	8	190	896.00	0.09	0.94	77.220	0.008	0.081
Impact Hammer	DIESEL	300	50	3.11E+02	3.14E-02	1.62E-01	1	8	190	2,488.00	0.25	1.30	214.424	0.022	0.112
										3,384.00	**0.34**	**2.24**	**291.64**	**0.03**	**0.19**
Deck Installation															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	2	8	200	356.80	0.17	0.36	32.369	0.015	0.033
Barge Crane - 150 Ton	DIESEL	314	41	1.12E+02	1.12E-02	1.18E-01	1	8	200	896.00	0.09	0.94	81.285	0.008	0.085
Concrete Truck	DIESEL	210	20	1.67E+02	1.48E-02	1.53E-01	1	8	200	1,336.00	0.12	1.23	121.201	0.011	0.111
Concrete Pump Truck	DIESEL	210	20	1.67E+02	1.48E-02	1.53E-01	1	8	200	1,336.00	0.12	1.23	121.201	0.011	0.111
Fork Lift	DIESEL	83	30	7.36E+01	1.26E-02	7.98E-02	2	8	200	1,177.60	0.20	1.28	106.831	0.018	0.116
Generator	DIESEL	33	74	3.06E+01	1.01E-02	2.92E-02	2	8	200	489.60	0.16	0.47	44.416	0.015	0.042
Wharf Crane - 150 ton	DIESEL	247	41	1.12E+02	1.12E-02	1.18E-01	1	8	200	896.00	0.09	0.94	81.285	0.008	0.085
										6,488.00	**0.95**	**6.44**	**588.59**	**0.09**	**0.58**
Shoreline Excavation															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	1	8	20	178.40	0.08	0.18	1.618	0.001	0.002
Dump Trucks	DIESEL	489	59	2.72E+02	2.25E-02	2.20E-01	4	8	20	8,704.00	0.72	7.05	78.962	0.007	0.064
Excavator	DIESEL	250	58	7.36E+01	1.26E-02	7.98E-02	1	8	8	588.80	0.10	0.64	2.137	0.000	0.002
Generator	DIESEL	45	74	3.06E+01	1.01E-02	2.92E-02	1	8	8	244.80	0.08	0.23	0.888	0.000	0.001
Loader	DIESEL	147	54	1.01E+02	1.10E-02	9.16E-02	1	8	8	808.00	0.09	0.73	2.932	0.000	0.003
										10,524.00	**1.07**	**8.84**	**86.54**	**0.01**	**0.07**
TOTAL										**20,396.00**	**2.36**	**17.51**	**966.77**	**0.12**	**0.85**

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Construction of MHP
Pier 8 Replacement EA

				Emission Factors						Emissions			Emission, metric tons (total)		
Equipment	FUEL	HP	Load Factor	CO2 (lb/hr)	CH4 (lb/hr)	N2O (lb/hr)	No of Equipment	Hrs Per Day	Days in Service	CO2 lbs/day	CH4 lbs/day	N2O lbs/day	CO2 tons (total)	CH4 tons (total)	N2O tons (total)
Piling Installation															
Barge Crane - 150 Ton	DIESEL	314	41	1.12E+02	1.12E-02	1.18E-01	1	8	20	896.00	0.09	0.94	8.128	0.001	0.009
Impact Hammer	DIESEL	300	50	3.11E+02	3.14E-02	1.62E-01	1	8	20	2,488.00	0.25	1.30	22.571	0.002	0.012
										3,384.00	**0.34**	**2.24**	**30.70**	**0.00**	**0.02**
Deck Installation															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	2	8	60	356.80	0.17	0.36	9.711	0.005	0.010
Barge Crane - 150 Ton	DIESEL	314	41	1.12E+02	1.12E-02	1.18E-01	1	8	60	896.00	0.09	0.94	24.385	0.002	0.026
Concrete Truck	DIESEL	210	20	1.67E+02	1.48E-02	1.53E-01	1	8	60	1,336.00	0.12	1.23	36.360	0.003	0.033
Concrete Pump Truck	DIESEL	210	20	1.67E+02	1.48E-02	1.53E-01	1	8	60	1,336.00	0.12	1.23	36.360	0.003	0.033
Fork Lift	DIESEL	83	30	7.36E+01	1.26E-02	7.98E-02	2	8	60	1,177.60	0.20	1.28	32.049	0.005	0.035
Generator	DIESEL	33	74	3.06E+01	1.01E-02	2.92E-02	2	8	60	489.60	0.16	0.47	13.325	0.004	0.013
Wharf Crane - 150 ton	DIESEL	247	41	1.12E+02	1.12E-02	1.18E-01	1	8	60	896.00	0.09	0.94	24.385	0.002	0.026
										6,488.00	**0.95**	**6.44**	**176.58**	**0.03**	**0.18**
Shoreline Excavation															
Air Compressor	DIESEL	50	48	2.23E+01	1.05E-02	2.27E-02	1	8	20	178.40	0.08	0.18	1.618	0.001	0.002
Dump Trucks	DIESEL	489	59	2.72E+02	2.25E-02	2.20E-01	4	8	20	8,704.00	0.72	7.05	78.962	0.007	0.064
Excavator	DIESEL	250	58	7.36E+01	1.26E-02	7.98E-02	1	8	8	588.80	0.10	0.64	2.137	0.000	0.002
Generator	DIESEL	45	74	3.06E+01	1.01E-02	2.92E-02	1	8	8	244.80	0.08	0.23	0.888	0.000	0.001
Loader	DIESEL	147	54	1.01E+02	1.10E-02	9.16E-02	1	8	8	808.00	0.09	0.73	2.932	0.000	0.003
										10,524.00	**1.07**	**8.84**	**86.54**	**0.01**	**0.07**
TOTAL										**20,396.00**	**2.36**	**17.51**	**293.81**	**0.04**	**0.27**

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Construction Trips Demolition
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles	Speed	VMT	CO2		N2O		CH4		Emissions, lbs/day				Emissions, metric tons per year		
		Per Day	(mph)	(mi/vehicle-day)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	CO2	CH4	N2O	Days of Demo	CO2	CH4	N2O
Demolition																	
Transport Trucks	Heavy-duty truck, diesel	4	15	26	2,595.96		2.05276		0.16		574.82	0.04	0.45	231	66.392	0.00409	0.0525
TOTAL											**574.82**	**0.04**	**0.45**		**66.39**	**0.00**	**0.05**

ASSUMPTIONS:

* Assuming 26 miles round trip per vehicle (distance to Miramar Landfill = 13 miles)
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60 degrees
* Assume 11 months for demolitions debris disposal (231 days without weekends or holidays)

Debris Generation:

		Units	Truck Trips, total
Concrete Debris Pier 8	201,286.80	cubic feet	373
Steel Debris Pier 8	720.00	tons	24
Asphalt Debris Pier 8	2,700.00	cubic feet	5
		Total =	**402**

Truck Trips:

Assume each truck holds 20 cubic yards of debris

GHG Emissions Summary Construction Truck Trips Conventional Pier
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles	Speed	VMT	CO2		N2O		CH4		Emissions, lbs/day				Emissions, metric tons per year		
		Per Day	(mph)	(mi/vehicle-day)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	CO2	CH4	N2O	Days of Delivery	CO2	CH4	N2O
Conventional Pier																	
Transport Trucks	Heavy-duty truck, diesel	71	15	40	2,595.96		2.05276		0.16		16,227.30	1.00	12.83	26	210.95485	0.013002	0.166813
TOTAL											**16,227.30**	**1.00**	**12.83**		**210.95**	**0.01**	**0.17**

ASSUMPTIONS:

* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F
* Assume 1 month for deliveries

Construction Materials	Units	Truck Trips, total
Concrete Structural Piles	516 piles	258
Fender Piles	434 piles	217
Construction Materials	Concrete mixer	1368
	Total =	**1,843**

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Construction Truck Trips MHP
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Vehicles	Speed	VMT	CO2		N2O		CH4		Emissions, lbs/day				Emissions, metric tons per year		
		Per Day	(mph)	(mi/ vehicle-day)	Running Exhaust (g/mi)	Start-Up (g/ start)[a]	Running Exhaust (g/mi)	Start-Up (g/ start)[a]	Running Exhaust (g/mi)	Start-Up (g/ start)[a]	CO2	CH4	N2O	Days of Delivery	CO2	CH4	N2O
MHP Construction																	
Transport Trucks	Heavy-duty truck, diesel	4	15	40	2,595.96		2.05276		0.16		915.70	0.06	0.72	26	11.90413	0.00073	0.00941
TOTAL											**915.70**	**0.06**	**0.72**		**11.90**	**0.00**	**0.01**

ASSUMPTIONS:

* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F
* Assume 1 month for deliveries

Construction Materials		Truck Trips, total
Concrete Structural Piles	96 piles	32
Concrete	concrete mixers	58
	Total =	**90**

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Worker Vehicle Trips Conventional Pier
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	CO2 Running Exhaust (g/mi)	CO2 Start-Up (g/start)[a]	N2O Running Exhaust (g/mi)	N2O Start-Up (g/start)[a]	CH4 Running Exhaust (g/mi)	CH4 Start-Up (g/start)[a]	Emissions, lbs/day CO2	CH4	N2O	Days	Emissions, metric tons per trip CO2	CH4	N2O
Demolition	Light-duty truck, catalyst	25	35	40	385.949	203.874	0.02565	0.05567	0.025	0.046	873.35	0.06	0.06	231	100.87189	0.0069515	0.0072402
Conventional Pier Construction	Light-duty truck, catalyst	25	35	40	385.949	203.874	0.02565	0.05567	0.025	0.046	873.35	0.06	0.06	210	91.701721	0.0063196	0.006582
TOTAL											**1,746.70**	**0.12**	**0.13**		**192.57**	**0.01**	**0.01**

ASSUMPTIONS:

* Assume 11 months for demolition
* Assume 10 months total for Conventional Pier construction
* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Worker Trips MHP
Pier 8 Replacement EA

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	CO2 Running Exhaust (g/mi)	CO2 Start-Up (g/start)[a]	N2O Running Exhaust (g/mi)	N2O Start-Up (g/start)[a]	CH4 Running Exhaust (g/mi)	CH4 Start-Up (g/start)[a]	Emissions, lbs/day CO2	Emissions, lbs/day CH4	Emissions, lbs/day N2O	Days	Emissions, metric tons per trip CO2	Emissions, metric tons per trip CH4	Emissions, metric tons per trip N2O
Demolition	Light-duty truck, catalyst	25	35	40	385.949	203.874	0.02565	0.05567	0.025	0.046	873.35	0.06	0.06	231	100.87189	0.0069515	0.0072402
MHP Construction	Light-duty truck, catalyst	25	35	40	385.949	203.874	0.02565	0.05567	0.025	0.046	873.35	0.06	0.06	84	36.680688	0.0025278	0.0026328
TOTAL											**1,746.70**	**0.12**	**0.13**		**137.55**	**0.01**	**0.01**

ASSUMPTIONS:

* Assume 11 months for demolition
* Assume 4 months total for MHP construction
* Assuming 40 miles round trip per vehicle
* Assume startup after 8 hours
* Assume 45 minutes run time total
* 2008 Emission Factors from EMFAC2007, average temp 60F

Notes: Numbers may not add precisely due to rounding and decimal places

GHG Emissions Summary Tugboats Conventional Pier
Pier 8 Replacement EA

Equipment Type	Operation/Location	power rating or fuel usage	units	Load %	No. of units	Fuel Type	hrs per day	Days/ year	hrs/ year	Fuel Consumption (g/kW-hr)	Emission Factors CO2	Emission factor units	Emissions, lbs/hr CO2	Emissions, lbs/day CO2	Emissions, metric tons/yr CO2
Support Boat	Demolition support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	700.48	g/kW-hr	3,085.83	6,171.65	285.54
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	202	404	222.33	700.48	g/kW-hr	4,910.63	9,821.25	899.89
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	700.48	g/kW-hr	3,085.83	6,171.65	285.54
Total Emissions												Total		**22,164.56**	**1,470.97**

SOURCE:

Load factors based on recommdations in EPA420-R-00-002, Table 5-2, assumed for maneuvering.
Auxiliary loads from Table 5-2, kW
Emission Factors from Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data, USEPA, Feb 2000, EPA420-R-00-002, page 5-3.
Emission factors from AP-42 1.3 for Fuel Oil Combustion - No 6 Oil Industrial Fired Boilers
* VOC emissions are actuallyTHC for Marine Vessels

0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.15	% Nitrogen content of the Fuel Oil used for the boilers
0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.944	kg/l density of residual oil, from AP-42 Appendix A

GHG Emissions Summary Tugboats MHP
Pier 8 Replacement EA

Equipment Type	Operation/Location	power rating or fuel usage	units	Load %	No. of units	Fuel Type	hrs	Days/ year	hrs/ year	Fuel Consumption (g/kW-hr)	Emission Factors CO2	Emission factor units	Emissions, lbs/hr CO2	Emissions, lbs/day CO2	Emissions, metric tons/yr CO2
Support Boat	Demolition Support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	700.48	g/kW-hr	3,085.83	6,171.65	285.54
Tugboats	Transit from Module drydock	3,183	kW	85.0%	1	California Diesel	120	9	1080	222.33	700.48	g/kW-hr	4,910.63	117,855.06	2,405.64
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	62	124	222.33	700.48	g/kW-hr	4,910.63	9,821.25	276.20
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	32	64	222.33	700.48	g/kW-hr	3,085.83	6,171.65	89.58
Total Emissions												Total		**140,019.61**	**3,056.97**

within 3 nm of SDAB

Equipment Type	Operation/Location	power rating or fuel usage	units	Load %	No. of units	Fuel Type	hrs	Days/ year	hrs/ year	Fuel Consumption (g/kW-hr)	Emission Factors CO2	Emission factor units	Emissions, lbs/hr CO2	Emissions, lbs/day CO2	Emissions, metric tons/yr CO2
Support Boat	Demolition Support	2,000	kW	85.0%	1	California Diesel	2	102	204	222.33	700.48	g/kW-hr	3,085.83	6,171.65	285.54
Tugboats	Transit from Module drydock	3,183	kW	85.0%	1	California Diesel	15	1	15	222.33	700.48	g/kW-hr	4,910.63	73,659.41	33.41
Tugboats	Construction support	3,183	kW	85.0%	1	California Diesel	2	62	124	222.33	700.48	g/kW-hr	4,910.63	9,821.25	276.20
Support Boat	Construction support	2,000	kW	85.0%	1	California Diesel	2	32	64	222.33	700.48	g/kW-hr	3,085.83	6,171.65	89.58
Total Emissions												Total		**95,823.97**	**684.74**

Assuming 5 knots within 5 nm of San Diego Mainland

SOURCE:

Load factors based on recommdations in EPA420-R-00-002, Table 5-2, assumed for maneuvering.
Auxiliary loads from Table 5-2, kW
Emission Factors from Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data, USEPA, Feb 2000, EPA420-R-00-002, page 5-3.
Emission factors from AP-42 1.3 for Fuel Oil Combustion - No 6 Oil Industrial Fired Boilers
* VOC emissions are actuallyTHC for Marine Vessels

0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.15	% Nitrogen content of the Fuel Oil used for the boilers
0.0015	% Sulfur content of the Fuel Oil used in the boiler and main engines,
0.944	kg/l density of residual oil, from AP-42 Appendix A

* Assume transit from as far as Tacoma, WA; transport emissions based on 5 trips, 9 days/trip

Notes: Numbers may not add precisely due to rounding and decimal places

Emission Factors

Commercial Marine Vessel Emissions

Pollutant	Exponent (x)	Intercept (b)	Coefficient (a)
PM	1.5	0.2551	0.0059
NOX	1.5	10.4496	0.1255
NO2	1.5	15.5247	0.18865
SO2	0	0	2.3735
CO	1	0	0.8378
HC	1.5	0	0.0667
CO2	1	648.6	44.1

Emission Factor equation is in the form:
Emissions Rate (g/kW-hr) = a * (Fractional Load of Engine Power)$^{-x}$ + b

For SO2, the equation is:
Emissions Rate (g/kW-hr) =
a * (Fuel Sulfur Flow in g/kW-hr) + b = a * (fuel consumption in g/kW-hr) * (% sulfur in fuel/100) + b
Requires an estimate of the % sulfur in the fuel.

Fuel Consumption Estimation equation:
Fuel Consumption (g/kW-hr) = 14.12/(Fractional Load) + 205.717

Emission Factor Source: Analysis of Commercial Marine Vessel Emissions and Fuel Consumption Data, USEPA, February 2000, EPA420-R-00-002, page 5-3.

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