Sylmar Ground Return System Replacement Project

DRAFT ENVIRONMENTAL IMPACT REPORT

Volume 2

SCH #2010091044 | March 2016

Prepared by :
Los Angeles Department of Power and Water
111 North Hope Street, Room 1044
Los Angeles, CA 90012

Technical Assistance Provided by:
POWER Engineers, Inc.
731 East Ball Road, Suite 100
Anaheim, CA 92805

Draft
Environmental Impact Report

Sylmar Ground Return System Replacement Project

SCH NO. 2010091044

Volume 2
Technical Appendices A – D3

Prepared by:

Los Angeles Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

Technical Assistance Provided by:

POWER Engineers, Inc.
731 East Ball Road, Suite 100
Anaheim, CA 92805

March 2016

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

A1: PROJECT INITIAL STUDY

THIS PAGE INTENTIONALLY LEFT BLANK

Initial Study

Sylmar Ground Return System Replacement Project

Los Angeles Department of Water and Power
Environmental Services
111 North Hope Street, Room 1044
Los Angeles, CA 90012

September 2010

THIS PAGE INTENTIONALLY LEFT BLANK

CEQA Initial Study

Sylmar Ground Return System Replacement Project

September 2010

Interim General Manager
Austin Beutner

Senior Assistant General Manager – Power System
Aram Benyamin

Electrical Services Manager - Power Transmission & Distribution
John C. Kokoska

Director of Environmental Services
Mark J. Sedlacek

Prepared by:

Los Angeles Department of Water and Power
111 North Hope Street, Room 1044
Los Angeles, CA 90012

Technical Assistance Provided by:

MWH Americas, Inc.
618 Michillinda Avenue, Suite 200
Arcadia, CA 91007

Los Angeles Department of Water and Power

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

List of Tables

Table No.

List of Figures

Figure No. **Page**

Section 1
Project and Agency Information

1.1 PROJECT TITLE AND LEAD AGENCY

Project Title:	Sylmar Ground Return System Replacement Project
Lead Agency Name:	Los Angeles Department of Water and Power
Lead Agency Address:	111 North Hope Street, Room 1044 Los Angeles, California 90012
Contact Person:	Ms. Irene Paul
Contact Phone Number:	(213) 367-3509
Project Sponsor:	Los Angeles Department of Water and Power

1.2 PROJECT BACKGROUND

The City of Los Angeles Department of Water and Power (LADWP) has prepared this Initial Study (IS) to address the impacts of construction and operation of the Sylmar Ground Return System Replacement Project (proposed Project). The Project is the replacement of overhead lines and underground and sub-sea electric cables that run from the Sylmar Converter Station to the Pacific Ocean. This series of overhead lines, underground cables, and sub-sea cables lead to an electrode in the ocean. These overhead, underground, and submarine segments constitute the Sylmar Ground Return System (Sylmar Electrode System).

The Project will increase reliability of the Sylmar Electrode System while also protecting other electric systems by allowing for energy to be safely conducted through an earth return path when needed on an infrequent basis. The existing infrastructure and equipment serving this function are undersized and deteriorated.

This IS serves to identify site-specific impacts, evaluate their potential significance, and determine the appropriate document needed to comply with the California Environmental Quality Act (CEQA). Based upon this IS, an Environmental Impact Report (EIR) is the appropriate CEQA document for the Project.

1.2.1 Electric Power Transmission

Regional electric power transmission line systems are frequently referred to as a “grid.” A grid provides redundant power transmission paths to ensure that electricity can be routed from any power generating station to any load center within a given service area through a variety of routes. To prevent system-wide failures and power outages from overload conditions and other system disturbances, the ability to re-route electricity within a grid is critical.

When power is transferred over very long distances, it can be more efficient and economical to use direct current (DC) transmission instead of alternating current (AC) transmission which is commonly used for electric power delivery to homes and businesses. As such, DC transmission results in lower power losses during transfer than AC transmission lines. Additionally, high voltage DC transmission lines can carry more electricity per conductor than a high voltage AC transmission line. Therefore, more electricity can be delivered to areas of high-energy demand using a DC current.

DC systems are typically designed with an electrode connection so that loss of one converter or conductor does not result in an immediate and complete shutdown of all transmitted power. Power from a DC system will automatically transfer to the parallel AC system (if present). Due to the large amount of power that can be transferred on these DC systems, their loss can overload these parallel AC systems.

1.2.2 Existing Electrode System

The existing Sylmar Electrode System was constructed in 1969 and is part of the +/-500-kilovolt (kV) Pacific Direct Current Intertie Transmission Line (PDCI). The PDCI is approximately 846 miles long, extending from the Celilo Converter Station, located near the City of The Dalles, Oregon, to the Sylmar Converter Station, located in the San Fernando Valley, California. The transmission line is used to transfer power generated along the Columbia River in Oregon to the greater Los Angeles area. In addition, the PDCI also transmits power from south to north as seasonal load and resource conditions dictate.

The Sylmar Converter Station and the line from Sylmar to the Nevada/Oregon Border (NOB) are owned by PDCI Partners: Southern California Edison (SCE), Burbank Water and Power, Glendale Water and Power, Pasadena Water and Power, and LADWP. LADWP operates the southern portion of the PDCI. The Celilo Converter Station and the Oregon portion of the line are owned by Bonneville Power Administration (BPA).

The electrode system is designed to carry current when the PDCI is experiencing an anomaly. By carrying power during disturbances, the electrode system allows the unaffected portions of the PDCI to continue to operate, sending electric current offshore to prevent damage to, and disruption of, other underground utilities located onshore. During normal operation, the electrode's current is nearly zero. The electrode system is approximately 31 miles in length, comprising an overhead line portion, an underground cable portion and a submarine cable which terminates at an electrical ground point.

The earth is used as a return path in the DC circuit, due to its low resistance, which results in maximum current transfer. In electrical circuits, the current follows the path of least resistance and returns back to its source – in this case, to the Celilo electrode located in Rice Flats, a few miles from the Celilo Converter Station.

The overhead portion of the electrode system consists of two, 1,272 kilo-circular mils (Kcmil)[1], 45 AL/7 ST[2] aluminum conductor steel reinforced (ACSR) conductors attached to steel towers. The towers have an average height of 127 feet and are spaced an average of 1,028 feet apart.

[1] Kilo-circular mil (Kcmil) refers to a unit of conductor area in thousands of circular mils. One (1) circular mil equals 0.001 inch squared.

The underground portion comprises two, 15-kV, 1,250 Kcmil copper, single-conductor cables known as the Kenter-Sunset Electrode Cables A and B, which are insulated with oil impregnated paper and covered with an outer lead sheath. The cables are installed in concrete-encased conduits in city streets with 47 subsurface vaults along the existing alignment. Vaults are part of the overall underground system, and house conduits, cables, and other related components. Vaults also serve as cable pulling points that allow tension to be controlled. The vaults are accessed via surface maintenance holes for cable maintenance and repair. The vaults are approximately 6 to 10 feet wide, 9 to 21 feet long, and 9 feet high. The tops of the vaults are approximately 3 feet below the street surface.

The submarine segment of the electrode system starts at the existing Sunset Vault located at 17350 Sunset Boulevard near U.S. Highway 1 – Pacific Coast Highway (PCH). The existing vault has a footprint of approximately 80 square feet and is 10 feet high. From the Sunset Vault, the two copper submarine cables, referred to as the Santa Monica and Malibu cables, connect to a second vault (the Gladstone Vault) located on the south side of PCH in a commercial parking lot. The distance between the two vaults is approximately 400 feet. From the Gladstone Vault to approximately 1,000 feet offshore, the two cables are 3-conductor, 500 Kcmil copper, 2.75 inches in diameter, insulated with 175 circular mils of Ethylene Propylene Rubber (EPR), and enclosed in a common 125 mil-thick Polyvinyl Chloride (PVC) jacket. From 1,000 feet to approximately 6,000 feet offshore, the Santa Monica and Malibu cables are 3-conductor, 300 Kcmil copper, 2.23 inches in diameter, insulated with 175 circular mils of high-density polyethylene (HDPE), and enclosed in a common HDPE jacket. The Santa Monica Cable was originally buried approximately 3 feet below the ocean floor. The Malibu Cable was laid on the ocean floor and portions have become buried as a result of shifting sand and sediments. These two, 3-conductor submarine cables connect to the electrode, a ground point where electricity can travel through the earth.

Each of the six copper conductors connects to an electrical ground point consisting of an array of 4 silicon iron electrode elements. The electrode consists of 24 electrode elements in total. Each electrode element is placed inside a precast reinforced concrete vault. The 24 vaults are located approximately 6,000 feet from shore, and the distance between each of the vaults ranges from approximately 10 to 23 feet. The length of the total array is approximately 543 feet and is located directly on the ocean floor at approximately 60 feet below mean sea level (msl). Two unlighted, anchored buoys are located 25 feet from either end of the group of vaults. Each vault is 7 feet wide, 11 feet long and 6 feet high.

The Sylmar Electrode System is used for approximately 20 hours per year. The total number of hours in service per year does not occur over a single period; operation is as needed to accommodate operation of the PDCI. The cables are configured to operate either individually, or simultaneously. Current ratings for the cables are as follows:

1. Two Cables Operating Together – 3,100 Amperes (Amps) for 20 minutes followed by “ramp down” to 1460 Amps and continuous operation at 1460 Amps thereafter

[2] aluminum/steel stranding

2. Only One Cable Operating – 3,100 Amps for 3 minutes followed by ramp down to 730 Amps and continuous operation at 730 Amps thereafter

Present operation of the electrode system is limited to 20 minutes at a maximum current of 3,100 Amps and then 1460 Amps continuously after that. Normal operation limits ground current operation to a maximum of 30 minutes for any single event. However, the 30 minute limit is procedural and not absolute and there have been occasions where the 30 minutes has been exceeded due to interconnection reliability requirements.

The Sylmar Electrode System is tested periodically. Testing for the land cables is typically conducted once per year to determine the integrity of cable insulation. A DC voltage of 5- to 10-kV is applied to the conductor for approximately 10 minutes. During the DC voltage application, insulation resistance and leakage current readings are taken at intervals of 1 minute for approximately 10 to 20 minutes. Any significant decrease in resistance or increase in leakage current is an indication of insulation degradation and/or an electrical fault. The submarine cables are tested monthly by measuring the resistance of the conductors. An increase in this resistance indicates the likelihood of an electrical fault.

1.2.3 Existing Electrode System Location

The onshore segment of the existing electrode system begins with an overhead portion that connects the Sylmar Converter Station to the Kenter Canyon Terminal Tower and travels through sections of the communities of Sylmar, Granada Hills, Northridge, Reseda, Tarzana, and Encino and through lands administered by the Santa Monica Mountains Conservancy (Conservancy lands) (see **Figure 1-1**). More specifically, from the Sylmar Converter Station, the overhead line proceeds west over Interstate 5 onto LADWP property. The overhead line then follows a path south around the Los Angeles Reservoir and Lower Retention Basin within LADWP property. At this point, the line exits LADWP property and parallels Rinaldi Street, and continues west over State Highway 118. Just after reaching Zelzah Avenue it turns southward before reaching Wilbur Avenue. In the community of Northridge, the overhead line follows Wilbur Avenue and crosses U.S. Highway 101 in Tarzana. After crossing the highway, the line follows a southeast path toward Encino, crossing Mulholland Drive and proceeding through Conservancy lands. The overhead line meets Mandeville Canyon Road outside of the Conservancy lands and travels south, paralleling the road, until connecting with the underground cables at the Kenter Canyon Terminal Tower. The overhead portion of the existing electrode system is approximately 22.5 miles long.

At the Kenter Canyon Terminal Tower the electrode system continues underground and traverses the communities of Brentwood and Pacific Palisades in the City of Los Angeles. From the Kenter Canyon Terminal Tower, the alignment proceeds southward along Homewood Road, then south on Gretna Green Way to San Vicente Boulevard (see **Figure 1-2**). The alignment proceeds westward on San Vicente Boulevard, turning northwest on 26th Street to Allenford Avenue. The alignment proceeds westward along Pontoon Place and Jonesboro Place to the intersection with Sunset Boulevard. It proceeds westward along Sunset Boulevard and turns westward at Napoli Drive.

Key to Features

- Existing Overhead Alignment
- Existing Underground Alignment
- Submarine Alignment

0 0.5 1 2 Miles

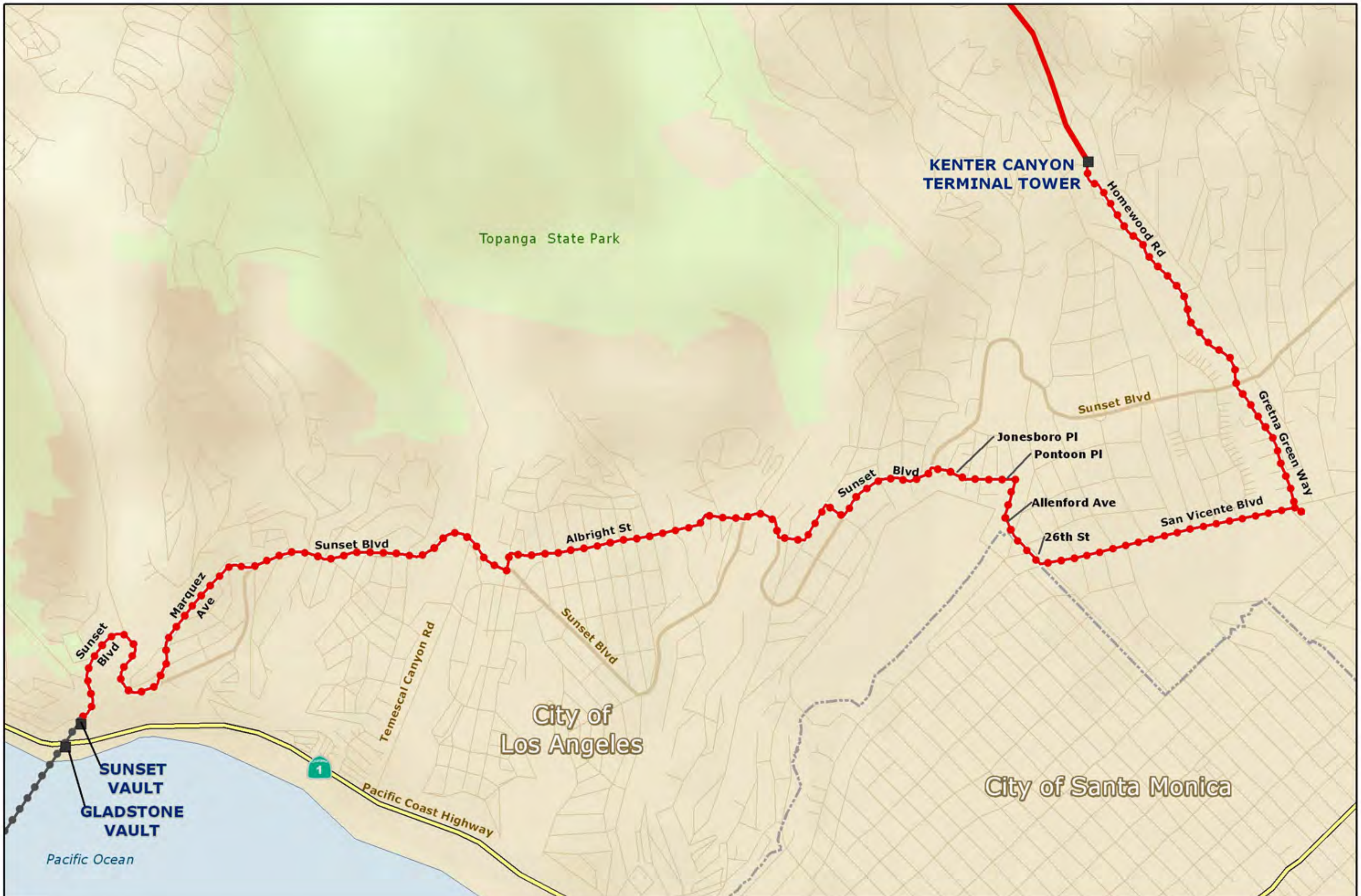
Date: August 16, 2010

Existing Overhead and Underground Alignments

Figure 1-1

MWH

Project File: InitialStudy1-1_ExistingUnderground.mxd



Key to Features

Existing Overhead Alignment

Existing Underground Alignment

Submarine Alignment

0 1,500 3,000 Feet

N

Date: June 14, 2010

Existing Underground Alignment

Figure 1-2

MWH

Path Name: Fig1-2_ExistingUnderground.mxd

The alignment continues south on Amalfi Drive, and just north of Minorca Drive the alignment turns west, crossing under Ravoli Drive to connect to Sunset Boulevard. The alignment proceeds northwest along Sunset Boulevard and then continues westward, crossing through Will Rogers State Park. From this location, the alignment proceeds directly to the west, crossing under Villa Grove Drive, Rivas Canyon Road, and Chautauqua Boulevard, and then traverses Albright Street until reconnecting with Sunset Boulevard. The alignment then continues westward along Sunset Boulevard to Marquez Avenue. The alignment proceeds southward on Marquez Avenue until it intersects again with Sunset Boulevard.

At this point, the alignment follows Sunset Boulevard until reaching the Sunset Vault. From the Sunset Vault, the underground cables connect to the Gladstone Vault, located underground on the west side of PCH, in the parking lot for Gladstone's Restaurant. The distance between the Sunset Vault and the Gladstone Vault is approximately 400 feet. From the Gladstone Vault, the Santa Monica and Malibu cables extend into Santa Monica Bay and tie into an electrode array approximately 6,000 feet offshore.

1.2.4 Upgrades to and Operational Deficiencies of the Existing Electrode System

1.2.4.1 Upgrades to the Existing System

The PDCI was energized in 1970 at a voltage of +/-400 kV and a current of 1,800 Amps (1,440 megawatts [MW]). The PDCI line was upgraded as follows:

- 1982: Current upgrade to 2,000 Amps (1,600 MW)
- 1985: Voltage upgrade to +/-500 kV (2,000 MW)
- 1989: Current upgrade to 3,100 Amps (3,100 MW), Sylmar East added
- 2004: Sylmar East and West combined into a single converter station

The upgrades to the PDCI necessitated upgrades to the overhead portion of the Sylmar Electrode System. Upgrades included an increase of the tension of the overhead lines and/or a reduction of the tension of the transmission lines below. The present emergency rating for the overhead portion of the Sylmar Electrode System is 3,100 Amps for 20 minutes. The emergency rating is determined by the amount of current that the line should be able to support for a specific period of time before the conductor would potentially sag into the transmission conductors below. If an emergency arises, the overhead portion can be continuously operated at 1,460 Amps.

1.2.4.2 Operational Deficiencies

In order to enhance the reliability of the Sylmar Electrode System, the overhead, underground and submarine segments system will be reviewed, studied, and replaced, as necessary, to address existing deficiencies.

Specific to the underground segment, the paper insulation of the existing land cables contains insulating fluid (an oil), which over the years has migrated along the cables due to the elevation difference (500 feet) between their two end points. The oil migration has caused the cables at certain locations to have an internal pressure higher than the allowable operating pressure of 20 pounds-force per square inch gauge (psig). The high internal pressure of the cable has caused cable lead sheath rupture, which allows water penetration into the cables and subsequent cable failures.

Since 1970, the high internal pressures in the cables and other factors may have contributed to numerous failures. Reservoirs were added in 1981 to drain fluid from the cables to alleviate the high internal pressure. However, since 1998 there have been seven failures, two of which involved both cables failing at the same time. These failures critically jeopardize operations of the PDCI during periods of peak load, thereby limiting power delivery to the greater Los Angeles area.

In 2003, LADWP commissioned a study to evaluate the existing underground cable segment of the electrode system. The study concluded that, in its present configuration, the underground cables do not have an adequate conductor size to meet the existing rating.

In December 2005 and October 2009, visual inspections of the offshore segment of the electrode system were undertaken by a team of divers. These inspections concluded that:

- Due to the original construction and design, the cables are vulnerable to anchor damage and other physical damage due to wave action.
- The Malibu Cable has sustained the most electrical faults as a result of external damage by anchors and wave action, due to the fact that it was not buried to the same extent as the Santa Monica Cable.
- Wave action over time causes the "pigtails" (i.e., connecting wires) on the electrode elements at the point of attachment to break open from metal fatigue.
- The submarine cables have been in place for 40 years and, due to failures, the conductors are full of seawater.

Therefore, to correct existing operational deficiencies and increase system reliability, LADWP proposes to upgrade the overhead, underground, and submarine segments comprising the Sylmar Ground Return System.

1.3 PROJECT OBJECTIVES

The objectives of the proposed Project are to 1) improve the reliability of the PDCI; 2) minimize restrictive operational conditions and failures of the Sylmar Electrode System; 3) minimize the operational risks associated with peak load conditions along the PDCI; and 4) enable future rating upgrades.

The Project would:

- Improve operation of the Ground Return System
- Improve operational flexibility of the PDCI
- Increase the emergency rating and reliability of the PDCI
- Reduce the need for system maintenance and repair

1.4 PROJECT DESCRIPTION

The Project would replace the existing electrode system from the Sylmar Converter Station to the Pacific Ocean. New features include:

- Up to 23 miles of overhead electric transmission lines
- Up to 8 miles of underground electric transmission cables, including 31 vaults in existing streets
- Up to 1.1 miles of submarine cables
- New electrode array system, including full or partial replacement of the 24 submarine vaults and electrode elements

The Project would also include the removal of the existing overhead lines and underground electrode cables, where possible.

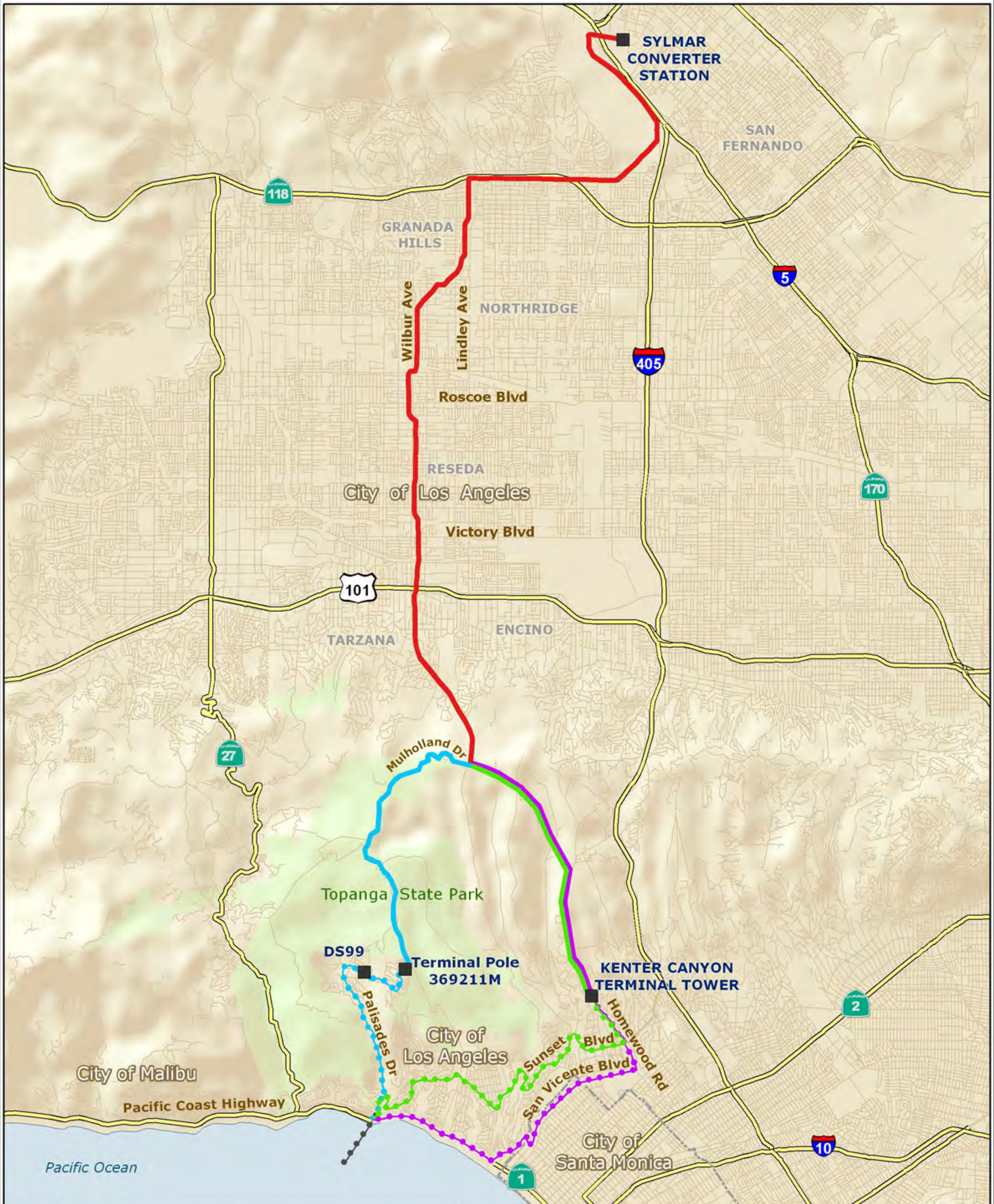
The new overhead, high temperature/low sag lines would support higher electrical ratings. The new overhead lines would have a size and weight substantially similar to the existing lines. The new underground cables would comprise two, new 4,000 Kcmil copper cables insulated with Direct Current Cross Linked Polyethylene (DC-XLPE), a plastic compound designed specifically for DC applications. The DC-XLPE compound is oil-free, unlike the existing oil impregnated paper insulation; as a result, DC-XLPE cables, in general, require substantially less maintenance and fewer inspections. The DC-XLPE insulated cables would be installed in two, 6-inch conduits encased in concrete.

In addition, LADWP is currently studying the submarine portion of the electrode system to assess the existing conditions of the ocean-based facilities, including electrode elements, cables, conduits and vaults. Based on the results of LADWP's findings, upgrades to the submarine portion of the Project could potentially comprise a full replacement of the existing submarine facilities, including the installation of new structures on or below the ocean floor.

1.4.1 Alignment Options

LADWP is currently evaluating three on-land alignments for the Sylmar Ground Return System Replacement Project. The locations of the alignments are described in further detail below and are shown in **Figure 1-3.**

A portion of the existing overhead segment, referred to as the Main Overhead Alignment, and the ocean-based portion of the electrode system, referred to as the Submarine Alignment, are common to all three alignments. The Main Overhead Alignment would originate at the Sylmar Converter Station, and would follow the same path as the existing alignment to the intersection of Mulholland Drive and Sullivan Fire Road. Also common to all three alignments are the relocation of the existing Sunset Vault and the expansion of the Gladstone Vault, located in the Gladstone Restaurant parking lot. The Sunset Vault needs to be relocated to accommodate upgraded equipment required for the Project.



Proposed Project Alignments

Figure 1-3

Located underground, the Sunset Vault is roughly aligned with the entrance to the Vons Market (17380 West Sunset Boulevard). The vault would be relocated on Sunset Boulevard. The exact location and size of the new Sunset Vault has not yet been determined; however, it is anticipated that the new vault would be located within a few hundred feet of the existing vault. New control, switching, and monitoring equipment would be installed in the relocated vault, which would connect the system to the Gladstone Vault. Equipment inside the existing Sunset Vault would be removed and recycled at the LADWP Investment Recovery Facility in Sun Valley. The existing Sunset Vault would be abandoned in place.

The three alignments under consideration by LADWP diverge from the intersection of Mulholland Drive and Sullivan Fire Road on Conservancy lands. From this portion of the Project site to each respective alignment's transition to the submarine portion of the Project, the three alignments are referred to as the San Vicente Alignment, the Topanga State Park Alignment, and the Sunset Alignment.

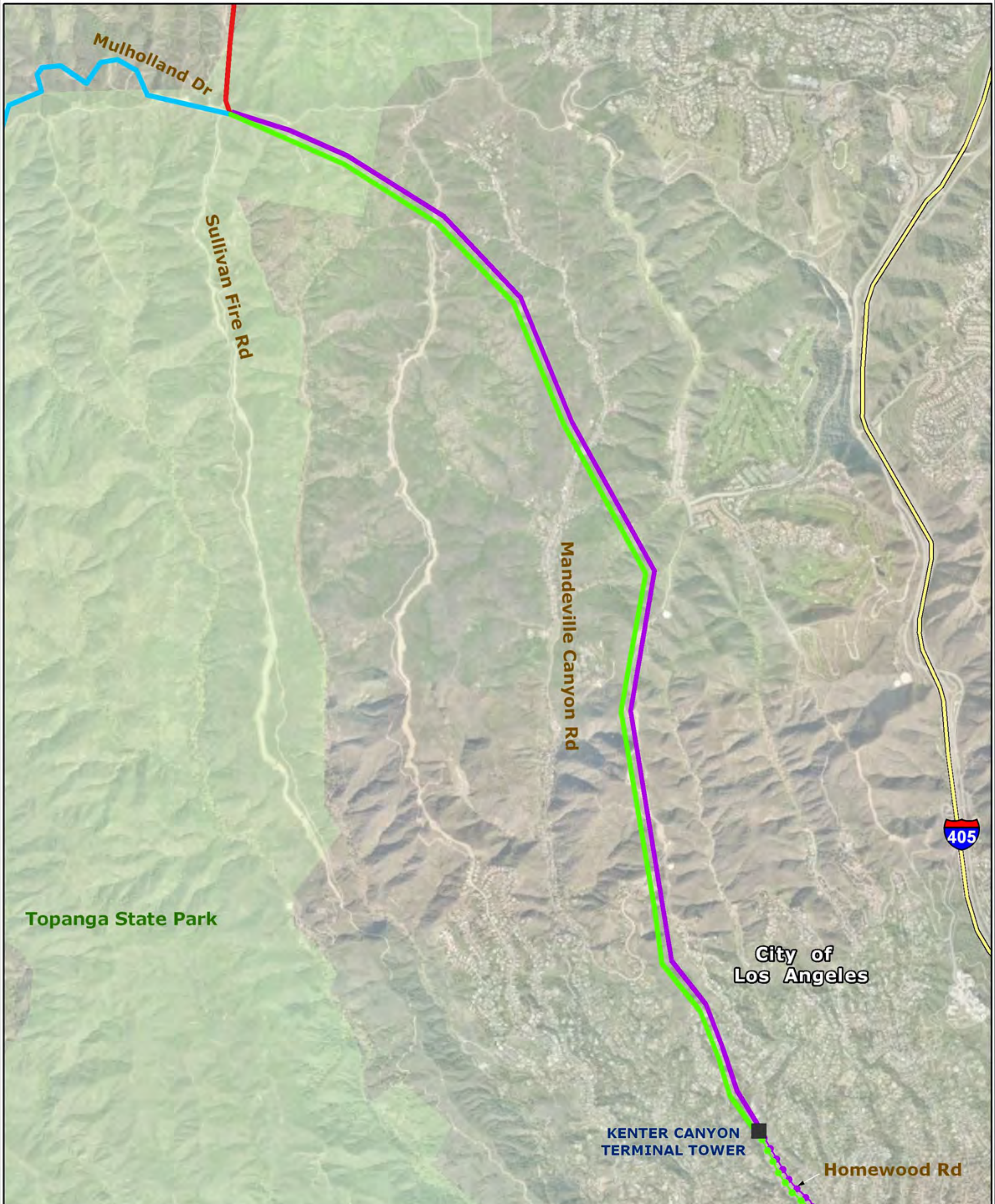
1.4.1.1 San Vicente Alignment

From the point on the Main Overhead Alignment where Mulholland Drive and Sullivan Fire Road intersect, the San Vicente Alignment would extend 5.1 miles in a southeasterly direction (following the same path as the existing alignment) to the Kenter Canyon Terminal Tower. At the Kenter Canyon Terminal Tower, the overhead lines would transition to underground cables (**Figure 1-4**). The underground cables would proceed southward along Homewood Road, south on Kenter Avenue and Gretna Green Way until meeting San Vicente Boulevard (**Figure 1-5**). From San Vicente Boulevard, the alignment would then proceed westward on the north side of San Vicente Boulevard through the City of Santa Monica to Entrada Drive until intersecting with West Channel Road. From the intersection of West Channel Road and PCH, the proposed alignment would be placed in the northernmost lane of the northbound side of PCH for approximately 2.3 miles to the new Gladstone Vault.

Between the Kenter Canyon Terminal Tower and West Channel Road the alignment would be approximately 4.8 miles in length. The PCH segment of the alignment would be approximately 2.3 miles in length. The total proposed length of the alignment would be approximately 7.1 miles.

Up to the intersection of West Channel Road and PCH, the alignment would be placed within existing roads, approximately 1 to 4 feet from sidewalk curbs. Along PCH, the cables would be placed approximately 4 to 5 feet from the northernmost lane's shoulder, depending on the location of existing underground utilities. Final placement of the underground alignment within the lane would be designed to avoid existing underground utilities.

Approximately 17 underground vaults would be placed along the alignment between the Kenter Canyon Terminal Tower and the intersection of West Channel Road and PCH. The outside dimensions of the vaults would be approximately 8 feet wide, 26 feet long and 11 feet high. The vaults would be approximately 1,500 feet apart. The tops of the vaults would be buried approximately 3 feet below the street surface. From West Channel Road, up to eight underground vaults would be constructed along PCH, for a total of 27 vaults along the San Vicente Alignment, including the enlarged Gladstone Vault. The vaults located along PCH would have the same dimensions and depth as the vaults located on surface streets.



Key to Features

Overhead
- Main Overhead Alignment
- San Vicente Alignment
- Topanga State Park Alignment
- Sunset Alignment

Underground
- San Vicente Alignment
- Sunset Alignment

N

0 0.25 0.5 Miles

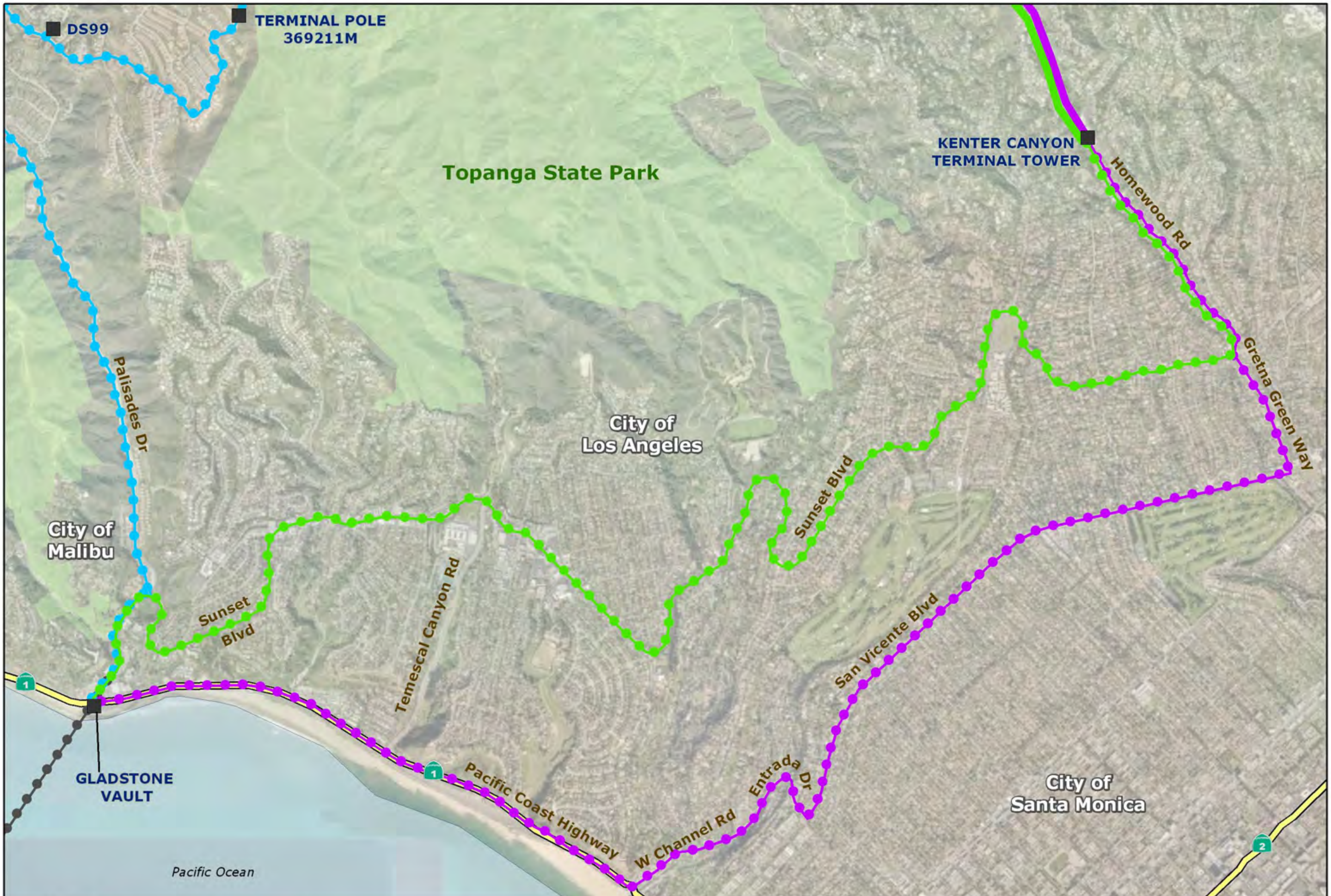
Date: June 14, 2010

San Vicente and Sunset Overhead Alignments

Figure 1-4

MWH

Path Name: Fig1-4_SanVicenteSunsetOH.mxd



Key to Features

Overhead
- San Vicente Alignment
- Topanga State Park Alignment
- Sunset Alignment

Underground
- San Vicente Alignment
- Topanga State Park Alignment
- Sunset Alignment

Submarine Alignment

N 0 0.25 0.5 Miles

Date: June 14, 2010

San Vicente and Sunset Underground Alignments

Figure 1-5

MWH

Path Name: Fig1-5_SanVicenteSunsetUG.mxd

1.4.1.2 Topanga State Park Alignment

From the point on the Main Overhead Alignment where Mulholland Drive and Sullivan Fire Road intersect on Conservancy lands, the overhead portion of the Topanga State Park Alignment would extend westerly from Sullivan Fire Road through Topanga State Park (**Figure 1-6**). Under this alignment, the 210 wood structures (typically two poles per structure) currently supporting existing 34.5-kV lines would be removed, and new 34.5-kV lines would be connected to new cylindrical steel poles.

Approximately 63 new steel poles would be constructed. The poles would be spaced approximately 500 feet apart and would be approximately 120 feet tall, with an average diameter of 4 feet.

The new poles would follow generally the same alignment as the existing poles. The alignment of the new poles, from the intersection of Mulholland Drive and Sullivan Fire Road, would follow Temescal Fire Road, and would terminate near Terminal Pole 369211M, approximately 0.75 miles northeast of Distributing Station (DS) 99, located at 1433 Monte Grande Place in the Pacific Palisades. This portion of the overhead alignment would be approximately 5 miles long. As part of the Topanga State Park Alignment, two new conductors and three to six 34.5-kV conductors would be attached to the newly constructed steel poles.

The overhead line would transition to an underground cable near Terminal Pole 369211M. Four, 6-inch underground conduits would be installed from the terminal pole to DS 99, continue south on Palisades Drive, turn west on Sunset Boulevard, connect to the new Sunset Vault, and then continue to the Gladstone Vault. The underground portion of this alignment would be approximately 4.5 miles long. Final placement of the underground alignment within the Palisades Drive and Sunset Boulevard lanes would be designed to avoid existing underground utilities.

Approximately 14 underground vaults would be placed along Palisades Drive and Sunset Boulevard. The vaults would be spaced an estimated 1,500 feet apart and the outside dimensions of the vaults would be approximately 8 feet wide, 26 feet long, and 11 feet high; the tops of the vaults would be 3 feet below the street surface. In addition, the Sunset Vault would be replaced and the Gladstone Vault would be enlarged, for a total of 16 vaults along the Topanga State Park Alignment.

1.4.1.3 Sunset Alignment

From the point in the Main Overhead Alignment where Mulholland Drive and Sullivan Fire Road intersect on Conservancy lands, the Sunset Alignment would extend 5.1 miles in a southeasterly direction (following the same path as the existing alignment) to the Kenter Canyon Terminal Tower (**Figure 1-4)**. At the Kenter Canyon Terminal Tower, the overhead line would transition to underground cables (**Figure 1-5**). The underground cables would proceed southward along Homewood Road, south on Kenter Avenue, and then would turn west on Sunset Boulevard. The underground cables would connect to the new Sunset Vault and continue to the Gladstone Vault. The underground portion of the Sunset Alignment would traverse portions of the communities of Brentwood and the Pacific Palisades in the City of Los Angeles.

Key to Features

Overhead
- Main Overhead Alignment
- San Vicente Alignment
- Topanga State Park Alignment
- Sunset Alignment

Underground
- San Vicente Alignment
- Topanga State Park Alignment
- Sunset Alignment
- Submarine Alignment

N

0 0.25 0.5 Miles

Date: June 14, 2010

Topanga State Park Alignment

Figure 1-6

MWH

Path Name: Fig1-6_TSPAlignment.mxd

The underground alignment along Homewood Road and Kenter Avenue would be approximately 1 mile in length. The Sunset Boulevard segment would be approximately 7 miles long. Therefore, the underground portion of the Sunset Alignment would be approximately 8 miles in length.

The proposed underground cables would be placed in a trench approximately 5 feet deep and 2 feet wide. Final placement of the underground alignment within a lane would be designed to avoid existing underground utilities. Approximately three underground, pre-cast vaults would be placed 1,500 feet apart on Homewood Road between the Kenter Canyon Terminal Tower and the intersection of Kenter Avenue and Sunset Boulevard. The outside dimensions of the vaults would be approximately 8 feet wide, 26 feet long and 11 feet high. The tops of the vaults would be buried approximately 3 feet below the street surface. Approximately 26 additional vaults would be installed along the Sunset Alignment. In addition, the Sunset Vault would be replaced and the Gladstone Vault would be enlarged, for a total of 31 vaults along the Sunset Alignment.

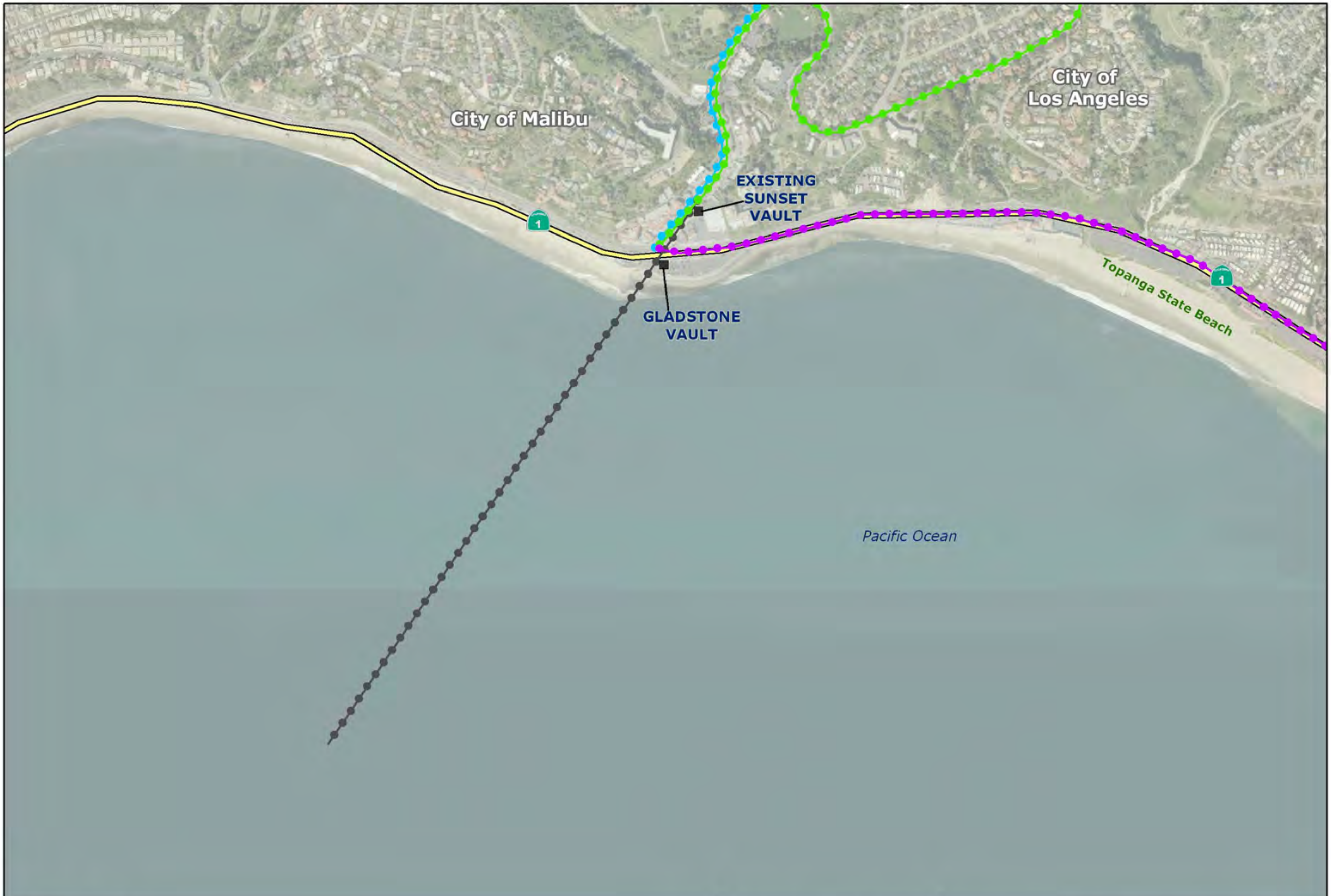
1.4.2 Submarine Alignment

The Submarine Alignment extends from the Sunset Vault to the Gladstone Vault, and then continues 6,000 feet offshore. See **Figure 1-7** for the approximate location of the alignment.

1.4.3 Environmental Setting

The proposed Project would traverse highly urbanized communities, open space areas, and the ocean floor. Summarized below is the environmental setting for each of the potential segments:

- **Main Overhead –** Approximately 17.4 miles, primarily within streets in urban areas of the City of Los Angeles and on State Park and State Conservancy lands
- **San Vicente (Overhead) –** Approximately 5.1 miles, within open space areas and within streets in residential areas in the City of Los Angeles
- **San Vicente (Underground) –** Approximately 7.1 miles, within streets in urban areas of the City of Los Angeles and the City of Santa Monica
- **Topanga State Park (Overhead) –** Approximately 5 miles, within Topanga State Park (adjacent to park roadways and across open space) and within residential areas in the City of Los Angeles
- **Topanga State Park (Underground) –** Approximately 4.5 miles, within residential areas and along a roadway that traverses open space in the City of Los Angeles
- **Sunset (Overhead) –** Approximately 5.1 miles, within open space areas and within streets in urban areas in the City of Los Angeles
- **Sunset (Underground) –** Approximately 8 miles, within streets in urban areas in the City of Los Angeles
- **Submarine –** Approximately 1.1 miles, buried beneath the floor of the Pacific Ocean



Key to Features

Underground

San Vicente Alignment

Topanga State Park Alignment

Sunset Alignment

Submarine Alignment

0 500 1,000 Feet

N

Date: August 12, 2010

Submarine Alignment

Figure 1-7

MWH

Document Path: KenterSunsetOcean.mxd

1.4.4 Project Construction

1.4.4.1 New Electrode System Installation

Overhead Lines

Construction of the overhead portion of the electrode system would involve the installation of new lines on existing steel towers. Several wire-pulling sites would be located along the entire length of the overhead portion of the electrode system. Wire-pulling sites are locations where workers, equipment, and materials (including reels of the replacement wire or line) are staged on a temporary basis. From these sites, the replacement line would be pulled through the attachments on the towers in sections, ultimately stringing the line through the entire aboveground alignment.

The new line would be installed in sections by one, six-person crew. The wire-pulling sites would move along the alignment as the replacement process moved along. Where the line is installed above the road, lane closures would occur. More specifically, in areas where lines parallel the road, lanes below would be closed, along with the adjacent lane(s). Where the lines cross the road, all lanes would be closed. Installation lengths can be varied to minimize road closure durations, but closures would likely occur during the day only.

Overhead construction activities for the Main Overhead Alignment are anticipated to take approximately 6 months to complete. If selected, the overhead portion of the Topanga State Park Alignment would take an additional 6 months to complete. As discussed earlier, construction of the overhead portion of the Topanga State Park Alignment would involve construction of approximately 63 new steel poles.

Underground Cables

The proposed replacement underground cables would be placed in a trench approximately 5 to 7 feet deep and 2 feet wide. Installation of the new underground cables would include trench excavation, the placement of four 6-inch conduits (two with cables, two spares), concrete encasement, backfilling, temporary plating and road resurfacing. Backfilling would occur with cement slurry.

Installation of the new cables into the conduits would likely occur at one or two locations simultaneously. An area of approximately 1,000 square feet around each maintenance hole would be needed for equipment and crews. At a minimum, two crews, comprising 6 to 8 workers, would be needed to pull one span of cable per day. A third crew would take 5 days per vault to mount hardware and splice cables. During construction, it is anticipated that a minimum of two crews would be involved in conduit construction and vault installation, two additional crews would pull cables, and one additional crew would mount hardware and splice cables.

Due to the need for concrete encasement of the conduits and placement of a slurry backfill above the concrete encasement, all excavated material would be removed. Approximately 422,400 cubic feet (cu ft), (15,644 cubic yards [cu yd]), of trenched material would require offsite disposal and an additional 38,880 cu ft (1,440 cu yd) of excavated material would be permanently removed and disposed of for the underground vault excavations.

For the offshore transition, which includes the conduit and submarine cables from the new Sunset Vault to the existing Gladstone Vault, the PCH under-crossing would be constructed via a combination of directional boring and trench excavation in the vicinity of the two vaults. During directional boring, PVC or HDPE conduits would be installed at 4- to 20-foot depths through which the new submarine cables would be pulled. The boring equipment would be located on the north side of PCH. An area of approximately 1,000 square feet would be needed during construction to accommodate equipment and vehicles. The submarine cables would be pulled through the conduits under PCH from the Sunset Vault to the Gladstone Vault.

The Kenter Canyon Terminal Tower site, Receiving Station K, and/or DS 66 are possible staging areas for all construction-related equipment and materials for the San Vicente and Sunset Alignments. Receiving Station K is located at 1840 Centinela Avenue in the City of Los Angeles. DS 66 is located at 12200 San Vicente Boulevard in the City of Los Angeles. Possible staging areas for the Topanga State Park Alignment are the Kenter Canyon Terminal Tower site, DS 99, Receiving Station K, and/or DS 29, located at 15345 Sunset Boulevard in the City of Los Angeles. An additional staging area may include DS 135, located at 121 South Church Lane. All staging area sites are owned and operated by LADWP. Public access to the staging areas would be restricted by full fencing around the site with locked gates.

Submarine Cables

LADWP is currently conducting a study to determine upgrades necessary for the submarine portion of the Project for increased reliability. From the Gladstone Vault to 1,000 feet offshore, there are three existing HDPE conduits. Four new HDPE conduits would be directionally bored at a depth of 5 to 20 feet from the Gladstone Vault to 1,000 feet offshore. The new submarine cables would be pushed from the Gladstone Vault through the new conduits. From a minimum of 1,000 feet to approximately 6,000 feet offshore, the new submarine copper cables would be buried approximately 3 feet beneath the ocean floor. The study will determine other upgrades to the submarine portion of the Project, which could include full replacement of the existing facilities and installation of new structures on or below the ocean floor.

1.4.4.2 Removal of the Existing Electrode System

Main Overhead Alignment and Topanga State Park Alignment

Existing overhead lines along the Main Overhead Alignment would be removed as the new overhead lines were being installed using the same wire-pulling sites. In addition, if the Topanga State Park Alignment were selected, existing overhead lines and wood structures would be removed as new overhead lines were installed. Existing lines would be removed by cutting sections and winding them so that the old line could be hauled to the LADWP Investment Recovery Facility in Sun Valley for recycling.

Underground Cables

While the existing overhead lines would be pulled at the same time as the new overhead lines are mounted, the removal of the existing underground cables would be undertaken following completion of the installation and final inspection and testing of the new underground cables. The existing cables would be removed by pulling them through existing maintenance holes and ducts. The existing maintenance holes are located approximately every 400 to 2,000 feet along the alignment; there are 47 maintenance holes in total. The cable pulling equipment would have a cable-chopping capability to cut the cables into 4- to 5-foot-long pieces during the removal process. The chopped cable pieces would then be transported to the LADWP Investment Recovery Facility, located in Sun Valley, for recycling.

An area of approximately 1,000 square feet around each maintenance hole would be needed for pulling equipment and crews. For each 1,500-foot segment, activities would last for approximately 3 days. One traffic lane along the existing alignment would be temporarily closed to accommodate the cable removal equipment. In total, approximately 7.5 miles (equaling approximately 790,000 pounds) of cable would be removed and recycled. With two construction crews working simultaneously, removal of the existing underground cables is anticipated to take approximately 2 months (40 working days) to complete. While the Department intends to remove all of the underground cable, access constraints and possible failures or breaks in the cable itself may limit the ability of work crews to remove the cable in its entirety. Cable that cannot be removed will remain in conduits or vaults that would be sealed from public access.

Vaults

Abandonment of the Sunset Vault would involve excavation to remove the vault cover. The vault would then be backfilled with slurry, which would take approximately 2 to 3 days to set. Once the slurry hardened, the area above the vault would be paved. Abandonment of the vault would be completed within 4 working days. A work area of approximately 100 feet by 50 feet would be required.

In addition, the existing Gladstone Vault would be expanded in place. The outside dimensions of the existing vault are 5.5 feet wide by 9.5 feet long by 9.2 feet high, and would be enlarged to 8 feet wide, 26 feet long, and 11 feet high to accommodate the electrode system upgrade, including the installation of four, 6-inch new conduits that would extend to the ocean. Construction to enlarge the Gladstone Vault would last approximately 4 to 5 days, and a work area of approximately 100 feet by 50 feet would be required. Some parking spaces could be used for staging during the enlargement of the vault.

Submarine Cables

Offshore, removal of the existing submarine cables would begin with disconnection of the two cables from the switchgear located at the existing Sunset Vault. From shore to 1,000 feet offshore, if feasible and depending on the condition of the conduits, the submarine cables would be removed in the same manner as described for the land cables. From 1,000 feet offshore to the submarine vaults (located approximately 6,000 feet offshore), the cables would be abandoned in place to avoid disruption of the marine sediments.

An approximately 100-foot-long work area would be needed at the existing Sunset Vault and an approximately 50-foot-long work area would be needed at the Gladstone Vault to remove the connecting cables. One traffic lane along Sunset Boulevard would be temporarily closed to accommodate the cable removal equipment. The removal operation would be as described for the land cables.

1.4.5 Construction Timeframes

It is anticipated that construction of the overhead and underground portions of the electrode system and removal of the existing system would take approximately 28 months assuming, 20 working days in each month and construction hours of 9:00 am to 3:30 pm weekdays, in accordance with the City of Los Angeles Mayor's Executive Directive No. 2 prohibiting construction during rush hours in the City of Los Angeles. LADWP is in discussions with the Los Angeles Department of Public Works and Bureau of Engineering to evaluate the feasibility of the Bureau granting a variance to Executive Directive No. 2 to allow some construction between the hours of 7:00 am and 5:00 pm. If a variance were to be granted, it would be limited in scope and the majority of the construction would be limited to the hours of 9:00 am to 3:30 pm. If a variance is granted to allow some construction during the hours of 7:00 am to 5:00 pm, the construction duration could be reduced from 28 months to a shorter period, depending on the specifics of the variance.

Each 1,000-foot segment of the underground alignment would take approximately 10 working days to complete, including construction of underground vaults located within the segment (approximately 5 to 7 days are needed to set one vault). Overall, trenching and vault placement would take approximately 18 months to complete. Cable pulling and splicing would occur over 11 months. Cable pulling activities would overlap with trenching and vault placement for an estimated 4-month period. Cable testing and commissioning of the underground cables would take approximately 1 month.

Since LADWP has not yet determined whether the Submarine Alignment will require full or partial replacement, the duration of construction has not yet been determined. Therefore, the construction timeframe for the Submarine Alignment will be further discussed in the EIR.

Inspections for quality control would occur throughout Project construction and would not add to the timeframes outlined above. Final inspection would occur following completion of all underground Project elements and would take approximately 2 weeks to complete.

1.5 PROJECT OPERATION

The completed Sylmar Electrode System would operate in the same manner as the existing facility. Each cable would be tested approximately once per year for approximately 10 to 30 minutes per test. Visual inspections would occur approximately once per year. Approximately five vaults per day would be inspected by a two-person crew.

Maintenance and repair of the existing electrode system, and associated temporary disturbances, would be reduced due to improved design and materials. The new cables would be oil-free; therefore, the physical vulnerability associated with the existing oil-type cables would be eliminated.

1.6 PROJECT APPROVALS

Depending on the final alignment selected, construction and operation of the proposed Project may require permits and/or approvals from the following agencies:

- U.S. Army Corps of Engineers (USACE)
- National Marine Fisheries Service (NMFS)
- State Lands Commission (SLC)
- California Regional Water Quality Control Board, Los Angeles Region (Regional Board)
- California Department of Fish and Game (CDFG)
- California Coastal Commission (CCC)
- California State Parks
- Santa Monica Mountains Conservancy
- California Department of Transportation (Caltrans)
- City of Los Angeles Department of Transportation (LADOT)
- City of Los Angeles, Department of Public Works, Bureau of Engineering
- City of Los Angeles, Department of Planning
- City of Santa Monica, Planning & Community Development Department
- City of Santa Monica, Department of Public Works

Section 2
Environmental Analysis

2.1 ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☒ Greenhouse Gas Emissions	☐ Population and Housing
☐ Agricultural Resources	☒ Hazards and Hazardous Materials	☐ Public Services
☒ Air Quality	☒ Hydrology and Water Quality	☐ Recreation
☒ Biological Resources	☐ Land Use and Planning	☒ Transportation and Traffic
☒ Cultural Resources	☐ Mineral Resources	☐ Utilities and Service Systems
☐ Geology and Soils	☒ Noise	☒ Mandatory Findings of Significance

2.2 AGENCY DETERMINATION

On the basis of this initial evaluation:

☐ I find that the project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the applicant. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

Signature: Irene Paul   Title: Project Manager

Printed Name: Irene Paul   Date: September 1, 2010

2.3 ENVIRONMENTAL CHECKLIST

2.3.1 Aesthetics

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Discussion:

a) Less Than Significant Impact. Scenic vistas are those that offer high-quality – and often panoramic – views of the natural environment.

The Main Overhead Alignment crosses through highly urbanized areas. In addition, overhead portions of the San Vicente, Topanga State Park, and Sunset Alignments would traverse lands administered by California State Parks (Park lands) and the Santa Monica Mountains Conservancy (Conservancy lands), including portions of Mulholland Drive. Both the Park and Conservancy lands offer open space and wilderness views.

Underground portions of the San Vicente, Topanga State Park and Sunset Alignments also cross through urbanized areas. For the Topanga State Park and Sunset Alignments, the underground cables would cross under PCH. For the San Vicente alignment, underground cables would be installed along State Highway 1 – Pacific Coast Highway (PCH), which offers scenic vistas of the Pacific Ocean.

Scenic and natural resources, as well as the overall character of neighborhoods and communities in the Project area, are protected and regulated by the Mulholland Scenic Parkway Specific Plan, the San Vicente Scenic Corridor Specific Plan, and the Pacific Palisades Community Village and Neighborhood Specific Plan, which are part of the City of Los Angeles General Plan. The Mulholland Scenic Parkway Specific Plan would be germane to the Main Overhead Alignment, while the San Vicente Scenic Corridor Specific Plan, and the Pacific Palisades Community Village and Neighborhood Specific Plan would be relevant to the underground alternatives.

The Mulholland Scenic Parkway Specific Plan designates major vista points and prominent ridges along Mulholland Drive. A major vista point (MVP) is defined by this Specific Plan as an "area in the Mulholland Drive right-of-way…which has exceptional mountain, ocean and/or city views and is set aside for public use," while a prominent ridge is defined as "a mountain ridge which is visible from Mulholland Drive" (City of Los Angeles, 1992).

There are two MVPs located within the Project area. Construction of the overhead portion of the Topanga State Park alignment may be visible in the distance looking southeasterly from the Topanga State Park MVP, while construction of the overhead portions of the San Vicente and Sunset Alignments may be visible in the distance looking southwesterly from the San Vicente Mountain Park MVP. From these locations, views of the Project would primarily consist of a crew pulling overhead lines across existing poles, reels used to store lines, and construction vehicles and equipment.

Construction activities and the use of equipment and vehicles associated with construction of the overhead alignment would result in short-term visual disruptions of the scenic vistas discussed above. However, construction activity would comprise only a small portion of the overall viewshed with regard to the areas along Mulholland Drive. In addition, since the proposed electrode system is a linear facility, construction activities would not occur at any one location for an extended period of time. Therefore, temporary impacts from construction of the Project would be less than significant.

Views within the San Vicente Scenic Corridor in the Project area primarily comprise residential neighborhoods and the Brentwood Country Club. Within the Pacific Palisades Community Village and Neighborhood Specific Plan area, portions of Sunset Boulevard, Palisades Drive, Channel Road and PCH offer residential, commercial and ocean views.

Project-related construction activities such as the use of equipment and vehicles associated with trench excavation and cable installation, reels of cable, and construction vehicles and equipment would result in short-term visual disruptions of scenic areas within the San Vicente Scenic Corridor and the Pacific Palisades Community Village and Neighborhood Specific Plan area. However, since such activities would be temporary, and given the proposed electrode system is a linear facility, construction activities would not occur at any one location for an extended period of time. Therefore, impacts to scenic vistas from construction of the Project would be less than significant.

During Project operation, the overhead portions of the San Vicente and Sunset Alignments would be the same in visual appearance as existing conditions, since replacement lines would look visually the same as existing lines and would be suspended from existing steel towers. Therefore, a less than significant visual impact would occur during Project operation.

As discussed in **Section 1.4, Project Description**, if the Topanga State Park Alignment were selected, the existing wood poles along the overhead portion of the alignment would be removed and new steel poles would be constructed as part of the Project. The new poles would be constructed generally along the same route as the existing alignment. The new poles would be 52 feet taller than the existing poles, which are approximately 48 feet in height. However, given the height of the new poles, fewer poles would be required. In addition, the new poles would be spaced 500 feet apart, which is 350 feet greater than the current spacing between the existing poles. Also, similar to the wood poles, the steel poles would be cylindrical. Therefore, given their thin, vertical design, the new poles would neither block nor dominate the viewshed. Rather, the new poles would occupy only a small portion of the overall landscape. The final selection of finish color would be based on community and agency input. Operation of the Topanga State Park Alignment would not present a substantial difference in appearance from existing conditions; the impact to scenic vistas would be less than significant.

Underground portions of the Project would not affect scenic views once completed since the underground cables and associated vaults would be buried. The underground and submarine portions of the electrode system would not be visible during Project operation; therefore, no impact to scenic vistas relative to these portions of the alignment would occur.

b) Less Than Significant Impact. There are no designated State scenic highways in the vicinity of the Main Overhead, San Vicente, Topanga State Park, Sunset, and Submarine Alignments (Caltrans, 2009). While PCH is eligible for designation as a State scenic highway in the area that coincides with the Project site, the roadway is not officially designated (Caltrans, 2009). Therefore, since the Project would not result in any impacts to trees, rock outcroppings, or historic structures within an officially designated State scenic highway, impacts relative to a State scenic highway would be less than significant.

c) Less Than Significant Impact. During construction, the presence of equipment and vehicles along the overhead and underground portions of the Project site would result in short-term visual impacts. However, due to the temporary nature of these changes to the visual quality of the environment, impacts would be less than significant.

During Project operation, the overhead portions of the San Vicente and Sunset alignments would be the same in visual appearance as existing facilities, since replacement lines would look visually the same as existing lines and would be suspended from existing steel towers. Therefore, a less than significant impact would result.

If the Topanga State Park Alignment were selected, the existing wood poles along the alignment would be removed and new cylindrical steel poles would be constructed. However, as discussed above, similar to the existing poles, the new poles would be cylindrical in design and would be located generally along the same route as the existing alignment.

While the new poles would be 52 feet taller than existing poles, the new poles would be spaced 500 feet apart, 350 feet greater than the spacing between the existing poles. As such, fewer poles than current conditions would be required. Since the new poles would not result in a substantial change in the existing visual character or quality of the Project site and its surroundings, a less than significant impact relative to the operation of the Topanga State Park Alignment would occur.

The underground and submarine portions of the electrode system would not be visible during Project operation. Therefore, no permanent changes to visual quality or character would occur for the underground and submarine portions of the alignment; impacts on visual character and quality would be less than significant.

d) Less Than Significant Impact. As discussed in **Section 1.4.4**, LADWP is in discussions with the LADWP Bureau of Engineering to evaluate the feasibility of the Bureau granting a variance to Executive Directive No. 2 to allow some construction of the underground portion of the alignment during the heavy traffic hours of 7:00 to 9:00 am and 3:30 to 5:00 pm. If a variance were to be granted, the majority of the construction would be limited to the hours of 9:00 am to 3:30 pm; however, some construction could occur between 7:00 am and 5:00 pm. During autumn and winter months when the sun sets in late afternoon, the use of some lighting could be necessary. It is anticipated that any lighting used in late afternoon would be limited to vehicle headlights (e.g., haul trucks) and lights used to directly illuminate construction activities. Lighting used during construction would be directed away from residences and businesses located along the alignment. In addition, the use of lighting during construction would be temporary in nature and limited in duration for each location along the alignment. Therefore, since any new sources of light or glare would be related to short-term construction activities and vehicle travel, these construction impacts would be less than significant.

During Project operation, existing steel towers along the overhead portions of the San Vicente and Sunset Alignments would support lines that would be the same in appearance as existing lines, which do not produce light or glare. Therefore, no new sources of light or glare that could adversely affect day or night time views would result from the overhead portions of the San Vicente and Sunset Alignments.

New steel poles would be constructed under the Project if the Topanga State Park Alignment were selected. Final selection of finish color will be based on community and agency input; impacts relative to light and glare would therefore be less than significant. The new steel poles would support lines that would be the same in appearance as existing lines, which do not produce light or glare. Therefore, operational impacts of the overhead portions of the Topanga State Park Alignment would result in a less than significant impact relative to new sources of light and glare.

The underground and submarine portions of the Project, including vaults, would not be visible during Project operation and therefore would not create new sources of light or glare. Accordingly, during Project operation, no impacts relative to light or glare from the underground and submarine portions of the Project would occur.

2.3.2 Agriculture and Forest Resources

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐

Issues and Supporting Information Sources		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
b)	Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☒	☐
c)	Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d)	Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e)	Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☒	☐

Discussion:

Under the Farmland Mapping and Monitoring Program, the California Department of Conservation Division of Land Resources Protection maintains maps of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to determine impacts to agricultural resources. Agricultural lands are rated and mapped by soil quality and irrigation status (California Department of Conservation, 2009).

The majority of the Main Overhead Alignment is urbanized; however, land traversed by the Main Overhead Alignment, mapped by the Department of Conservation, currently supports farming activities on lands designated as Unique Farmland. No additional Farmland is mapped along the San Vicente, Topanga State Park and Sunset Alignments.

a) Less Than Significant Impact. The Project would traverse Unique Farmland, as shown on the Los Angeles Important Farmland map developed by the California Department of Conservation Division of Land Resources Protection (California Department of Conservation, 2008a). More specifically, the Main Overhead Alignment would cross over five areas mapped as Unique Farmland:

- One of the areas is bounded by San Fernando Mission Boulevard on the north and Tribune Street on the south, with residences bordering the area on the west and a concrete-lined channel bordering the area on the east.

- A second Unique Farmland area is bounded by Tribune Street on the north and Chatsworth Street on the south, with residences bordering the area on the west and industrial buildings bordering the area on the east.

- A third Unique Farmland area is bounded by Lassen Street on the north and Citronia Street on the south, with residences bordering the area on the northwest and a concrete-lined channel bordering the area on the southeast.

- A fourth area is bounded by Prairie Street on the north and Nordhoff Street on the south, with residences bordering the area on the west and east.

- A fifth area is bounded by Nordhoff Street on the north and Rayen Street on the south, with residences bordering the area on the west and east.

Construction of the Main Overhead Alignment would involve the replacement of overhead lines attached to existing steel towers located above land mapped as Unique Farmland. No portion of the farmland would be physically altered and no additional construction beyond the installment of the new lines and removal of the existing lines would be required. In addition, no Unique Farmland would be converted to non-agricultural use under the Project.

None of the underground portions of the San Vicente, Topanga State Park or Sunset Alignments traverse Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.

Therefore, Project construction would have a less than significant impact to Unique Farmland, and no impacts to Prime Farmland or Farmland of Statewide Importance would occur.

During Project operation, no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program would be converted to non-agricultural use. As such, no operational impacts would occur.

b) Less Than Significant Impact. No portion of the Project site is subject to a Williamson Act contract (California Department of Conservation, 2006). The Main Overhead Alignment would traverse five farmland areas, as discussed in **Section 2.3.2(a)**. These areas are zoned Agriculture and Public Facility by the City of Los Angeles (City of Los Angeles, 2009). Construction of the Main Overhead Alignment would involve the replacement of lines attached to existing towers. No portion of the Farmland would be physically altered by the Project and no zoning changes are proposed. Therefore, since there would be no conflict with existing zoning for agricultural use or a Williamson Act contract, Project construction and operation would result in a less than significant impact.

c) and d) No Impact. The Project is the upgrade of an existing electrode system for increased reliability. The Project does not propose any zoning changes; the replacement lines and cables would be installed along existing rights-of-way (ROW). In addition, the Project site is not located in areas mapped as forest or woodland (California Department of Forestry and Fire Protection, 2003). As such, the Project would not conflict with existing zoning or result in rezoning of forest or timberland, or result in the loss of forest land or conversion of forest land to non-forest use. Therefore, no impact would occur to forest land, timberland, and timberland zoned Timberland Production.

e) Less Than Significant Impact. The proposed Project would replace existing overhead lines with new ones and existing underground cables and vaults with new ones. Construction and operation of the proposed replacement electrode system would not provide any facilities or services that could induce growth or otherwise change an existing land use that could directly or indirectly result in the conversion of farmland to non-agricultural use or conversion of forest land to non-forest use. Project construction may result in a temporary disruption of farming activities with regard to access during installation of the new overhead lines and removal of the existing lines. Such disruption, if any, would be short-term due to the use of construction equipment and vehicles in the vicinity of the farmland. No permanent cessation of farming activities would result from Project implementation, and no conversion of farmland to non-agricultural use or conversion of forest land to non-forest use would occur. Therefore, the impact to farmland and forest land would be less than significant.

2.3.3 Air Quality

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☒	☐	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☒	☐	☐	☐

Discussion:

a) through e) Potentially Significant Impact. The Project site is located in the portion of the South Coast Air Basin that is regulated by the South Coast Air Quality Management District (SCAQMD). The area is designated as a "Severe 17" non-attainment area for ozone (8-hour standard), a serious non-attainment area for particulate matter 10 microns or less in diameter (PM10), and a non-attainment area for particulate matter 2.5 microns or less in diameter (PM2.5) (USEPA, 2010).

The Project would involve the use of vehicles and heavy equipment during construction of the Main Overhead Alignment and the overhead and underground portions of the San Vicente, Topanga State Park, or Sunset Alignments. The vehicles and equipment would generate exhaust pollutants and could create nuisance odors. While construction of the Submarine Alignment would occur under water, trucks used to haul materials (i.e., cables, equipment, etc.) to and from an onshore staging area would also emit exhaust pollutants.

In addition, it is assumed that excess material generated during excavation of the underground portion of the Project, not recycled by LADWP, would be hauled off-site to a yet-to-be-determined facility, thereby creating additional exhaust pollutants along the travel route. Furthermore, trenching during construction of the underground portion of the Project would result in the creation of fugitive dust. Due to the proximity of sensitive receptors such as schools and residences to the Project sites, these receptors may be exposed to both vehicle pollutants and fugitive dust during Project construction.

Given the above, since Project construction could result in a temporary increase in localized emissions that could have a regional effect on air quality and a local effect on sensitive receptors, a potentially significant impact relative to air quality could occur. Therefore, the air quality impacts resulting from Project construction will be analyzed further in an EIR and feasible mitigation measures will be incorporated, as necessary.

During Project operation, no emissions would be generated from the Sylmar Electrode System. As under existing conditions, maintenance workers would inspect Project facilities occasionally. There would be no substantial increase in vehicle trips or resultant air emissions during Project operation. Therefore, operational impacts on air quality would be less than significant.

2.3.4 Biological Resources

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?	☒	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☒	☐	☐	☐

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Discussion:

a) through e) Potentially Significant Impact. The Project site comprises urbanized lands and open space, including Santa Monica Mountains Conservancy land, that may support protected or native species or habitats, or other biological resources. Construction activities involving the overhead and underground portions of the San Vicente, Topanga State Park, and Sunset Alignments could adversely impact sensitive biological resources (e.g., direct or indirect disturbance of plant or animal species in the Project area). Therefore, impacts to biological resources will be further analyzed in an EIR. Mitigation measures will be incorporated, as applicable, to reduce impacts. Areas of further study will include potential impacts to wetlands, wildlife migration, raptor nests on existing poles, and protected trees.

In addition, for the Submarine Alignment, replacement or rehabilitation of cables and structures on or buried beneath the ocean floor may involve excavation that could impact marine species or habitats. A survey will be conducted for the submarine portion of the Project to determine potential impacts to marine biological resources; mitigation measures will be incorporated, as applicable. Therefore, construction-related impacts to biological resources are potentially significant and will be analyzed further in an EIR.

Operation of the Project will not differ substantially from existing conditions. The electrode system would not emit noise, and therefore would not disturb biological resources. Additionally, the electrode system facilities would not impede the movement of native or migratory species, since the overhead lines would be supported by steel towers or poles, underground cables and vaults would be buried, and the submarine cables and vaults or others structures would be laid on or beneath the ocean floor. As under existing conditions, on-going activities related to Project operation would be limited to infrequent inspections by maintenance workers. Therefore, no additional operational impacts to biological resources would occur.

f) No Impact. The Project site does not fall within the boundaries of any adopted Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) (CDFG, 2009). Therefore, proposed construction and operation of the replacement electrode system and removal of the existing electrode system would not conflict with any adopted HCPs or NCCPs. Therefore, no impact would occur.

2.3.5 Cultural Resources

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☒	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☒	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☒	☐	☐	☐

Discussion:

a) through d) Potentially Significant Impact. Construction activities involving the Main Overhead Alignment, the overhead portions of the San Vicente and Sunset Alignments, and the Submarine Alignment are not expected to disturb known or undiscovered cultural resources. Replacement lines for the Main Overhead, San Vicente and Sunset Alignments would be mounted on existing towers, and therefore no excavation would be necessary. With regard to the Submarine Alignment, sub-sea cables and vaults would be placed offshore where no cultural resources are expected to occur. Therefore, construction of the Main Overhead Alignment, the overhead portions of the San Vicente and Sunset Alignments, and the Submarine Alignment would result in a less than significant impact to cultural resources.

Project construction of the underground portions of all three alignments would involve excavation as part of trenching activities; if the Topanga State Park Alignment were selected, excavation for the installation of the bases of the new steel poles along the overhead portion of the route would also be required. Such excavation could potentially uncover previously undiscovered cultural resources. A field study and records search will be conducted for the Project to determine potential impacts to historical, archeological and paleontological resources. Mitigation measures will be incorporated, as applicable, to reduce impacts to cultural resources. Accordingly, construction-related Project impacts to cultural resources are potentially significant and will be analyzed further in an EIR.

During Project operation, excavation would be limited to emergency maintenance activities along the underground portion of the alignment and such activities are likely to occur only in previously disturbed soils. Notwithstanding, since previously undiscovered cultural resources could be unearthed during maintenance-related excavation, a potentially significant impact could occur. Accordingly, this issue will be analyzed further in an EIR.

2.3.6 Geology and Soils

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994) creating substantial risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems, where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Discussion:

a)-i) Less Than Significant Impact. According to the Department of Conservation California Geological Survey, the Project site is located within areas identified as Alquist-Priolo Earthquake Zones (California Department of Conservation, 2008b). Specifically, faults are shown on the U.S.G.S. Oat Mountain, San Fernando, and Beverly Hills quadrangles in which the San Vicente, Topanga State Park and Sunset Alignments are located.

As with most of Southern California, the proposed Project site is located in a seismically active area and therefore would be subject to ground shaking and potential damage during an earthquake. However, the Project is the replacement of an existing electrode system; no habitable structures are proposed to be constructed. Overhead lines would be replaced on existing steel towers if either the San Vicente or Sunset Alignment were selected, or on new steel poles if the Topanga State Park alignment were selected. Underground cables and vaults would be buried. For the Submarine Alignment, cables would be laid on the ocean floor or buried. Furthermore, the proposed Project would be constructed to meet all applicable National Electrical Code (NEC) and seismic safety standards, and all trenched areas would be backfilled to meet proper shear strength requirements. Therefore, hazards associated with ground shaking would be reduced to a less than significant level with incorporation of geotechnical measures into Project design plans and specifications. Accordingly, Project impacts relative to the risk of loss, injury, or death involving earthquake rupture would be less than significant.

a)-ii) Less Than Significant Impact. As with most of Southern California, the proposed Project site would be located in a seismically active area and therefore would be subject to ground shaking and potential damage during an earthquake. However, the proposed Project is the replacement of an existing electrode system; no habitable structures are proposed. For the land-based portion of the Project, overhead lines would be replaced on existing steel towers if either the San Vicente or Sunset Alignment were selected, or on new steel poles if the Topanga State Park alignment were selected. Underground cables and vaults would be buried. For the Submarine Alignment, cables would be laid on the ocean floor or buried. Furthermore, the proposed replacement electrode system would be constructed to meet all applicable NEC and seismic safety standards, and all trenched areas would be backfilled to meet proper shear strength requirements. Therefore, hazards associated with ground shaking would be reduced to a less than significant level with incorporation of geotechnical measures into Project design plans and specifications.

a)-iii) Less Than Significant Impact. Seismic-related ground failures such as liquefaction, lurching, lateral spreading, and differential settlement can result from strong ground shaking. Liquefaction-related phenomena occur when seismic shaking of loose, saturated sand deposits temporarily lose strength and behave as a liquid. Liquefaction-related phenomena generally occur in areas of shallow groundwater (depths of 50 feet or less). The Main Overhead, San Vicente, Topanga State Park, and Sunset Alignments would cross through several areas mapped as either liquefiable, or having the potential for seismically induced liquefaction (City of Los Angeles, 1996b; City of Santa Monica, 1995a).

Seismic ground failure, including liquefaction, could particularly impact the underground portions of the alignments and steel towers in those areas with liquefiable alluvial deposits. However, the proposed electrode system would be designed and constructed to meet all applicable NEC and seismic safety standards. Additionally, all trenched areas would be backfilled to meet shear strength requirements. Removal of the existing underground cables would be completed at existing maintenance hole locations along the existing alignment.

For the San Vicente and Sunset Alignments, replacement of the existing overhead lines would not involve earth-disturbing activities. The overhead portion of the Topanga State Park Alignment is not mapped as crossing through liquefiable areas (City of Los Angeles, 1996b). Therefore, the potential for damage or failure due to liquefaction would be less than significant.

a)-iv) Less Than Significant Impact. The proposed Project would be located almost entirely within areas mapped as having landslide potential, except for the San Fernando Valley floor portion of the Main Overhead Alignment and the underground portion of the San Vicente Alignment that would be located within the City of Santa Monica (City of Los Angeles, 1996c; City of Santa Monica, 1995b). For the Main Overhead, San Vicente and Sunset Alignments, replacement of the overhead lines would not necessitate earth disturbing activities, since lines would be mounted on existing towers. Removal of the existing underground portion of the electrode system also would not involve earth disturbing activities (e.g. trenching).

Underground cables would be buried and therefore not susceptible to landslide impacts. Furthermore, the proposed electrode system would be constructed to meet all applicable NEC and seismic safety standards, and all trenched areas would be backfilled to meet proper shear strength requirements.

If the Topanga State Park Alignment were selected, new poles would be constructed. However, during construction, each pole would be placed in a 20-foot-deep hole for the foundation pedestal, which would be round and 5 feet in diameter. In addition, the poles would be submerged in concrete to prevent movement. Therefore, the potential for damage or failure due to landslides would be less than significant.

b) Less Than Significant Impact. Removal of the old lines in the overhead portions of the Project site would not involve ground disturbance (i.e., excavation, grading). For the San Vicente and Sunset Alignments, installation of new overhead lines would not necessitate ground disturbance. However, if the Topanga State Park Alignment were selected, new poles would be constructed. Construction of the new poles would involve the excavation of 20-foot-deep holes for the foundation pedestals. During construction, water trucks would be used to keep adjacent areas damp, spoil piles would be covered and excavated soil would be immediately deposited in haul trucks to preclude soil erosion. Therefore, since no substantial soil erosion or loss of topsoil is anticipated during construction of the overhead portion of the Project, a less than significant impact would result.

For the southernmost portions of the San Vicente Alignment along PCH, the underground alignment would be placed approximately 4 to 5 feet from the northernmost lane’s shoulder, depending on the location of existing underground utilities. Therefore, since excavation could occur in areas not previously paved, some loss of topsoil could occur. However, trenched areas would be backfilled and restored to previous conditions. In addition, in accordance with the State Water Resources Control Board (SWRCB) General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 2009-0009-DWQ) for projects that disturb areas greater than 1 acre, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented for the Project. As part of the SWPPP, Best Management Practices (BMPs) would be implemented to control erosion and discharge of any polluted runoff. As such, with implementation of a SWPPP and BMPs, a less than significant impact would occur relative to soil erosion or loss of topsoil.

Construction of all the underground portions of the San Vicente, Topanga State Park and Sunset Alignments would occur in existing, paved City streets or previously disturbed areas. Once excavated, trenched areas would be backfilled, compacted and repaved; therefore, no substantial erosion or loss of topsoil would be expected to result and a less than significant impact would occur.

Removal of the existing underground cables would be completed at existing maintenance hole locations and would not involve any earth-disturbing activities that would result in erosion or the loss of topsoil. During Project operation, overhead lines would be suspended from towers, resulting in no earth disturbance, and underground cables would be buried and, as such, no erosion or the loss of topsoil would occur. Accordingly, replacement and removal of the overhead lines and underground cables would be expected to have a less than significant impact on erosion or loss of the topsoil.

c) and d) Less Than Significant Impact. As described above in **Section 2.3.6(a)**, a portion of the proposed Project would be located on soils that are potentially unstable. However, all Project components would be designed and constructed to meet NEC and seismic safety standards. No habitable structures are proposed under the Project. Additionally, all trenches would be backfilled to meet proper shear strength requirements. Removal of the existing electrode system would not involve any earth-disturbing activities. Therefore, potential impacts related to unstable soils, including onsite or offsite landslides, lateral spreading, subsidence, liquefaction, expansive soils, or collapse would be less than significant.

e) No Impact. The proposed Project would not involve the construction or use of septic tanks or alternative wastewater disposal systems. Construction and operation of the Project would not affect any existing septic tanks or alternative wastewater disposal systems, or disturb the soils that support such systems. The existing underground cables are located within existing public utility rights-of-way and their removal would not require any earth-disturbing activities that could affect existing septic tanks or alternative wastewater disposal systems. Access to and removal of the existing underground cables would be accomplished at existing maintenance hole locations. Therefore, there would be no impact relative to septic tanks or alternative wastewater disposal systems.

2.3.7 Greenhouse Gas Emissions

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☒	☐	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☒	☐	☐	☐

a) and b) Potentially Significant Impact. As discussed above in **Section 2.3.3, Air Quality**, Project construction could result in a temporary increase in localized emissions that could have a regional effect on air quality. As such, a potentially significant impact relative to greenhouse gas emissions could occur. Therefore, the air quality impacts resulting from Project construction, as well as a discussion of applicable plans, policies, or regulations relative to reducing greenhouse gas emissions, will be addressed further in an EIR, and feasible mitigation measures will be incorporated, as necessary.

During Project operation, no emissions would be generated from the electrode system. Therefore, no new Project-related sources of pollutants that could cumulatively contribute to greenhouse gas emissions would be introduced to the Project site. Accordingly, operational impacts relative to greenhouse gas emissions would be less than significant.

2.3.8 Hazards and Hazardous Materials

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☒	☐	☐	☐
h) Expose people or structures to the risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

Discussion:

a) and b) Less Than Significant Impact. During construction of the proposed Project, small quantities of hazardous materials such as gasoline, oils, lubricants, and solvents would be required to fuel and operate construction vehicles and equipment. These materials would be contained within vessels engineered for their safe storage, and substantial quantities of these materials are not anticipated to be stored along an alignment or in staging areas.

Construction of the proposed electrode system would involve the excavation and transport of soils and paving materials (e.g., asphalt, concrete, road bed fill materials) that could possibly be contaminated by vehicle-related pollution (e.g., oil, gasoline, diesel, and other automotive chemicals) as a result of having been existing roadway underfill. All such soil and paving materials would be transported and disposed of by qualified personnel in accordance with all applicable State and federal codes and regulations.

Proposed removal of existing overhead lines and underground cables would involve chopping the removed cable into segments of 4 to 5 feet long for hauling off site. The removed pieces would then be transported to the LADWP Investment Recovery Facility in Sun Valley for recycling. Up to approximately 45 miles of overhead lines from the existing electrode system (22.5 miles of parallel lines) and nearly 15 miles of underground cable (7.4 miles of two cables) would be recycled. As referenced in **Section 1.2.2**, the existing land-based portion of the electrode system is insulated with oil-impregnated paper and is lead covered; these non-recoverable elements of the existing cables would be considered hazardous and would be handled and disposed of in accordance with the federal Resource Conservation and Recovery Act (RCRA), as well as Title 22 of the California Code of Regulations, as implemented by the California Department of Toxic Substances Control (DTSC), and either recycled or disposed of to an appropriate landfill.

Operation and maintenance of the proposed replacement underground cables would not require the use, storage, or disposal of hazardous substances. The proposed replacement cables would be oil-free.

Therefore, Project construction and operation impacts associated with routine transport, use, or disposal of hazardous materials, as well as impacts relative to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment, would be less than significant.

c) Less Than Significant Impact. Several schools are located within one-quarter mile of the Main Overhead, San Vicente, Topanga State Park, and Sunset Alignments. The removed pieces of the existing cable that would be transported to the LADWP Investment Recovery Facility to be recycled would be considered hazardous, but exposure would be avoided by transporting them in an enclosed vehicle.

The non-recoverable elements of the existing land-based cables would be handled and disposed of in accordance with the federal Resource Conservation and Recovery Act, as well as Title 22 of the California Code of Regulations, which is implemented by the DTSC. Therefore, impacts associated with hazardous emissions or the handling of hazardous materials, substances or waste within one-quarter mile of an existing or proposed school would be less than significant.

d) No Impact. Section 65962.5 of the California Government Code requires the California Environmental Protection Agency (CalEPA) to update a list of known hazardous materials sites, which is also called the "Cortese List." The sites on the Cortese List are designated by the State Water Resources Control Board, the Integrated Waste Management Board, and the DTSC.

A records search of relevant federal, state, and local environmental regulatory databases, including the Cortese List, was conducted for the Project site area (EDR, 2010). The records search meets the requirements of the American Society for Testing and Materials Standard Practice for Environmental Site Assessments. The results of the records search show that there are no known hazardous materials sites that could be encountered during Project construction. Therefore, no impact relative to hazardous materials sites would occur.

e) and f) Less Than Significant Impact. The closest public airport to the Project site is the Van Nuys Airport, which is located approximately 2 miles east of the Main Overhead Alignment. The Van Nuys Airport Plan guides the long-term development of the airport; however, the plan includes only the land within the airport's boundaries and the Main Overhead Alignment does not cross through and is not directly located adjacent to the airport (Van Nuys Airport Plan, 2006). Therefore, the Project would not be subject to the Van Nuys Airport Plan.

Installation of replacement lines and removal of existing lines along the Main Overhead Alignment would involve the use of construction vehicles and equipment. During operation, the Project would be unmanned, requiring only periodic inspection, testing and maintenance. Given the distance of the Main Overhead Alignment from the Van Nuys Airport, Project construction and operation would not result in a safety hazard for people residing or working in the Project area and, as such, impacts would be less than significant.

In addition, there are no private airports located in the vicinity of the Project. Therefore, Project implementation would have no impact on a private airstrip or result in an aviation safety hazard for people residing in the proposed Project area.

g) Potentially Significant Impact. During construction of the proposed electrode system and removal of the existing underground cables, Project-related activities could temporarily interfere with an adopted emergency response plan or a local, State, or federal agency's emergency evacuation plan due to roadway traffic lane reductions and restrictions. Therefore, prior to construction, a Traffic Management and Control Plan would be prepared in coordination with the Los Angeles Department of Transportation (LADOT), Caltrans, and the City of Santa Monica Planning & Community Development Department (if the San Vicente alignment is chosen) to minimize impacts relative to transportation and traffic, including those impacts associated with emergency response access. Since project construction impacts relative to emergency response routes and traffic would be potentially significant, this issue will be evaluated further in an EIR.

Once operational, the proposed overhead lines would be attached to steel towers or steel poles, or located underground, and buried beneath the Pacific Ocean. Therefore, the completed electrode system would not interfere with emergency response or evacuation plans. Similarly, following removal of the existing underground cables, no surface street obstructions (i.e., construction vehicles) would physically interfere with emergency response or evacuation plans. Therefore, Project operation would have a less than significant impact on an adopted emergency response plan or emergency evacuation plan.

h) Less Than Significant Impact. The Main Overhead Alignment, as well as overhead and underground portions of the San Vicente, Topanga State Park, and Sunset Alignments traverse areas designated as wildland fire hazard areas (City of Los Angeles, 1996d). The northernmost portion of the Main Overhead Alignment traverses a Fire Buffer Zone. The central portion of the Main Overhead Alignment between Chatsworth Street and Ventura Boulevard crosses through urbanized areas that are not mapped as having a high fire danger risk. Between Ventura Boulevard and U.S. Highway 101, the Main Overhead Alignment traverses a Fire Buffer Zone and south of U.S. Highway 101 the alignment crosses through a Mountain Fire District.

The overhead portion of the San Vicente Alignment is located within a Mountain Fire District; the underground portion straddles both a Mountain Fire District and a Fire Buffer Zone. Both the overhead and underground portions of the Topanga State Park and Sunset Alignments traverse a Mountain Fire District.

The proposed Project would not introduce new habitable structures to the area. No welding or use of similar equipment that would produce open flames or sparks would be used during Project construction. Once the Project was completed, operation of the overhead lines and underground cables would be the same as existing conditions, and thus would not expose any people or structures to a significant risk of loss, injury or death involving wildland fires. Therefore, impacts would be less than significant.

2.3.9 Hydrology and Water Quality

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐

Issues and Supporting Information Sources		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
d)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐
e)	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f)	Otherwise substantially degrade water quality?	☒	☐	☐	☐
g)	Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☒	☐
h)	Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☒	☐
i)	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j)	Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

Discussion:

Surface Waters

The Project area is within the jurisdiction of the California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board), which designates beneficial uses (BU) for surface and groundwaters and identifies water quality objectives (WQO) to protect the BU, presented in a Water Quality Control Plan or Basin Plan. The Basin Plan was adopted in 1995, with amendments adopted through 2006 (Regional Water Board, 2010). The Project area is within the Basin Plan's Malibu Hydrologic Unit and the Los Angeles – San Gabriel Rivers Hydrologic Unit.

The landward section of the project area is traversed by largely intermittent surface streams. The underground portion of the project would cross, from west to east, Santa Ynez Creek, Temescal Creek, Rustic Canyon Creek, and Santa Monica Canyon Creek (Thomas Guide, 2010), all of which drain generally southward from the Santa Monica Mountains to the Pacific Ocean. Surface waters in the San Fernando Valley overhead portion of the project are the Los Angeles River and its tributaries, which flow roughly to the east.

The coastal areas where the submarine cables would be replaced are off Will Rogers State Beach and Topanga Beach in Santa Monica Bay. BU established for Santa Monica Canyon, Santa Ynez Canyon and coastal waters are listed below.

Table 2-1
Beneficial Uses for Santa Ynez and Santa Monica Canyons and Coastal Waters

Beneficial Use	Santa Ynez Canyon	Santa Monica Canyon	Coastal Waters*
MUN	P	P	--
REC 1	I	Ps	E
REC 2	E	I	E
WARM	I	P	--
WILD	E	P	E
RARE	E	--	--
NAV	--	--	E
COMM	--	--	E
MAR	--	--	E
SPWN	--	--	P
SHELL	--	--	E

Source: Regional Water Board, 1995.
MUN = Municipal and Domestic Supply; REC-1 = Water Contact Recreation; REC-2 = Non- Contact Water Recreation; WARM = Warm Freshwater Habitat; WILD = Wildlife Habitat, RARE = Rare, Threatened or Endangered Species; NAV = Navigation; COMM = Commercial and Sport Fishing: MAR = Marine Habitat: SPWN = Spawning, Reproduction and/or Early Development (of fish); SHELL = Shellfish Harvesting.
P = Potential beneficial use; E = Existing beneficial use; I = Intermittent beneficial use. Ps for Santa Monica Canyon = Potential beneficial use, but access is prohibited by Los Angeles County Department of Public Works.
*Topanga Beach and Will Rogers State Beach

The Regional Water Board develops both narrative WQO and waterbody-specific WQO for selected waterbodies. Of the project area streams, the Malibu Creek Watershed and the Los Angeles River have specific WQO, presented below. WQO for coastal waters are presented in the SWRCB *Water Quality Control Plan for Ocean Waters of California* (*Ocean Plan*) and the *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan*) (State Board, 2009). Specific marine water quality criteria are not presented in this IS, however, since marine impacts are considered to be potentially significant and will be subject to additional evaluation and study in the EIR. Waterbody-specific water quality objectives for the study area surface waters are listed below.

Table 2-2
Waterbody-Specific Water Quality Objectives for Study Area Surface Waters

	Malibu Creek Watershed	Los Angeles River at Pacoima Wash
Total Dissolved Solids (mg/L)	2000	250
Sulfate (mg/L)	500	30
Chloride (mg/L)	500	10
Boron (mg/L)	2.0	--
Nitrogen (mg/L)	10	10

Source: Regional Water Board, 1995.

The Basin Plan also presents narrative WQO for ammonia, coliform bacteria, biochemical oxygen demand, biostimulatory substances, chemical constituents, total chlorine, color, floating material, introduction of exotic vegetation, detergents, nitrogen, oil and grease, dissolved oxygen, pesticides, pH, PCBs, radioactive substances, settleable solids, taste and odor, temperature, toxicity, and turbidity.

Groundwaters

The underground portion of the Project does not overlie a groundwater basin identified in the Basin Plan. The overhead portion overlies the San Fernando Valley groundwater basin, for which designated BU are (for San Fernando Basin west of Highway 405): Municipal and Domestic Supply, Industrial Process Supply, Industrial Service Supply, and Agricultural Supply. Specific WQO are: 800 mg/L TDS, 300 mg/L sulfate, 100 mg/L chloride and 1.5 mg/L boron.

a) and f) Potentially Significant Impact (less than significant for freshwater and groundwater; potentially significant for marine waters).

Site Dewatering. The average depth of excavation for cable installation along the underground portions of the San Vicente, Topanga State Park, and Sunset Alignments would be approximately 5 feet below street surface. The depth of excavation could be up to 11 to 12 feet below street surface at the proposed vaults. If construction occurs in areas having a high groundwater table, it may be necessary to dewater these areas during excavation. If relevant, the Project would then require a temporary SWRCB National Pollutant Discharge Elimination System (NPDES) Permit for dewatering activities during construction. LADWP would comply with all provisions of the dewatering permit to meet waste discharge requirements. Therefore, the impact would be less than significant.

Surface Water Quality. While the underground alignment would cross several streams that have designated beneficial uses and water quality objectives, and while the streams are considered waters of the State and waters of the U.S., it is proposed to use bore and jack construction under all of these drainages. As a result, there would be no impact of construction on water quality of the streams. The impact would therefore be less than significant.

The aboveground alignment would cross the Los Angeles River and two of its tributaries, Bull Creek and Wilbur Wash, in the San Fernando Valley, but would involve replacement of overhead cables only. The Project would have no impact on river or stream water quality. Excavation of foundations for new power poles along the alignment through Topanga State Park would create soil that potentially could wash into Topanga Creek and increase its turbidity. With the implementation of BMPs in a construction SWPPP, discussed previously, the potential effects would be reduced to a level of less than significant.

Removal of the existing electrode system would be completed by pulling the lines and cables from existing steel towers and maintenance holes, respectively. No earth disturbing (e.g., trenching or grading) activities would be required as part of the electrode system removal process; therefore, activities related to removal of the existing lines and cables would not create conditions that would violate water quality standards or waste discharge requirements.

Marine Water Quality. The existing submarine facilities would be either replaced in full or in part, depending on the results of LADWP's current studies. The replacement could create turbidity, which in turn could locally degrade the benthic marine community in the immediate vicinity of the construction zone. The impact is potentially significant and will be discussed in an EIR.

Groundwater Quality. If dewatering is required for portions of the underground alignment, dewatering would not affect groundwater quality. Groundwater would not be affected in the overhead portion of the alignment and is not an issue for the submarine portion of the Project.

Operation of the proposed replacement system would be limited to periodic inspection, testing, and maintenance activities that would not involve any water discharges. As such, impacts relative to Project operation would be less than significant.

b) Less Than Significant Impact. As addressed above, in the event that groundwater is encountered during excavation for the underground portion of the Project along Sunset Boulevard, site-specific dewatering may be required. However, dewatering would not be expected to involve water quantities that would substantially deplete groundwater supplies (and there are no significant supplies in this area) or interfere with groundwater recharge, due to the short duration of trenching activities at each location along the alignment. Therefore, a less than significant impact to groundwater supplies or groundwater recharge would result during Project construction. No water supplies would be required during Project operation. Accordingly, operation-related impacts would have no impact on groundwater.

c), d), and e) Less Than Significant Impact. The underground portions of the alignments would jack and bore under existing streams and drainages traversed; therefore, there would be no impact on flooding, drainage patterns, or erosion in these watercourses. Therefore, no water bodies would be altered under the Project.

Following installation of the underground cables and vaults, all trenches would be backfilled and re-graded to restore original drainage patterns. As such, construction of the underground portion of the alignment would not permanently change runoff characteristics or alter drainage patterns, or result in substantial erosion, siltation, or flooding. If dewatering is required during construction of the underground portion of the alignment, all dewatering activities would be carried out in accordance with the Project's Temporary NPDES Permit. Additionally, since any necessary dewatering would occur at site-specific locations during the construction process, water discharges are not expected to involve substantial water quantities that would exceed the existing or planned capacity of the local stormwater drainage system.

Removal of the existing electrode system would involve pulling the lines and cables from existing steel towers and maintenance holes, respectively. No excavation activities would be required. Therefore, no temporary or permanent changes to the existing drainage pattern or runoff characteristics would occur during removal of the existing lines and cables.

Construction and operation of the overhead lines would not involve any grading activities; as such, existing drainage patterns would not change. Construction of the underground portion of the Project would involve temporary earthwork for trench excavation.

Given the above, proposed construction, removal and operational activities of the Project would result in a less than significant impact relative to drainage patterns and surface runoff. Additionally, since the Project would not contribute to a substantial amount of runoff water that would either exceed the capacity of existing or planned stormwater drainage systems, or create a substantial source of polluted runoff water, the impact would be less than significant impact.

g) and h) Less Than Significant Impact. These issues do not apply to the offshore structures. Portions of the Main Overhead Alignment and underground portions of the San Vicente, Topanga State Park, and Sunset Alignments traverse areas located within a 100-year flood hazard area (City of Los Angeles, 1996e). However, construction and operation of the proposed Project would not involve the construction of any habitable structures nor would it modify the characteristics of a floodplain. Therefore, no housing would be placed within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map. The only new structures proposed to be constructed would be underground vaults, which would not be habitable and would be buried; as such, these structures would not impede or redirect flood flows.

Once the underground cables and vaults were installed, all existing roadways would be repaved and existing drainage flows and patterns would be restored to existing conditions. Therefore, no surface-level structures or facilities that could impede or redirect flood flows would be constructed.

Removal of the existing underground cables would not involve the construction of any facilities, above or below ground, and thus would not impede or redirect flood flows. Therefore, impacts relative to the placement of structures within a 100-year flood hazard area would be less than significant.

i) No Impact. The Main Overhead, San Vicente, Topanga State Park, and Sunset Alignments are not located within the vicinity of any levees or dams, and construction of the electrode system and removal of the existing facilities would not involve the development of any levees, dams, or water storage facilities. Similarly, this issue does not apply to the offshore structures. Therefore, construction and operation of the proposed Project would not expose people or structures to a significant risk of loss, injury or death involving flooding.

j) Less Than Significant Impact.

Seiches. The Project does not include the development of any bodies of standing water in which seiches (seismic standing waves in a water body) could develop; therefore, there would be no impacts from seiching.

Tsunamis. Portions of the San Vicente, Topanga State Park, and Sunset Alignments in Los Angeles are located in potential tsunami inundation areas, as mapped in the City of Los Angeles General Plan Safety Element (City of Los Angeles, 1996f). The underground portion of the San Vicente Alignment located in the City of Santa Monica would not be subject to tsunami inundation, as mapped by in the Technical Background Report for the City's General Plan Safety Element (City of Santa Monica, 1995c). During operation of the underground portions of the Project, the underground cables and vaults would be buried and thus would not be vulnerable to the risks of inundation by tsunamis. Any damage would be repaired as required. Tsunamis would not affect the offshore portions of the Project.

Mudflows. The Project does not propose to build any habitable structures that could be affected by mudflow. Mudflows are not known from the proposed Project alignments.

Therefore, no people or structures would be exposed to a significant risk of loss, injury or death involving inundation by tsunami, mudflow, or seiche. Therefore, impacts would be less than significant.

2.3.10 Land Use and Planning

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☒	☐
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion:

The Main Overhead Alignment traverses the communities of Sylmar, Granada Hills, Northridge, Reseda, Tarzana, and Encino, and Conservancy and Park lands. The San Vicente Alignment crosses through Conservancy lands, the Cities of Los Angeles and Santa Monica, as well as the communities of Brentwood and Pacific Palisades. The Topanga State Park Alignment traverses Conservancy and Park lands (which include Topanga State Park) and the Pacific Palisades community. The Sunset Alignment crosses through Conservancy and Park lands, and the communities of Brentwood and Pacific Palisades.

Within the jurisdictional boundaries of City of Los Angeles, the Project site would be subject to the City of Los Angeles General Plan, as well as the Community Plans for Sylmar; Granada Hills-Knollwood; Northridge; Reseda-West Van Nuys; Encino-Tarzana; and Brentwood-Pacific Palisades. Portions of the Project site located within the Coastal Zone within the City of Los Angeles would also be subject to the California Coastal Act. Within the jurisdictional boundaries of the City of Santa Monica, the portion of the San Vicente alignment that traverses the City would be subject to the City of Santa Monica General Plan. In addition, the Topanga State Park alignment would be subject to the Santa Monica Mountains State Parks Resource Management Plans and General Development Plans (California Department of Parks and Recreation, 1977). The Topanga State Park General Development Plan, contained within the Santa Monica Mountains State Parks Resource Management Plans and General Development Plans, is currently in the process of being updated (California State Parks, 2009).

a) Less Than Significant Impact. The proposed Project is the upgrade of an existing electrode system to increase reliability. The Project would have temporary, site-specific impacts on land uses during construction with regard to access for residences and businesses located adjacent to the alignment. However, construction activities would not cause the physical division of an established community. Additionally, no permanent physical barriers between existing land uses are proposed; once constructed, overhead lines would be suspended from existing towers or new steel poles, underground cables and vaults would be buried, and submarine cables and vaults would be located under water. Accordingly, the Project would not physically divide an established community or neighborhood and therefore, the impact would be less than significant.

b) No Impact. The proposed electrode system would be a public utility placed in a public right-of-way. No changes to existing land use plans or zoning ordinances are proposed; the Project would be consistent with the Zoning Ordinances of the City of Los Angeles and its General Plan and Community Plans, and the Zoning Ordinances of the City of Santa Monica (if the San Vicente alignment is chosen). Therefore, no conflicts with adopted land use plans, policies or regulations for the avoidance or mitigation of environmental effects would occur.

c) No Impact. The Project site does not fall within the boundaries of any adopted Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) (CDFG, 2009). Therefore, proposed construction and operation of the Sylmar Electrode System and removal of the existing electrode system would not conflict with any adopted HCPs or NCCPs.

2.3.11 Mineral Resources

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

Discussion:

a) and b) No Impact. The California Geologic Survey of the California Department of Conservation has classified lands in urban and developing urban areas according to the presence or absence of significant sand, gravel, or stone deposits that are suitable as sources of aggregate. These areas are called Mineral Resources Zones (MRZ). The classification system is intended to ensure that through appropriate State and local policies and procedures, mineral deposits of statewide or regional significance are considered in agency decisions. The MRZ-2 classification includes those areas where adequate information indicates that significant mineral deposits are present, or there is a high likelihood for their presence (City of Los Angeles, 1994).

Based on the map of Areas Containing Significant Mineral Deposits prepared by the City of Los Angeles, the proposed alignments, as well as the areas immediately surrounding them, are not identified as important (MRZ-2) mineral resource areas. Therefore, proposed construction and operational activities would not result in the loss of availability of a known mineral resource classified as MRZ-2, and no impact to mineral resources would occur.

2.3.12 Noise

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☒	☐	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐

Issues and Supporting Information Sources		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f)	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion:

a) through d) Potentially Significant Impact. Construction of the Project would involve the use of heavy equipment for the transport of materials and for excavation during construction of the underground portion of the Project. All three alignment options would require excavation activities within residential and school areas, considered to be sensitive receptors. Impacts regarding noise and vibration would be potentially significant and will be analyzed further in an EIR.

e) and f) No Impact. The Project would not be located in the vicinity of a public or private airport. Therefore, the Project would not expose people living or working in the Project area to excessive noise levels.

2.3.13 Population and Housing

Issues and Supporting Information Sources		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:					
a)	Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b)	Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c)	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion:

a) through c) No Impact. The Project is the upgrade of an existing electrode system; no extension of the existing electricity grid or an increase in electricity supply is proposed. The proposed Project would allow for energy to be safely conducted to protect existing electric systems and other structures. No habitable structures would be constructed and no housing or persons would be displaced by Project construction or operation. As such, since the Project is neither growth-inducing nor growth-accommodating, no impact relative to the displacement of housing or people that would necessitate the construction of replacement housing elsewhere would occur. Therefore, there would be no impact on population and housing.

2.3.14 Public Services

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i) Fire protection?	☐	☐	☒	☐
ii) Police protection?	☐	☐	☒	☐
iii) Schools?	☐	☐	☐	☒
iv) Parks?	☐	☐	☐	☒
v) Other public facilities?	☐	☐	☒	☐

Discussion:

a)-i) Less Than Significant Impact. As discussed in **Section 2.3.7(h), Hazards and Hazardous Materials**, the Main Overhead Alignment, as well as overhead and underground portions of the San Vicente, Topanga State Park, and Sunset Alignments traverse areas designated as wildland fire hazard areas (City of Los Angeles, 1996d). Nonetheless, no habitable or other structures for human occupation are proposed under the Project that could increase the need for additional fire service in the Project area. In addition, as discussed in **Section 2.3.12, Population and Housing**, since the Project is neither growth-inducing nor growth-accommodating, no need for additional fire protection facilities or services, or changes in service ratios beyond that which currently exist, would be required. Therefore, impacts relative to maintaining current levels of fire service and the provision of new or physically altered facilities would be less than significant. A more detailed discussion of the locations of fire stations relative to the Project alignments will be addressed in an EIR to address temporary construction impacts on access.

a)-ii) Less Than Significant Impact. As discussed above, the Project is neither growth-inducing nor growth-accommodating, and does not propose the construction of habitable or other structures for human occupation. Therefore, the Project would not reduce existing officers to population ratios or increase the demand for public police protection services. Therefore, impacts to police services would be less than significant. A more detailed discussion of the locations of police stations relative to the Project alignments will be addressed in an EIR to address temporary construction impacts on access.

a)-iii) and a–iv) No Impact. The demand for new or expanded schools or parks is generally associated with an increase in housing or population. As described above, the proposed Project would neither induce nor accommodate population growth that would require new or expanded schools or parks. In addition, the Project does not propose to construct new housing or displace existing housing or persons. Therefore, no impact to schools and parks would result from Project implementation. A more detailed discussion of the locations of schools and parks relative to the Project alignments will be addressed in an EIR to address temporary construction impacts on access.

a)-v) Less Than Significant Impact. The demand for new or expanded public facilities such as hospitals, libraries, power/data lines, and roadways is generally associated with an increase in housing or population. As discussed above, the proposed Project would neither induce population growth nor result in new housing that would necessitate the construction of new or expansion of existing public facilities, utilities or infrastructure services.

Construction of the overhead portions of the alignment would involve the installation of new lines on existing poles; the construction of additional utility poles would be required only if the Topanga State Park Alignment is selected. Final placement of the underground alignment within existing City streets would be designed to avoid any existing underground utilities; utility searches and coordination with other providers will be conducted during final design of underground facilities. Following construction of the underground portions of the Project, each segment would be backfilled, the pavement replaced, and traffic delineation (striping) restored to previous conditions. Therefore, since no permanent change to the existing roadway networks or existing utilities would occur or be required, impacts would be less than significant.

2.3.15 Recreation

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

Discussion:

a) and b) Less Than Significant Impact. The Project would not involve the construction of recreational facilities, nor require the construction or expansion of such facilities. However, the Project would be constructed adjacent to several recreational facilities in the Project area. (A more detailed discussion of the locations of recreational facilities relative to the Project alignments will be addressed in an EIR). During proposed construction activities, users of these recreational facilities would be subject to temporary disturbances, such as increased noise and traffic. These disturbances may discourage some recreational users from accessing these facilities, and as such, these users may seek out similar opportunities at other nearby recreational areas. Notwithstanding, construction disturbances would be short-term. As such, it is not anticipated that the temporary disturbances caused by construction would cause substantial physical deterioration of other parks and recreational facilities in the Project area. In addition, once operational, the Project would have no affect on recreational users or facilities; overhead lines would be suspended from existing poles and the underground and submarine portions of the alignment would be buried and under water, respectively. Accordingly, since the Project would not result in substantial physical deterioration of existing recreational facilities, or require the construction or expansion of recreational facilities, impacts would be less than significant.

2.3.16 Transportation and Traffic

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☒	☐	☐	☐
b) Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☒	☐	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☒	☐	☐	☐
e) Result in inadequate emergency access?	☒	☐	☐	☐

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☒	☐	☐	☐

Discussion:

a), b), d) through f) Potentially Significant Impact. Construction of the proposed Project would place construction-related vehicles on existing City streets, and include excavation in City streets to install new underground cables and vaults. The addition of vehicles and construction activities could cause an increase in traffic and could affect emergency access. For example, construction would require periodic, shifting lane closures – in some cases along streets that pass through or adjacent to residential communities. Such closures have the potential to significantly impact traffic. In addition, as discussed in **Section 1.4.4**, LADWP is in discussions with the LADWP Bureau of Engineering to evaluate the feasibility of the Bureau granting a variance to Executive Directive No. 2 to allow some construction of the underground portion of the alignment between the hours of 7:00 am and 5:00 pm (outside the hours of 9 am through 3:30 pm). Construction activities that could occur during morning and evening peak commuting times could result in additional traffic impacts. Given the Project's anticipated effect on transportation and traffic, a potentially significant impact could occur. Therefore, traffic impacts will be analyzed further in an EIR.

c) No Impact. The project would have no impact on air traffic, because construction equipment would be below air traffic height constraints and the Project overhead segments are not near any airfields.

2.3.17 Utilities and Service Systems

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐

Issues and Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statues and regulations related to solid waste?	☐	☐	☒	☐

Discussion:

a) Less than Significant Impact. The Project is the upgrade of an existing electrode system for increased reliability and would not require any connections to an existing sewer system. Therefore, no increase in wastewater demand would occur. Consequently, Project implementation would not result in the exceedance of wastewater treatment requirements of the Los Angeles RWQCB, since no additional wastewater would require treatment beyond current conditions. Site dewatering would be in compliance with a Temporary NPDES permit from the Regional Board. Accordingly, impacts would be less than significant.

b) and d) Less Than Significant Impact. As discussed above, construction of the Project would not result in increased wastewater treatment demand, and therefore no additional wastewater treatment beyond existing conditions would be required. The Project could require the use of limited quantities of water on a short-term basis during construction of the underground portion of the alignment for dust control; however, no water supply would be necessary during removal of the existing electrode system or during Project operation. Accordingly, the existing water supply available to the proposed Project area would not be substantially affected, and no new or expanded water supply entitlements would be needed. Impacts to water and wastewater treatment facilities would therefore be less than significant.

c) Less Than Significant Impact. Since the construction of the overhead portions of the electrode system would not require any earth disturbance, no impact to stormwater drainages would occur. Construction of the underground portions of the alignments would jack and bore under existing streams and drainages; accordingly, there would be no impact to these watercourses, and the construction of new or additional stormwater facilities would not be necessary. Therefore, a less than significant impact would occur. Removal of the existing underground cables would occur at existing maintenance hole locations and would not affect stormwater drainage facilities. Therefore, no existing drainage patterns would be permanently altered, and no new or expanded stormwater drainage facilities would be required that could cause significant environmental effects. The Project would have less than significant impact on stormwater drainage facilities.

e) No Impact. Project construction and operation would not require wastewater treatment; therefore there would be no impact.

f) Less Than Significant Impact. The Project would generate debris during construction of the underground portions of the alignment, primarily in the form of soil spoils and pavement from roadways. Within the City of Los Angeles, solid waste management (including collection and disposal services and landfill operation) is administered by various public agencies and private companies.

While the Project would generate construction debris, recycling and on-site re-use of construction materials would occur, where feasible, to minimize the amount of construction solid waste generation. As discussed in **Section 1.4, Project Description,** during removal of the existing overhead lines and underground cables would be chopped into pieces and transported to the LADWP Investment Recovery Facility located in Sun Valley for recycling.

Upon completion of the proposed Project, no new solid wastes would be generated, and no permanent increase in solid waste generation would occur. The proposed Project would be an unmanned electrode system and would not require any additional staff to oversee facility operations. Therefore, operation of the proposed Project would not introduce any increase in solid waste contribution to the landfill facilities serving the proposed Project area. Therefore, the impact would be less than significant.

g) Less Than Significant Impact. Existing solid waste facilities serving the proposed Project area are anticipated to continue to provide solid waste disposal services in compliance with existing federal, State, and local statutes and regulations. As standard practice, LADWP complies with all applicable laws and regulations related to solid waste generation, collection, and disposal. Although construction and removal activities associated with the proposed Project would temporarily increase solid waste generation, these activities would not, directly or indirectly, affect the routine solid waste operations of any given landfill facility, which, by permit, must comply with applicable federal, State and local statutes and regulations. Standard LADWP recycling practices during construction and removal activities would ensure that the proposed Project would be in compliance with the California Integrated Waste Management Act of 1989 (AB 939), the County of Los Angeles Source Reduction and Recycling Element, and the County of Los Angeles Countywide Integrated Waste Management Plan. Operation of the proposed electrode system would not generate solid waste, and thus would not affect operations of the landfill facilities which serve the Project area, or their compliance with federal, State or local statutes and regulations related to solid waste. Therefore, the impact would be less than significant.

2.3.18 Mandatory Findings of Significance

Issues and Supporting Information Sources		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b)	Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	☐	☐	☒	☐
c)	Does the project have impacts that are individually limited, but cumulatively considerable ("cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, effects of other current projects, and the effects of probable future projects.)?	☒	☐	☐	☐
d)	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

Discussion:

a), c) and d) Potentially Significant Impact. The Project has potentially significant impacts on air quality, biological resources, cultural resources, greenhouse gas emissions, noise, and transportation and traffic (including emergency access). These potentially significant impacts may be site-specific and/or cumulative. Accordingly, these issue areas will be analyzed further in an EIR.

b) Less than Significant Impact. The Project would result in short-term impacts from construction necessary to upgrade the existing electrode system. Project operation would have less than significant impacts on the environment. The Project would meet a long-term goal of maintaining a reliable utility service.

THIS PAGE INTENTIONALLY LEFT BLANK

Section 3
References, Abbreviations and Report Preparation

3.1 REFERENCES AND BIBLIOGRAPHY

California Department of Conservation. 2006. California Williamson Act. Available: http://www.conservation.ca.gov/dlrp/lca/Pages/Index.aspx

-----. 2008a. Important Farmland, Los Angeles County. Available: http://redirect.conservation.ca.gov/DLRP/fmmp/product_page.asp

-----. 2008b. Seismic Hazards Zonation Program. Available: http://gmw.consrv.ca.gov/shmp/html/pdf_maps_so.html

-----. 2009. Available: http://www.conservation.ca.gov/DLRP/fmmp/Pages/Index.aspx

California Department of Fish and Game (CDFG) 2009. Natural Community Conservation Planning (NCCP) Program. Available: http://www.dfg.ca.gov/habcon/nccp/

California Department of Forestry and Fire Protection. 2003. Land Cover – Multi-Source Data Compiled for Forest and Range 2003 Assessment. Available: http://frap.cdf.ca.gov/webdata/maps/statewide/fvegwhr13_map.pdf

California Department of Parks and Recreation. 1977. Santa Monica Mountains State Parks Resource Management Plans, General Development Plans and Environmental Impact Reports. January 1977; amended February 1978. Available: http://www.parks.ca.gov/pages/21299/files/572.pdf

California Department of Transportation (Caltrans). 2009. Los Angeles County Scenic Highways Program. Available: http://www.dot.ca.gov/hq/LandArch/scenic_highways/scenic_hwy.htm

California Integrated Waste Management Board, data updated continuously. California Waste Facilities, Sites, & Operations (SWIS) Database. Available: http://www.ciwmb.ca.gov/SWIS

California Regional Water Quality Control Board, Los Angeles Region (4). 1995. Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.

California State Parks. 2009. Topanga State Park General Plan. Available: http://www.parks.ca.gov/?page_id=25956

California State Water Resources Control Board. California Ocean Plan. 2009. Available: http://www.swrcb.ca.gov/water_issues/programs/ocean/

Environmental Data Resources (EDR), 2010. Corridor Study for the Sylmar Ground Return System Replacement Project. Inquiry Number 02682056.1r. January 21, 2010.

Los Angeles, City of. Executive Directive No. 2: Available: http://mayor.lacity.org/stellent/groups/electedofficials/@myr_ch_contributor/documents/contributor_web_content/lacityp_006043.pdf

Los Angeles, City of, Planning Department. 1980. San Vicente Scenic Corridor Specific Plan. Adopted May 31, 1980; amended 2000. Available: http://cityplanning.lacity.org/complan/specplan/sparea/sanvicepage.htm

-----. 1985. Pacific Palisades and Commercial Village and Neighborhoods Specific Plan. Adopted December 31, 1985; amended 1993. Available: http://cityplanning.lacity.org/complan/specplan/sparea/pacpalpage.htm

-----. 1992. Mulholland Scenic Parkway Specific Plan. Adopted May 13, 1992. Available: http://cityplanning.lacity.org/complan/specplan/sparea/mulholpage.htm

-----. 1994. Environmental and Public Facilities Maps. Areas Containing Significant Mineral Deposits in the City of Los Angeles. Prepared by the General Framework Section.

-----. 1996. General Plan Safety Element. Adopted November 26, 1996. Available: http://cityplanning.lacity.org/Cwd/GnlPln/SaftyElt.pdf

-----. 1996a. Safety Element, Exhibit A. Alquist-Priolo Special Study Zones & Fault Rupture Study Areas.

-----. 1996b. Safety Element, Exhibit B. Areas Susceptible to Liquefaction.

-----. 1996c. Safety Element, Exhibit C. Landslide Inventory & Hillside Areas.

-----. 1996d. Safety Element, Exhibit D. Selected Wildfire Hazard Areas.

-----. 1996e. Safety Element, Exhibit F. 100-Year & 500-Year Flood Plains.

-----. 1996f. Safety Element, Exhibit G. Inundation & Tsunami Hazard Areas.

-----. Van Nuys Airport Plan. 2006. Available: http://www.vnymasterplan.org/docs/vny_draft_mp.pdf

-----. Zimas (Zone Information & Map Access System). 2009. Available: http://zimas.lacity.org

Santa Monica, City of. 1995. Safety Element of the General Plan, Technical Background Report. Adopted February 21, 1995.

-----. 1995a. Plate 1 – Seismic Hazards: Fault Hazard Management Zones and Liquefaction Susceptibility.

-----. 1995b. Plate 2 – Geologic Hazards: Abandoned Clay Pits and Landfills, and Slope Instability.

-----. 1995c. Plate 3 – Inundation Hazards: Dam Failure Inundation Paths and Tsunami Runup.

SCAQMD (South Coast Air Quality Management District). 1993. CEQA Air Quality Handbook.

Thomas Guide. 2010. Thomas Brothers Map for Los Angeles County. Published by Rand McNally.

U.S. Environmental Protection Agency (USEPA). 2010. The Green Book – Nonattainment Areas for Criteria Pollutants. Available: http://www.epa.gov/air/oaqps/greenbk/

3.2 ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AC	Alternating Current
ACSR	aluminum conductor steel reinforced
Amps	Amperes
BMPs	Best management practices
BU	beneficial uses
CalEPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CCC	California Coastal Commission
CARB	California Air Resources Board
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cu ft	cubic feet
cu yd	cubic yard
DC	Direct Current
DC-XLPE	Direct Current Cross Linked Polyethylene
DOC	California Department of Conservation
DS	Distributing Station
EDR	Environmental Data Resources, Inc.

EIR	Environmental Impact Report
EPR	Ethylene Propylene Rubber
Farmland	Prime Farmland, Unique Farmland, or Farmland of Statewide Importance
FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
GHG	Greenhouse gas
HCP	Habitat Conservation Plan
HDPE	high-density polyethylene
IS	Initial Study
Kcmil	kilo-circular mils
kV	kilovolt
LADOT	(City of) Los Angeles Department of Transportation
LADWP	(City of) Los Angeles Department of Water and Power
mg/L	milligrams per liter
MRZ	Mineral Resource Zone
msl	mean sea level
MVP	Major vista point
MW	megawatts
NCCP	Natural Communities Conservation Plan
NPDES	National Pollution Discharge Elimination System
NEC	National Electrical Code
NMFS	National Marine Fisheries Service
PCH	Pacific Coast Highway
PDCI	Pacific Direct Current Intertie
PM2.5	particulate matter 2.5 microns or less in diameter
PM10	particulate matter 10 microns or less in diameter
psig	per square inch gauge
PVC	Polyvinyl Chloride
ROW	Right-of-way
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SLC	State Lands Commission

SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WQO	water quality objectives

3.3 PREPARERS OF THE INITIAL STUDY

PREPARED BY

Los Angeles Department of Water & Power
111 North Hope Street, Room 1044
Los Angeles, CA 90012

Irene Paul, Project Manager

TECHNICAL ASSISTANCE PROVIDED BY

MWH Americas, Inc.
Sarah Garber, Project Manager
Juan Diaz-Carreras, Task Leader
Dr. Janet Fahey, P.E., Technical Reviewer
Lauren Siniawer, Environmental Analysis
Jackie Silber, GIS Specialist

THIS PAGE INTENTIONALLY LEFT BLANK

A2: NOTICE OF PREPARATION

THIS PAGE INTENTIONALLY LEFT BLANK

ANTONIO R. VILLARAIGOSA
Mayor

Commission
LEE KANON ALPERT, President
THOMAS S. SAYLES, Vice-President
ERIC HOLOMAN
JONATHAN PARFREY
BARBARA E. MOSCHOS, Secretary

AUSTIN BEUTNER
General Manager
RAMAN RAJ
Chief Operating Officer

Date: September 24, 2010

To: Agencies, Organizations, and Interested Parties

Subject: Notice of Preparation of an Environmental Impact Report
Sylmar Ground Return System Replacement Project

The City of Los Angeles Department of Water and Power (LADWP) is proposing to replace a 31-mile system of overhead lines, underground cables, and sub-sea cables that run from the Sylmar Converter Station to the Pacific Ocean. This system of overhead, underground, and submarine segments is known as the Sylmar Ground Return System. As the Lead Agency under the California Environmental Quality Act (CEQA), the LADWP has determined that an Environmental Impact Report (EIR) will be prepared for the Sylmar Ground Return System Replacement Project (proposed project).

Background

LADWP is continually assessing the existing electric grid to provide reliable power to residents and businesses in the city. A key feature of the grid is a high-voltage direct current transmission system, known as the Pacific Direct Current Intertie (PDCI) that carries power between the Pacific Northwest and the Los Angeles area. The PDCI is owned by Bonneville Power Administration, LADWP, Southern California Edison and the Cities of Glendale, Pasadena and Burbank. LADWP is the operating agency for the southern portion of the system.

An integral part of the PDCI is the Sylmar Ground Return System, which allows energy to be safely conducted through the earth to ensure power reliability. While needed infrequently, the Ground Return system is designed to carry current when the PDCI is experiencing an anomaly. The Ground Return system allows unaffected portions of the PDCI line to continue providing power in the event of an interruption and also ensures a consistent flow of electricity along the line during normal operations.

Location

The existing overhead line extends from the Sylmar Converter Station to the Kenter Canyon Terminal Tower, located near Sunset Boulevard and Homewood Road. From that point, the overhead line transitions to underground cable. The underground portion travels along portions of Sunset and San Vicente Boulevards, crosses through the City of Santa Monica and terminates near Sunset and Pacific Coast Highway. It continues under the ocean for approximately 6,000 feet, ultimately connecting to the electrode. The electrode provides a "ground point" at which the electric current can travel through the earth (refer to the Existing and Proposed Project Alignments Map).

Project Alternatives

LADWP is currently evaluating three alternative alignments for the proposed project. All three alternative routes follow the same overhead route segment, known as the Main Overhead Alignment, from where the line originates in Sylmar to the intersection of Mulholland Drive and Sullivan Fire Road. All three routes also follow the same ocean-based portion of the electrode system, referred to as the Submarine Alignment, and call for relocating the existing Sunset Vault and expanding the Gladstone Vault. The alternative alignments are referred to as the San Vicente Alignment, the Topanga State Park Alignment, and the Sunset Alignment.

The proposed project would include the following:

- Up to 23 miles of overhead lines.
- Up to 8 miles of underground cables and related infrastructure.
- Up to 1.1 miles of submarine cables.
- New or partial replacement of the submarine electrode equipment.

Potential Environmental Effects: Potential environmental impacts that may occur as a result of the proposed project include Air Quality, Biological Resources, Cultural Resources, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Noise, and Transportation and Traffic impacts. An analysis of these potential environmental impacts and other potential impacts that could be mitigated to a less-than-significant level is provided in an Initial Study Checklist, which is attached or can be reviewed at the following libraries:

Lake View Terrace Branch Library
12002 Osborne Street
Sylmar, CA 91342

Sylmar Branch Library
14561 Polk Street
Sylmar, CA 91342

Granada Hills Branch Library
10640 Petit Avenue
Granada Hills, CA 91344

Northridge Branch Library
9051 Darby Avenue
Northridge, CA 91325

Palisades Branch Library
861 Alma Real Drive
Pacific Palisades, CA 90272

Encino-Tarzana Branch Library
18231 Ventura Boulevard
Tarzana, CA 91356

Donald Bruce Kaufman – Brentwood Branch Library
11820 San Vicente Boulevard
Brentwood, CA 90049

West Valley Regional Branch Library
19036 Vanowen Street
Reseda, CA 91335

City of Santa Monica Main Library
601 Santa Monica Boulevard
Santa Monica, CA 90401

The document may also be viewed at the following website addresses: www.ladwp.com/envnotices and http://www.ladwp.com/ladwp/cms/ladwp013603.jsp

Public Review Period: LADWP invites the views of your agency regarding the scope and content of the environmental information to be included in the EIR, relevant to your agency's statutory responsibilities in connection with the proposed project. Your agency will need to use the EIR when considering your permit or other discretionary approval your agency may issue for the proposed project.

Due to the time limits mandated by State Law, your response must be received by 5:00 p.m. **October 25, 2010**. Please indicate a contact person in your response and submit your response to the following address:

Los Angeles Department of Water and Power
111 North Hope Street, Room 1044
Los Angeles, California 90012
Attn: Irene Paul

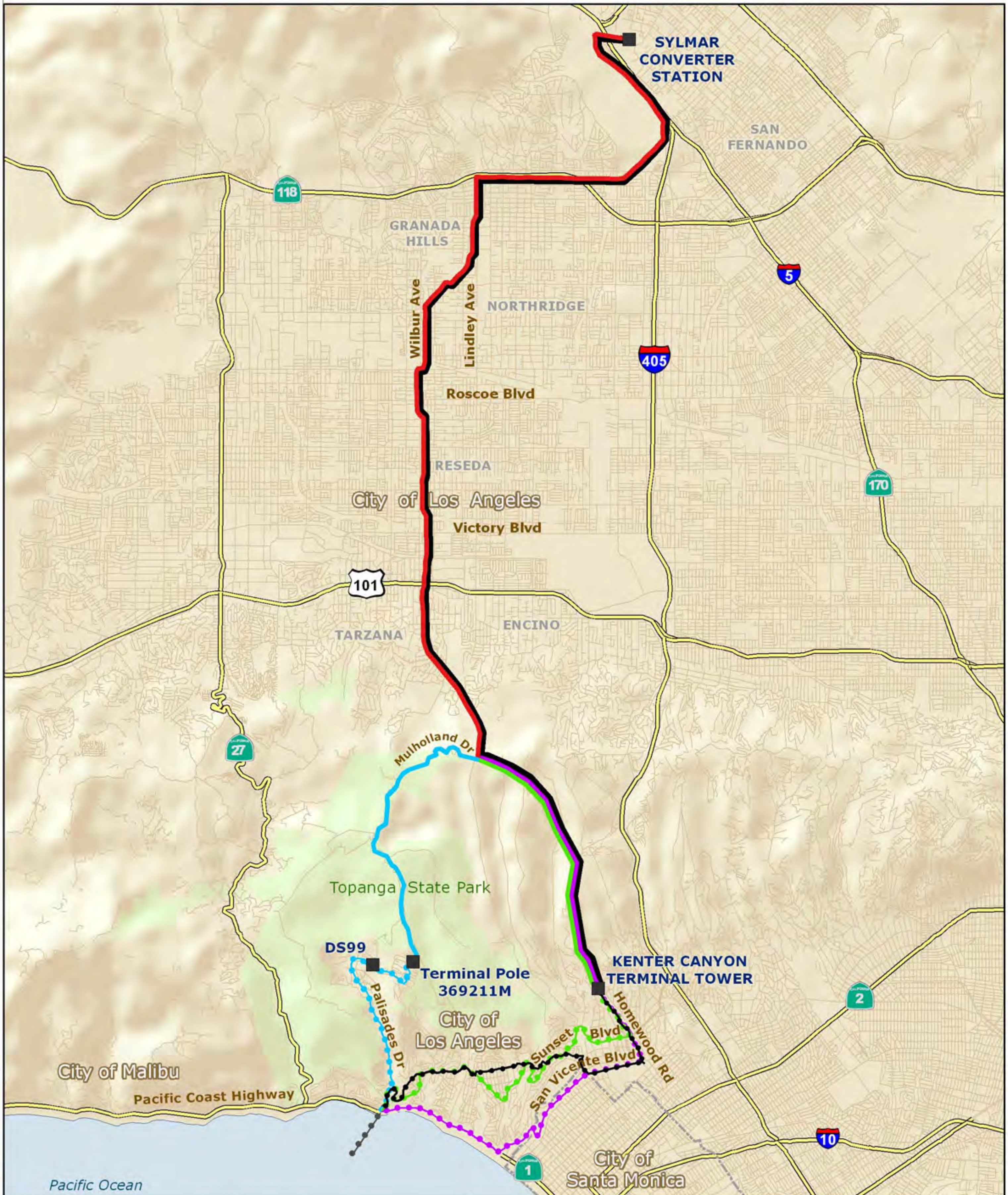
Comments may also be faxed to Ms. Paul at (213) 367-4710.

If you require additional information, please contact Ms. Paul at (213) 367-3509 or e-mail at: SylmarGroundReturnProject@ladwp.com.

Sincerely,

Charles C. Holloway

Charles C. Holloway
Manager of Environmental Planning and Assessment



Key to Features

Overhead
- Existing Overhead Alignment (22.5 Miles)
- Main Overhead Alignment (17.4 miles)
- San Vicente Alignment (5.1 miles)
- Topanga State Park Alignment (5.0 miles)
- Sunset Alignment (5.1 miles)

Underground
- Existing Underground Alignment (7.4 Miles)
- San Vicente Alignment (7.1 miles)
- Topanga State Park Alignment (4.5 miles)
- Sunset Alignment (8 miles)
- Submarine Alignment (1.1 miles)

N

0 0.5 1 2 Miles

Date: August 24, 2010

Existing and Proposed Project Alignments

MWH

Path Name: Fig1-3_ProposedExistingAlignments.mxd

A3: PROJECT FACT SHEET

THIS PAGE INTENTIONALLY LEFT BLANK

Los Angeles Department of Water and Power

SYLMAR GROUND RETURN SYSTEM REPLACEMENT PROJECT

FACT SHEET

Background
The City of Los Angeles Department of Water and Power (LADWP) is continually assessing the existing electric grid to provide reliable power to residents and businesses in the city. A key feature of the grid is a high-voltage direct current transmission system, known as the Pacific Direct Current Intertie (PDCI) that carries power between the Pacific Northwest and the Los Angeles area. The PDCI is owned by Bonneville Power Administration, LADWP, Southern California Edison and the Cities of Glendale, Pasadena and Burbank. LADWP is the operating agency for the southern portion of the system.

An integral part of the PDCI is the Sylmar Ground Return System, which allows energy to be safely conducted through the earth to ensure power reliability. While needed infrequently, the Ground Return system is designed to carry current when the PDCI is experiencing an anomaly. The Ground Return system allows unaffected portions of the PDCI line to continue providing power in the event of an interruption and also ensures a consistent flow of electricity along the line during normal operations.

Existing Ground Return System
The Sylmar Ground Return System consists of 31-miles of overhead lines, underground cables and sub-sea cable segments that begins at the Sylmar Converter Station, the southern terminus of the PDCI.

The existing overhead line extends from the Sylmar Converter Station to the Kenter Canyon Terminal Tower, located near Sunset Boulevard and Homewood Road. From that point, the overhead line transitions to underground cable. The underground portion travels along portions of Sunset and San Vicente Boulevards, crosses through the City of Santa Monica and terminates near Sunset and Pacific Coast Highway. It continues under the ocean for approximately 6,000 feet, ultimately connecting to the electrode. The electrode provides a "ground point" at which the electric current can travel through the earth.

Project Benefits
The major benefit of replacing the Sylmar Ground Return System is to ensure that the PDCI continues to operate reliably. The existing Ground Return System has not been upgraded since the original PDCI was first energized in 1970, even though the PDCI itself has been upgraded several times. The project will:

- Improve operation and reliability of the Ground Return System,
- Improve operation and flexibility of the PDCI,
- Increase the emergency rating and reliability of the PDCI,
- Reduce the need for system maintenance and repair.

Project Description
LADWP has been authorized by the PDCI partners to modify and to replace the PDCI overhead lines and underground cables leading to the electrode to enhance the reliability and availability of the transmission system.

The Project would replace the existing Ground Return System from the Sylmar Converter Station to the Pacific Ocean.

New features would include:

- Up to 23 miles of overhead lines,
- Up to 8 miles of underground cables and related infrastructure,
- Up to 1.1 miles of submarine cables, and
- New or partial replacement of the submarine electrode equipment.

Project Alternatives
LADWP is currently evaluating three alternative alignments for the proposed project. All three alternative routes follow the same overhead route segment, known as the Main Overhead Alignment, from where the line originates in Sylmar to the intersection of Mulholland Drive and Sullivan Fire Road. All three routes also follow the same ocean-based portion of the electrode system, referred to as the Submarine Alignment, and call for relocating the existing Sunset Vault and expanding the Gladstone Vault. The alternative alignments are referred to as the San Vicente Alignment, the Topanga State Park Alignment, and the Sunset Alignment.

Environmental Impact Report
As the Lead Agency under the California Environmental Quality Act (CEQA), LADWP has determined that an Environmental Impact Report (EIR) will be prepared for the proposed project. As required by the California Environmental Quality Act (CEQA), LADWP has prepared an Initial Study of the proposed project and has determined that impacts to air quality, biological resources, cultural resources, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, noise, transportation and traffic may be potentially significant as a result of the proposed project. The Draft EIR will provide a more detailed evaluation of these potential impacts. The remaining environmental issues have been determined to have no impact, less-than-significant impact, or less-than-significant impacts with mitigation incorporated.

Public Review
The Draft EIR will be circulated for a 45-day public review period. LADWP will conduct public hearings and public workshops during the public review period. Comments received will be responded to and incorporated into the Final EIR. The Board of Water and Power Commissioners (the Board) is required to certify the Final EIR and approve the project.

Timeline
Following is a general timeline for the EIR and the project:

- May 2010: Preliminary meeting with stakeholders
- September 2010: Issue Notice of Preparation (NOP)
- Sept.-Oct.2010: Public scoping meeting(s)
- Spring 2011: Issue Draft EIR
- Summer 2011: Board Certification of the Final EIR
- Summer 2012: Obtain Development Permits
- Summer 2012-Fall 2014: Construction

Contacts
Ms. Irene Paul
Los Angeles Water & Power Environmental Services
(213) 367-3509
SylmarGroundReturnProject@ladwp.com

APPENDIX B:
AGENCY NOTICE OF PREPARATION MAILING LIST

THIS PAGE INTENTIONALLY LEFT BLANK

Type	NAME	ORGANIZATION	ORGANIZATION 2	ADDRESS	CITY / STATE / ZIP	Mail	Sent	Receipt
Agency	Governor's Office of Planning and Research	State Clearinghouse		1400 Tenth Street, Room 212	Sacramento, CA 95812	**Fed Ex**	x	x
Agency		Office of the County Clerk/Recorder	County of Los Angeles	12400 Imperial Highway	Norwalk, CA 90650	**Hand Deliver**	x	x
Agency	CEQA Review Section	Environmental and Public Works Dept.	City of Santa Monica	1685 Main Street	Santa Monica, CA 90405	**Certified Mail**	x	x
Agency		Office of the City Clerk	City of Los Angeles	200 North Spring Street, Room 360	Los Angeles, CA 90012	**Hand Deliver**	x	x
Agency	Edward Guerrero Jr.	LADOT Development Review	Westchester Municipal Building	7166 W. Manchester Ave.	Los Angeles, CA 90045	**Certified Mail**	x	x
Agency	Planning and Development	Department of Recreation and Parks	City of Los Angeles	221 N. Figueroa Street, 1st Floor	Los Angeles, CA 90012	**Certified Mail**	x	x
Agency	Cheryl J. Powell	CA Department of Transportation	IGR/CEQA Branch	100 South Main Street	Los Angeles, CA 90012	**Certified Mail**	x	x
Agency	Mr. William Robertson	Bureau of Street Services	City of Los Angeles	1149 S. Broadway, 4th Floor	Los Angeles, CA 90015	**Certified Mail**	x	x
Agency	CEQA Review Section	LA Regional Water Quality Control Board		320 West 4th Street, Ste. 200	Los Angeles, CA 90013	**Certified Mail**	x	x
Agency	Suzanne Goode	California State Parks	Angeles District	1925 Las Virgenes Road	Calabasas, CA 91302	**Certified Mail**	x	**signed&unclaimed**
Agency	South Coast Air Quality Management District	Planning, Rule Development & Area Sources	CEQA Review Section	21865 East Copely Drive	Diamond Bar, CA 91765	**Certified Mail**	x	x
Agency	Los Angeles County	Department of Beaches and Harbors		13483 Fiji Way	Marina del Rey, CA 90292	**Certified Mail**	x	x
Agency	Susan Chapman, Program Mngr.	Metropolitan Transit Authority	Long Range Planning, 99-23-2	One Gateway Plaza	Los Angeles, CA 90012	**Certified Mail**	x	x
Agency	Susan Young, Public Land Management	Public Land Management Specialist	California State Lands Commision	100 Howe Avenue, Suite 100 South	Sacramento, CA 95825	**Certified Mail**	x	x
Agency	Chuck Posner, Coastal Analyst	California State Coastal Commission	South Coast Region	200 Oceangate, 10th Floor	Long Beach, CA 90802	**Certified Mail**	x	x
Agency	Alison Dettmer, Deputy Director	California State Coastal Commission	Energy, Ocean Resources & Federal Consistency Division	45 Fremont, Suite 2000	San Francisco, CA 94105-2215	**Certified Mail**	x	x
Agency	Kenneth Wong	U. S. Army Corps of Engineers	Los Angeles District Regulatory Division	915 Wilshire Blvd., Suite 1101	Los Angeles, CA 90017	**Certified Mail**	x	x
Agency	Dennis Bedford	California Dept. of Fish and Game	Marine Region	4665 Lampson Ave., Suite C	Los Alamitos, CA 90720	**Certified Mail**	x	
Agency	Ara Kasparian	City of Los Angeles Dept. of Public Works	Bureau of Engineering	1149 S. Broadway, 6th Floor, Mail Stop 939	Los Angeles, CA 90015	**Certified Mail**	x	x
Agency	Hadar Plafkin	City of Los Angeles Dept. of City Planning	Environmental Review	200 N. Spring St., 7th Floor, Mail Stop 395	Los Angeles, CA 90012	**Certified Mail**	x	
Agency		Fire Station 28	Attn: Environmental Review	11641 Corbin Avenue	Porter Ranch, CA 91326	**Certified Mail**	x	
Agency		Fire Station #70	Attn: Environmental Review	9861 Reseda Boulevard	Northridge, CA 91324	**Certified Mail**	x	x
Agency		LA Fire Station #73	Attn: Environmental Review	7419 Reseda Boulevard	Reseda, CA 91335	**Certified Mail**	x	x
Agency		LA Fire Station #109	Attn: Environmental Review	16500 Mulholland Drive	Los Angeles, CA 90049	**Certified Mail**	x	x
Agency		LA Fire Station 19	Attn: Environmental Review	12229 Sunset Boulevard	Los Angeles, CA 90049	**Certified Mail**	x	x
Agency		Santa Monica Fire Department	Attn: Environmental Review	1444 7th Street	Santa Monica, CA 90401	**Certified Mail**	x	x
Agency		Pacific Palisades Fire Department	Attn: Environmental Review	15045 W Sunset Boulevard	Pacific Palisades, CA 90272	**Certified Mail**	x	
Agency		Pacific Palisades Fire Department	Attn: Environmental Review	17281 W Sunset Boulevard	Pacific Palisades, CA 90272	**Certified Mail**	x	x
Agency		Mission Division Police Station	Attn: Environmental Review	11121 Sepulveda Boulevard	Mission Hills, CA 91345	**Certified Mail**	x	x
Agency		Los Angeles Police Department	Attn: Environmental Review	10250 Etiwanda Avenue	Northridge, CA 91325-1099	**Certified Mail**	x	x
Agency		West Valley Police Station	Attn: Environmental Review	19020 Vanowen Street	Reseda, CA 91335	**Certified Mail**	x	x
Agency		West Los Angeles Police Department	Attn: Environmental Review	1663 Butler Avenue	Los Angeles, CA 90025	**Certified Mail**	x	
Agency		City of Santa Monica Police Headquarters	Attn: Environmental Review	1685 Main Street	Santa Monica, CA 90401	**Certified Mail**	x	
Agency		Burbank Water and Power	Attn: Environmental Review	164 W. Magnolia Blvd.	Burbank, CA 91502-1720	**Certified Mail**	x	
Agency		Glendale Water and Power	Attn: Environmental Review	141 N. Glendale Ave	Glendale, CA 91206	**Certified Mail**	x	x
Agency		Pasadena Water and Power	Attn: Environmental Review	150 S. Los Robles, Suite 200	Pasadena, CA 91109	**Certified Mail**	x	
Agency		LAUSD Operations and Maintenance Office	Attn: John Mapoli	1406 Highland Avenue	Los Angeles, CA 90019	**Certified Mail**	x	x
Agency		Porter Ranch Neighborhood Council	Attn: Environmental Review	P.O. Box 7337	Porter Ranch, CA 91327	**Certified Mail**	x	x
Agency		Brentwood Community Council	Attn: Environmental Review	149 S. Barrington Ave., Box 194	Los Angeles, CA 90049	**Certified Mail**	x	
Agency		Granada Hills South Neighborhood Council	Attn: Environmental Review	11024 Balboa Blvd., Box 767	Granada Hills, CA 91344	**Certified Mail**	x	
Agency		Sylmar Neighborhood Council	Attn: Environmental Review	13109 Borden Ave.	Sylmar, CA 91342	**Certified Mail**	x	x
Agency		Northridge West Neighborhood Council	Attn: Environmental Review	9401 Reseda Blvd. Suite 200	Northridge, CA 91324	**Certified Mail**	x	
Agency		Northridge East Neighborhood Council	Attn: Environmental Review	9420 Reseda Blvd. #325	Northridge, CA 91324	**Certified Mail**	x	
Agency		North Hills West Neighborhood Council	Attn: Environmental Review	P.O. Box 2190 North Hills	North Hills, CA 91393	**Certified Mail**	x	**unclaimed**
Agency		Reseda Neighborhood Council	Attn: Environmental Review	7324 Reseda Blvd. #118	Reseda, CA 91335	**Certified Mail**	x	x
Agency		Pacific Palisades Community Council	Attn: Environmental Review	P.O. Box 1131	Pacific Palisades, CA 90272	**Certified Mail**	x	x
Agency		Tarzana Neighborhood Council	Attn: Environmental Review	P.O. Box 571016	Tarzana, CA 91357	**Certified Mail**	x	x
Agency		Chatsworth Neighborhood Council	Attn: Environmental Review	P.O. Box 3395	Chatsworth, CA 91313	**Certified Mail**	x	x
Agency		Lake Balboa Neighborhood Council	Attn: Environmental Review	P.O. Box 7720	Van Nuys, CA 91409	**Certified Mail**	x	x
Agency		California Department of Boating and Waterways	Attn: Environmental Review	2000 Evergreen St. Suite 100	Sacramento, CA 95815	**Certified Mail**	x	x
Agency		California Highway Patrol	Attn: Environmental Review	P.O. Box 942898	Sacramento, CA 94298-0001	**Certified Mail**	x	x
Agency		California Department of Forestry and Fire Protection	Attn: Environmental Review	1416 9th St.	Sacramento, CA 94244	**Certified Mail**	x	x
Agency		Santa Monica Mountains Conservancy	Attn: Environmental Review	570 West Avenue Twenty-Six, Suite 100	Los Angeles, CA 90065	**Certified Mail**	x	x
Agency		California Department of Toxic Substances Control	Attn: Environmental Review	P.O. Box 806	Sacramento, CA 95812-0806	**Certified Mail**	x	x
Agency		National Marine Fisheries Service	Attn: Environmental Review	8604 La Jolla Shores Drive	La Jolla, CA 92037-1508	**Certified Mail**	x	x
Agency		California Department of Fish and Game	Attn: Environmental Review	1416 Ninth St.	Sacramento, CA 95814	**Certified Mail**	x	x
Agency		U.S. Fish & Wildlife Service	Attn: Environmental Review	6010 Hidden Valley Road	Carlsbad, CA 92009	**Certified Mail**	x	x
Agency		City of Malibu	Attn: Environmental Review	23815 Stuart Ranch Road	Malibu, CA 90265	**Certified Mail**	x	x

Agency	Anthony Munoz	City of Los Angeles, Bureau of Engineering	Mail Stop 499	1828 Sawtelle Boulevard, 3rd Floor	Los Angeles, CA 90025	**Certified Mail**	**x**	**x**
	Jill Horswell	Southern California Edison		2244 Walnut Grove Avenue, P.O. Box 800	Rosemead, CA 91770	**Certified Mail**	**x**	**x**
	Donald Johnson	Southern California Edison		6 Pointe Drive, 4th Floor	Brea, CA 92821			

NAME	ORGANIZATION	ORGANIZATION 2	ADDRESS	CITY / STATE / ZIP	Mail	Sent	Receipt
	Hillcrest Christian School		17531 Rinaldi Street	Granada Hills, CA 91344	Certified Mail	x	x
	Granada Hills Baptist Elementary School		10949 Zelzah Avenue	Granada Hills, CA 91344	Certified Mail	x	x
	Tarzana Elementary School		5726 Topeka Drive	Tarzana, CA 91356	Certified Mail	x	x
	Wilbur Avenue Elementary School		5213 Crebs Avenue	Tarzana, CA 91356	Certified Mail	x	x
	Kenter Canyon Elementary School		645 N Kenter Avenue	Los Angeles, CA 90049	Certified Mail	x	
	Paul Revere Middle School		1450 Allenford Avenue	Los Angeles, CA 90049	Certified Mail	x	x
	Pacific Palisades Presbyterian Nursery School		15821 W Sunset Boulevard	Pacific Palisades, CA 90272	Certified Mail	x	x
	Palisades Lutheran Preschool		15905 W Sunset Boulevard	Pacific Plsds, CA 90272-3499	Certified Mail	x	x
	Montessori School		16706 Marquez Avenue	Pacific Palisades, CA 90272	Certified Mail	x	x
	Palisades High School		16821 Marquez Avenue	Pacific Palisades, CA 90272	Certified Mail	x	x
	Marquez Avenue Elementary School		16821 Marquez Avenue	Pacific Palisades, CA 90272	Certified Mail	x	
	Westside Waldorf School		17310 W Sunset Boulevard	Pacific Palisades, CA 90272	Certified Mail	x	x
	Adderley School		522 Palisades Drive	Pacific Palisades, CA 90272	Certified Mail	x	x
	Calvary Christian School		701 Palisades Drive	Pacific Palisades, CA 90272	Certified Mail	x	x
	Canyon Elementary School		421 Entrada Drive	Santa Monica, CA 90402	Certified Mail	x	x

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C:
DAILY / ANNUAL CONSTRUCTION UPDATE AIR QUALITY TABLES

- **C1: Daily Construction Update**
- **C2: Annual Construction Update**

THIS PAGE INTENTIONALLY LEFT BLANK

C1: DAILY CONSTRUCTION UPDATE

THIS PAGE INTENTIONALLY LEFT BLANK

Sylmar Ground Return System

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	10.00	1000sqft	0.23	10,000.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 31

Climate Zone 8 **Operational Year** 2017

Utility Company Southern California Edison

CO2 Intensity (lb/MWhr) 630.89 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Interior	15000	0
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstructionPhase	NumDays	100.00	110.00

tblConstructionPhase	NumDays	100.00	110.00
tblConstructionPhase	PhaseEndDate	12/30/2016	12/31/2016
tblConstructionPhase	PhaseEndDate	6/2/2017	12/31/2016
tblConstructionPhase	PhaseStartDate	1/1/2017	8/1/2016
tblOffRoadEquipment	HorsePower	84.00	600.00
tblOffRoadEquipment	HorsePower	171.00	100.00
tblOffRoadEquipment	UsageHours	4.00	0.00
tblOffRoadEquipment	UsageHours	4.00	8.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2017

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2016	4.3770	47.4291	22.5833	0.0597	0.1144	2.2621	2.3765	0.0308	2.1350	2.1658	0.0000	6,558.0726	6,558.0726	0.7585	0.0000	6,574.0020
Total	**4.3770**	**47.4291**	**22.5833**	**0.0597**	**0.1144**	**2.2621**	**2.3765**	**0.0308**	**2.1350**	**2.1658**	**0.0000**	**6,558.0726**	**6,558.0726**	**0.7585**	**0.0000**	**6,574.0020**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2016	4.3770	47.4291	22.5833	0.0597	0.1144	2.2621	2.3765	0.0308	2.1350	2.1658	0.0000	6,558.0726	6,558.0726	0.7585	0.0000	6,574.0020
Total	**4.3770**	**47.4291**	**22.5833**	**0.0597**	**0.1144**	**2.2621**	**2.3765**	**0.0308**	**2.1350**	**2.1658**	**0.0000**	**6,558.0726**	**6,558.0726**	**0.7585**	**0.0000**	**6,574.0020**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2140	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003
Energy	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747
Mobile	0.0585	0.1934	0.7743	2.0900e-003	0.1409	2.8900e-003	0.1438	0.0376	2.6600e-003	0.0403		177.9343	177.9343	6.6300e-003		178.0735

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Total	**0.2789**	**0.2516**	**0.8241**	**2.4400e-003**	**0.1409**	**7.3100e-003**	**0.1482**	**0.0376**	**7.0800e-003**	**0.0447**		**247.6867**	**247.6867**	**7.9800e-003**	**1.2800e-003**	**248.2505**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2140	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003
Energy	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747
Mobile	0.0585	0.1934	0.7743	2.0900e-003	0.1409	2.8900e-003	0.1438	0.0376	2.6600e-003	0.0403		177.9343	177.9343	6.6300e-003		178.0735
Total	**0.2789**	**0.2516**	**0.8241**	**2.4400e-003**	**0.1409**	**7.3100e-003**	**0.1482**	**0.0376**	**7.0800e-003**	**0.0447**		**247.6867**	**247.6867**	**7.9800e-003**	**1.2800e-003**	**248.2505**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Cable Pulling	Building Construction	8/1/2016	12/31/2016	5	110	
2	Electrode Array Installation	Building Construction	8/1/2016	12/31/2016	5	110	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Cable Pulling	Cranes	1	0.00	226	0.29
Cable Pulling	Forklifts	2	0.00	89	0.20
Cable Pulling	Other Construction Equipment	1	8.00	100	0.42
Cable Pulling	Tractors/Loaders/Backhoes	2	0.00	97	0.37
Electrode Array Installation	Cranes	1	8.00	226	0.29
Electrode Array Installation	Forklifts	2	8.00	89	0.20
Electrode Array Installation	Generator Sets	1	8.00	600	0.74
Electrode Array Installation	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Cable Pulling	6	4.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Electrode Array Installation	6	4.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Cable Pulling - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.5210	4.6855	2.8956	3.6000e-003		0.3672	0.3672		0.3378	0.3378		374.3389	374.3389	0.1129		376.7101
Total	**0.5210**	**4.6855**	**2.8956**	**3.6000e-003**		**0.3672**	**0.3672**		**0.3378**	**0.3378**		**374.3389**	**374.3389**	**0.1129**		**376.7101**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0167	0.1737	0.1995	4.4000e-004	0.0125	2.8200e-003	0.0153	3.5600e-003	2.5900e-003	6.1500e-003		43.6396	43.6396	3.1000e-004		43.6462
Worker	0.0167	0.0208	0.2595	5.7000e-004	0.0447	3.7000e-004	0.0451	0.0119	3.4000e-004	0.0122		47.5833	47.5833	2.4400e-003		47.6345
Total	**0.0334**	**0.1945**	**0.4589**	**1.0100e-003**	**0.0572**	**3.1900e-003**	**0.0604**	**0.0154**	**2.9300e-003**	**0.0184**		**91.2229**	**91.2229**	**2.7500e-003**		**91.2807**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.5210	4.6855	2.8956	3.6000e-003		0.3672	0.3672		0.3378	0.3378	0.0000	374.3389	374.3389	0.1129		376.7101
Total	**0.5210**	**4.6855**	**2.8956**	**3.6000e-003**		**0.3672**	**0.3672**		**0.3378**	**0.3378**	**0.0000**	**374.3389**	**374.3389**	**0.1129**		**376.7101**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0167	0.1737	0.1995	4.4000e-004	0.0125	2.8200e-003	0.0153	3.5600e-003	2.5900e-003	6.1500e-003		43.6396	43.6396	3.1000e-004		43.6462
Worker	0.0167	0.0208	0.2595	5.7000e-004	0.0447	3.7000e-004	0.0451	0.0119	3.4000e-004	0.0122		47.5833	47.5833	2.4400e-003		47.6345
Total	**0.0334**	**0.1945**	**0.4589**	**1.0100e-003**	**0.0572**	**3.1900e-003**	**0.0604**	**0.0154**	**2.9300e-003**	**0.0184**		**91.2229**	**91.2229**	**2.7500e-003**		**91.2807**

3.3 Electrode Array Installation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Off-Road	3.7893	42.3546	18.7699	0.0541		1.8885	1.8885		1.7913	1.7913		6,001.2880	6,001.2880	0.6401		6,014.7306
Total	**3.7893**	**42.3546**	**18.7699**	**0.0541**		**1.8885**	**1.8885**		**1.7913**	**1.7913**		**6,001.2880**	**6,001.2880**	**0.6401**		**6,014.7306**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0167	0.1737	0.1995	4.4000e-004	0.0125	2.8200e-003	0.0153	3.5600e-003	2.5900e-003	6.1500e-003		43.6396	43.6396	3.1000e-004		43.6462
Worker	0.0167	0.0208	0.2595	5.7000e-004	0.0447	3.7000e-004	0.0451	0.0119	3.4000e-004	0.0122		47.5833	47.5833	2.4400e-003		47.6345
Total	**0.0334**	**0.1945**	**0.4589**	**1.0100e-003**	**0.0572**	**3.1900e-003**	**0.0604**	**0.0154**	**2.9300e-003**	**0.0184**		**91.2229**	**91.2229**	**2.7500e-003**		**91.2807**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	3.7893	42.3546	18.7699	0.0541		1.8885	1.8885		1.7913	1.7913	0.0000	6,001.2879	6,001.2879	0.6401		6,014.7306
Total	**3.7893**	**42.3546**	**18.7699**	**0.0541**		**1.8885**	**1.8885**		**1.7913**	**1.7913**	**0.0000**	**6,001.2879**	**6,001.2879**	**0.6401**		**6,014.7306**

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0167	0.1737	0.1995	4.4000e-004	0.0125	2.8200e-003	0.0153	3.5600e-003	2.5900e-003	6.1500e-003		43.6396	43.6396	3.1000e-004		43.6462
Worker	0.0167	0.0208	0.2595	5.7000e-004	0.0447	3.7000e-004	0.0451	0.0119	3.4000e-004	0.0122		47.5833	47.5833	2.4400e-003		47.6345
Total	**0.0334**	**0.1945**	**0.4589**	**1.0100e-003**	**0.0572**	**3.1900e-003**	**0.0604**	**0.0154**	**2.9300e-003**	**0.0184**		**91.2229**	**91.2229**	**2.7500e-003**		**91.2807**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Mitigated	0.0585	0.1934	0.7743	2.0900e-003	0.1409	2.8900e-003	0.1438	0.0376	2.6600e-003	0.0403		177.9343	177.9343	6.6300e-003		178.0735
Unmitigated	0.0585	0.1934	0.7743	2.0900e-003	0.1409	2.8900e-003	0.1438	0.0376	2.6600e-003	0.0403		177.9343	177.9343	6.6300e-003		178.0735

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	15.00	15.00	15.00	66,424	66,424
Total	15.00	15.00	15.00	66,424	66,424

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.513125	0.060112	0.180262	0.139218	0.042100	0.006630	0.016061	0.030999	0.001941	0.002506	0.004348	0.000594	0.002104

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747
NaturalGas Unmitigated	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	592.877	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747
Total		**6.3900e-003**	**0.0581**	**0.0488**	**3.5000e-004**		**4.4200e-003**	**4.4200e-003**		**4.4200e-003**	**4.4200e-003**		**69.7502**	**69.7502**	**1.3400e-003**	**1.2800e-003**	**70.1747**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0.592877	6.3900e-003	0.0581	0.0488	3.5000e-004		4.4200e-003	4.4200e-003		4.4200e-003	4.4200e-003		69.7502	69.7502	1.3400e-003	1.2800e-003	70.1747
Total		**6.3900e-003**	**0.0581**	**0.0488**	**3.5000e-004**		**4.4200e-003**	**4.4200e-003**		**4.4200e-003**	**4.4200e-003**		**69.7502**	**69.7502**	**1.3400e-003**	**1.2800e-003**	**70.1747**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.2140	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003
Unmitigated	0.2140	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					

Architectural Coating	0.0159					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1980					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003
Total	**0.2140**	**1.0000e-005**	**1.0400e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.1900e-003**	**2.1900e-003**	**1.0000e-005**		**2.3200e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0159					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1980					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0400e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.1900e-003	2.1900e-003	1.0000e-005		2.3200e-003
Total	**0.2140**	**1.0000e-005**	**1.0400e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.1900e-003**	**2.1900e-003**	**1.0000e-005**		**2.3200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

C2: ANNUAL CONSTRUCTION UPDATE

THIS PAGE INTENTIONALLY LEFT BLANK

Sylmar Ground Return System

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	10.00	1000sqft	0.23	10,000.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 31

Climate Zone 8 **Operational Year** 2017

Utility Company Southern California Edison

CO2 Intensity (lb/MWhr) 630.89 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Interior	15000	0
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstructionPhase	NumDays	100.00	110.00

tblConstructionPhase	NumDays	100.00	110.00
tblConstructionPhase	PhaseEndDate	12/30/2016	12/31/2016
tblConstructionPhase	PhaseEndDate	6/2/2017	12/31/2016
tblConstructionPhase	PhaseStartDate	1/1/2017	8/1/2016
tblOffRoadEquipment	HorsePower	84.00	600.00
tblOffRoadEquipment	HorsePower	171.00	100.00
tblOffRoadEquipment	UsageHours	4.00	0.00
tblOffRoadEquipment	UsageHours	4.00	8.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2017

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.2408	2.6098	1.2442	3.2800e-003	6.1800e-003	0.1244	0.1306	1.6700e-003	0.1174	0.1191	0.0000	326.9752	326.9752	0.0379	0.0000	327.7700
Total	**0.2408**	**2.6098**	**1.2442**	**3.2800e-003**	**6.1800e-003**	**0.1244**	**0.1306**	**1.6700e-003**	**0.1174**	**0.1191**	**0.0000**	**326.9752**	**326.9752**	**0.0379**	**0.0000**	**327.7700**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.2408	2.6098	1.2442	3.2800e-003	6.1800e-003	0.1244	0.1306	1.6700e-003	0.1174	0.1191	0.0000	326.9748	326.9748	0.0379	0.0000	327.7696
Total	**0.2408**	**2.6098**	**1.2442**	**3.2800e-003**	**6.1800e-003**	**0.1244**	**0.1306**	**1.6700e-003**	**0.1174**	**0.1191**	**0.0000**	**326.9748**	**326.9748**	**0.0379**	**0.0000**	**327.7696**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0390	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	37.9898	37.9898	1.4400e-003	4.6000e-004	38.1635
Mobile	0.0105	0.0378	0.1378	3.7000e-004	0.0252	5.3000e-004	0.0257	6.7400e-003	4.8000e-004	7.2200e-003	0.0000	28.2648	28.2648	1.0900e-003	0.0000	28.2877

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	8.6168	9.3504	0.0758	1.8600e-003	11.5181
Total	**0.0507**	**0.0484**	**0.1468**	**4.3000e-004**	**0.0252**	**1.3400e-003**	**0.0265**	**6.7400e-003**	**1.2900e-003**	**8.0300e-003**	**3.2507**	**74.8715**	**78.1223**	**0.2270**	**2.3200e-003**	**83.6106**

<u>**Mitigated Operational**</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0390	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	37.9898	37.9898	1.4400e-003	4.6000e-004	38.1635
Mobile	0.0105	0.0378	0.1378	3.7000e-004	0.0252	5.3000e-004	0.0257	6.7400e-003	4.8000e-004	7.2200e-003	0.0000	28.2648	28.2648	1.0900e-003	0.0000	28.2877
Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	8.6168	9.3504	0.0757	1.8600e-003	11.5170
Total	**0.0507**	**0.0484**	**0.1468**	**4.3000e-004**	**0.0252**	**1.3400e-003**	**0.0265**	**6.7400e-003**	**1.2900e-003**	**8.0300e-003**	**3.2507**	**74.8715**	**78.1223**	**0.2270**	**2.3200e-003**	**83.6094**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Cable Pulling	Building Construction	8/1/2016	12/31/2016	5	110	
2	Electrode Array Installation	Building Construction	8/1/2016	12/31/2016	5	110	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Cable Pulling	Cranes	1	0.00	226	0.29
Cable Pulling	Forklifts	2	0.00	89	0.20
Cable Pulling	Other Construction Equipment	1	8.00	100	0.42
Cable Pulling	Tractors/Loaders/Backhoes	2	0.00	97	0.37
Electrode Array Installation	Cranes	1	8.00	226	0.29
Electrode Array Installation	Forklifts	2	8.00	89	0.20
Electrode Array Installation	Generator Sets	1	8.00	600	0.74
Electrode Array Installation	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Cable Pulling	6	4.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Electrode Array Installation	6	4.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Cable Pulling - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0287	0.2577	0.1593	2.0000e-004		0.0202	0.0202		0.0186	0.0186	0.0000	18.6777	18.6777	5.6300e-003	0.0000	18.7960
Total	**0.0287**	**0.2577**	**0.1593**	**2.0000e-004**		**0.0202**	**0.0202**		**0.0186**	**0.0186**	**0.0000**	**18.6777**	**18.6777**	**5.6300e-003**	**0.0000**	**18.7960**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.8000e-004	9.9900e-003	0.0128	2.0000e-005	6.8000e-004	1.6000e-004	8.3000e-004	1.9000e-004	1.4000e-004	3.4000e-004	0.0000	2.1697	2.1697	2.0000e-005	0.0000	2.1701
Worker	8.8000e-004	1.3000e-003	0.0135	3.0000e-005	2.4100e-003	2.0000e-005	2.4300e-003	6.4000e-004	2.0000e-005	6.6000e-004	0.0000	2.2614	2.2614	1.2000e-004	0.0000	2.2639

Total	**1.8600e-003**	**0.0113**	**0.0263**	**5.0000e-005**	**3.0900e-003**	**1.8000e-004**	**3.2600e-003**	**8.3000e-004**	**1.6000e-004**	**1.0000e-003**	**0.0000**	**4.4311**	**4.4311**	**1.4000e-004**	**0.0000**	**4.4340**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0287	0.2577	0.1593	2.0000e-004		0.0202	0.0202		0.0186	0.0186	0.0000	18.6777	18.6777	5.6300e-003	0.0000	18.7960
Total	**0.0287**	**0.2577**	**0.1593**	**2.0000e-004**		**0.0202**	**0.0202**		**0.0186**	**0.0186**	**0.0000**	**18.6777**	**18.6777**	**5.6300e-003**	**0.0000**	**18.7960**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.8000e-004	9.9900e-003	0.0128	2.0000e-005	6.8000e-004	1.6000e-004	8.3000e-004	1.9000e-004	1.4000e-004	3.4000e-004	0.0000	2.1697	2.1697	2.0000e-005	0.0000	2.1701
Worker	8.8000e-004	1.3000e-003	0.0135	3.0000e-005	2.4100e-003	2.0000e-005	2.4300e-003	6.4000e-004	2.0000e-005	6.6000e-004	0.0000	2.2614	2.2614	1.2000e-004	0.0000	2.2639
Total	**1.8600e-003**	**0.0113**	**0.0263**	**5.0000e-005**	**3.0900e-003**	**1.8000e-004**	**3.2600e-003**	**8.3000e-004**	**1.6000e-004**	**1.0000e-003**	**0.0000**	**4.4311**	**4.4311**	**1.4000e-004**	**0.0000**	**4.4340**

3.3 Electrode Array Installation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2084	2.3295	1.0323	2.9700e-003		0.1039	0.1039		0.0985	0.0985	0.0000	299.4352	299.4352	0.0319	0.0000	300.1060
Total	**0.2084**	**2.3295**	**1.0323**	**2.9700e-003**		**0.1039**	**0.1039**		**0.0985**	**0.0985**	**0.0000**	**299.4352**	**299.4352**	**0.0319**	**0.0000**	**300.1060**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.8000e-004	9.9900e-003	0.0128	2.0000e-005	6.8000e-004	1.6000e-004	8.3000e-004	1.9000e-004	1.4000e-004	3.4000e-004	0.0000	2.1697	2.1697	2.0000e-005	0.0000	2.1701
Worker	8.8000e-004	1.3000e-003	0.0135	3.0000e-005	2.4100e-003	2.0000e-005	2.4300e-003	6.4000e-004	2.0000e-005	6.6000e-004	0.0000	2.2614	2.2614	1.2000e-004	0.0000	2.2639
Total	**1.8600e-003**	**0.0113**	**0.0263**	**5.0000e-005**	**3.0900e-003**	**1.8000e-004**	**3.2600e-003**	**8.3000e-004**	**1.6000e-004**	**1.0000e-003**	**0.0000**	**4.4311**	**4.4311**	**1.4000e-004**	**0.0000**	**4.4340**

Mitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Off-Road	0.2084	2.3295	1.0323	2.9700e-003		0.1039	0.1039		0.0985	0.0985	0.0000	299.4349	299.4349	0.0319	0.0000	300.1056
Total	**0.2084**	**2.3295**	**1.0323**	**2.9700e-003**		**0.1039**	**0.1039**		**0.0985**	**0.0985**	**0.0000**	**299.4349**	**299.4349**	**0.0319**	**0.0000**	**300.1056**

<u>Mitigated Construction Off-Site</u>

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.8000e-004	9.9900e-003	0.0128	2.0000e-005	6.8000e-004	1.6000e-004	8.3000e-004	1.9000e-004	1.4000e-004	3.4000e-004	0.0000	2.1697	2.1697	2.0000e-005	0.0000	2.1701
Worker	8.8000e-004	1.3000e-003	0.0135	3.0000e-005	2.4100e-003	2.0000e-005	2.4300e-003	6.4000e-004	2.0000e-005	6.6000e-004	0.0000	2.2614	2.2614	1.2000e-004	0.0000	2.2639
Total	**1.8600e-003**	**0.0113**	**0.0263**	**5.0000e-005**	**3.0900e-003**	**1.8000e-004**	**3.2600e-003**	**8.3000e-004**	**1.6000e-004**	**1.0000e-003**	**0.0000**	**4.4311**	**4.4311**	**1.4000e-004**	**0.0000**	**4.4340**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Mitigated	0.0105	0.0378	0.1378	3.7000e-004	0.0252	5.3000e-004	0.0257	6.7400e-003	4.8000e-004	7.2200e-003	0.0000	28.2648	28.2648	1.0900e-003	0.0000	28.2877
Unmitigated	0.0105	0.0378	0.1378	3.7000e-004	0.0252	5.3000e-004	0.0257	6.7400e-003	4.8000e-004	7.2200e-003	0.0000	28.2648	28.2648	1.0900e-003	0.0000	28.2877

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	15.00	15.00	15.00	66,424	66,424
Total	15.00	15.00	15.00	66,424	66,424

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.513125	0.060112	0.180262	0.139218	0.042100	0.006630	0.016061	0.030999	0.001941	0.002506	0.004348	0.000594	0.002104

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	26.4418	26.4418	1.2200e-003	2.5000e-004	26.5453
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	26.4418	26.4418	1.2200e-003	2.5000e-004	26.5453
NaturalGas Mitigated	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	11.5479	11.5479	2.2000e-004	2.1000e-004	11.6182
NaturalGas Unmitigated	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	11.5479	11.5479	2.2000e-004	2.1000e-004	11.6182

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	216400	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	11.5479	11.5479	2.2000e-004	2.1000e-004	11.6182
Total		**1.1700e-003**	**0.0106**	**8.9100e-003**	**6.0000e-005**		**8.1000e-004**	**8.1000e-004**		**8.1000e-004**	**8.1000e-004**	**0.0000**	**11.5479**	**11.5479**	**2.2000e-004**	**2.1000e-004**	**11.6182**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	216400	1.1700e-003	0.0106	8.9100e-003	6.0000e-005		8.1000e-004	8.1000e-004		8.1000e-004	8.1000e-004	0.0000	11.5479	11.5479	2.2000e-004	2.1000e-004	11.6182
Total		**1.1700e-003**	**0.0106**	**8.9100e-003**	**6.0000e-005**		**8.1000e-004**	**8.1000e-004**		**8.1000e-004**	**8.1000e-004**	**0.0000**	**11.5479**	**11.5479**	**2.2000e-004**	**2.1000e-004**	**11.6182**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	92400	26.4418	1.2200e-003	2.5000e-004	26.5453
Total		**26.4418**	**1.2200e-003**	**2.5000e-004**	**26.5453**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	92400	26.4418	1.2200e-003	2.5000e-004	26.5453
Total		**26.4418**	**1.2200e-003**	**2.5000e-004**	**26.5453**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0390	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Unmitigated	0.0390	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.9000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0361					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0391**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.9000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0361					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0391**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	9.3504	0.0757	1.8600e-003	11.5170
Unmitigated	9.3504	0.0758	1.8600e-003	11.5181

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	2.3125 / 0	9.3504	0.0758	1.8600e-003	11.5181
Total		**9.3504**	**0.0758**	**1.8600e-003**	**11.5181**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	2.3125 / 0	9.3504	0.0757	1.8600e-003	11.5170
Total		**9.3504**	**0.0757**	**1.8600e-003**	**11.5170**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.5171	0.1488	0.0000	5.6410
Unmitigated	2.5171	0.1488	0.0000	5.6410

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	12.4	2.5171	0.1488	0.0000	5.6410
Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	12.4	2.5171	0.1488	0.0000	5.6410
Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

THIS PAGE INTENTIONALLY LEFT BLANK

D1: GEOPHYSICAL SURVEY

THIS PAGE INTENTIONALLY LEFT BLANK

FUGRO CONSULTANTS, INC.

GEOPHYSICAL SURVEY REPORT

LADWP CAT2010 - SYLMAR ELECTRODE STUDIES AND DESIGN UPGRADE SUBSEA CABLE INSTALLATION SANTA MONICA BASIN, CALIFORNIA

Survey Period: April 23 - June 1, 2012
Report Number: 04.64110025 D0

Prepared for: Burns & McDonnell
One Pointe Drive, Suite 540
Brea, California 92821

Client Reference: 04.64110025

R1	Issued as Draft	C. Pratt	R. Cypher	E. Stutts	06/11/12
D0	Issued as Draft	C. Pratt	R. Cypher	E. Stutts	05/25/2012
Rev	**Description**	**Prepared**	**Checked**	**Approved**	**Date**

4820 McGrath Street, Suite 100, Ventura, CA 93003 United States, North America
Phone: +1 805 650 7000, Fax: +1 805 658 6679, http:// www.fugrowest.com

CONTENTS

TABLES

CONTENTS-CONTINUED

FIGURES

APPENDICES

SUMMARY OF SURVEY RESULTS

Location:

Proposed Electrode Location NAD83		Geodetic Datum NAD83 California Zone 5 in U.S. Feet	
Latitude:	33° 59.791' N	Northing:	1821620
Longitude:	118° 34.753' W	Easting:	6386101

Study Area: A 3,700 feet x 3,700 feet area centralized on the proposed electrode site and a 1,200 foot corridor (600 feet either side) along both the proposed primary and the proposed optional cable routes.

Bathymetry:

Depth at proposed electrode location:	157 feet
Minimum depth within the survey area:	20 feet
Maximum depth within the survey area:	170 feet
Gradient at proposed electrode location:	<0.5°
Max gradient within survey area:	<0.5°

Seabed Features: Throughout the survey area seabed sediments comprise sand, sandy clay, sandy silt, and silty sand with occasional outcroppings of bedrock nearshore. Three magnetic anomalies and 15 side-scan-sonar targets were identified from the data sets.

Shallow gas was observed in the seismic data along both routes and throughout the survey corridor. Several gas seeps were also noted within the survey area.

Isolated bedrock was detected at Station 13076 on the primary subsea cable route and Station 19000 on the alternative subsea cable route, extending all the way to the shoreward end of the data.

1. INTRODUCTION AND SCOPE OF WORK

1.1 General

Burns & McDonnell contracted Fugro Consultants, Inc. (Fugro), part of the worldwide Fugro Group, to provide shallow hazards geophysical and geotechnical surveys for planning purposes for the conceptual alignment of an upgrade to the submarine segment of the electrode system. The purpose of the geophysical survey was to acquire multibeam bathymetry, side-scan-sonar imaging, marine magnetics, and shallow seismic data to document the seafloor and sub seafloor conditions within the proposed subsea cable installation corridor. The geophysical survey was conducted aboard the *M/V Westerly* from April 25 to April 30, 2012 and the *M/V Taku* from May 1 to 3, 2012.

The surveys included a primary and an optional proposed subsea cable routes. Water depths throughout the proposed survey area ranged from approximately 20 feet near shore to approximately 170 foot water depth offshore. The geophysical survey limits for both routes extended from as near to shore as safely possible to approximately 2.8 nautical miles offshore with a survey corridor width of 1,200 feet (600 feet each side of proposed subsea cable routes). For side-scan-sonar and sub-bottom data, Fugro surveyed a total of eight lines parallel to the proposed pipeline(s) routes and spaced at 160 feet on either side of the proposed cable alignment and along one line on centerline of the proposed cable routes, and nine tie lines oriented perpendicular to the proposed subsea cable routes and spaced 5,000 feet apart. In addition, 21 lines were collected near the proposed electrode location. Magnetometer data were acquired on every other line and tie lines. Multibeam bathymetric data was conducted from a separate vessel where an appropriate amount of track lines were run in order to provide 100 percent seafloor coverage where feasible (typically up to approximately 20 foot water depths). No data was acquired with the proposed acoustic geophysical and bathymetric systems in areas where kelp was present.

All data collected are based on the WGS-84 spheroid as North America Datum 83 (Universal Trans Mercator (UTM), Zone 11, meters [m]) grid coordinates or WGS-84 Geographical coordinates, and converted to North America Datum 83 California State Plane Zone 5 in feet for final mapping and reporting.

The vertical datum reference for this project is Mean Lower Low Water (MLLW). Depths were corrected for tide variations during field activities based upon tidal data obtained from the NOAA acoustic tide gauge, Station No. 442, for Santa Monica, California.

1.2 Permitting Requirements

The project included offshore geophysical survey using acoustic methods. California State Lands (within 3 nautical miles of the coast) activities in this area are under the jurisdiction of the California State Lands Commission (CSLC). The survey was conducted entirely in State controlled waters and a permit was required to conduct the field investigations. In accordance with CSLC regulations only qualified contractors that maintain a current Geophysical and Geological permit should be allowed to conduct geophysical surveys and geotechnical sampling in California State waters. Fugro is one of the few companies on the west coast that have and maintain a current permit for this purpose. Pertinent permits and notifications that were required to conduct the planned scope of work included:

- CSLC geophysical survey and geological permits;
- All offshore operation notifications to mariners;
- Offshore operations also complied with the Marine Mammal Protection requirements as outlined by Fugro's CSLC survey permits and the US National Marine Fisheries. This requirement includes the development of a Marine Wildlife Contingency Plan, having Marine Mammal Observers on the survey vessel during operations, and preparation of a final Wildlife Monitoring Report.

1.3 Units and Conventions

Units used on the survey are as follows:

- Linear units are meters.
- Angular units are degrees (°).
- Time was recorded as UTC (Time offset: -8:00 UTC) to all data files and both UTC and local time were noted in field logs.

1.4 Abbreviations

ADF	Anacapa-Dume Fault Zone
CSLC	California State Lands Commission
DGPS	Differential Global Positioning System
GPS	Global Positioning System
IMU	Inertial Measurement Unit
kHZ	Kilohertz
km	Kilometer
LADWP	Los Angeles Department of Water and Power
MLLW	Mean Lower Low Water
M/V	Marine Vessel
NAD	North American Datum
NOAA	National Oceanic and Atmospheric Administration
PRP	Peninsular Ranges (Geologic Province)
QMS	Quaternary Shelf Sediments
SEG-Y	Standard file format developed by the Society of Exploration Geophysicists
SIM	Sonar Interface Module
SCCBP	Southern California Continental Borderlands (Geologic Province)
SMF	Santa Monica Fault Zone
SPA	Shelf Projection Anticlinorium
SVP	Sound Velocity Profile
UTM	Universal Transverse Mercator
WGS	World Geodetic System
WTRP	Western Transverse Range (Geologic Province)

2. METHODS AND RESOLUTION LIMITATION

2.1 Positioning and Navigation System

Wide area Differential Global Positioning System (DGPS) was used to position the survey vessel. Global Positioning System (GPS) is satellite-based and operated by the U.S. Department of Defense. A "wide area" application operates with correction values applied to a stand-alone GPS receiver from base stations located over large distances. DGPS corrections were supplied to the system using the STARFIX II network. This differential network is a nationwide system operated by Fugro. STARFIX II broadcasts differential corrections via a communications satellite downlink to a Trimble 12-channel receiver. The differentially-corrected position from the Trimble receiver was then passed to an onboard navigation computer running Hypack 2012.

2.2 Side Scan Sonar

Surficial features and targets have been interpreted from a digital, dual-frequency side-scan-sonar system. The system consisted of a Klein 3000 sonar towfish and armored tow cable interfaced to the Klein topside unit, which was networked to a data logging computer and Klein's SonarPro acquisition software. SonarPro features include, amongst other features, automatic gain control, real-time bottom tracking, and time varied gain.

During the survey, the towfish was deployed from the center stern of the *M/V Westerly* as the vessel traversed the survey grid. The side scan sonar was operated at a frequency of 100 and 500 kHz at a slant range of 75 meters for all survey lines.

2.3 Sub-bottom Profiler

A sub-bottom profiler was employed to obtain shallow seismic reflection data on the sediment layers immediately beneath the seafloor. These shallow data provide information on the spatial distribution and thickness of the unconsolidated surficial sediments.

An EdgeTech X-Star (Chirp) full-spectrum, digital sub-bottom profiler with an SB-216S towfish was used to collect sub-bottom data for this project. The X-Star is a wide band FM high resolution sub-bottom profiler. It generates cross sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges.

The system transmits an FM pulse that is linearly swept over a spectrum frequency range (also called a "chirp pulse"), 2-16 kHz, over 20 milliseconds, for example. The acoustic return received at the hydrophone is matched filtered with the outgoing FM pulse, generating a high resolution image of the sub-bottom stratigraphy. Full Spectrum™ technology has several advantages over conventional systems including increased penetration with high resolution through use of the matched filter correlation and waveform weighting techniques. The X-Star combines a precision wide band, low noise, low distortion analog sonar front end with a powerful RISC workstation and a digital signal processing pipeline array coprocessor. The system provides sub-bottom penetration of up to 100 meters in clays with vertical resolution of 6 to 10 centimeters depending on operating frequency. The system was integrated with the navigation computer which provided real-time towfish positions and speed.

The towfish was deployed from the starboard side stern of the *M/V Westerly* at a depth of approximately 3 meters below the waterline. Sub-bottom and positioning data are both logged to the system's computer, hard drive.

2.4 Marine Magnetometer

A Geometrics 882 marine magnetometer sensor was deployed from the stern of the survey vessel and towed along the survey grid to aid in mapping ferrous debris. A Geometrics 882 marine magnetometer measures the ambient magnetic field using a specialized branch of nuclear magnetic resonance technology applied specifically to hydrogen nuclei producing; it is highly sensitive with a great degree of accuracy.

2.5 Multibeam Bathymetry

The R2 Sonic 2024 system was used to provide multibeam bathymetry coverage of the seafloor. The R2 Sonic 2024 transmits a shaped continuous wave pulse at the user selected frequency (200 KHz to 400 KHz). The transmit pulse is narrow in the along-track direction, but very wide in the across-track direction. The reflected acoustic energy is received via the R2 Sonic 2024 receivers. Within the receiver head, the beams are formed and the bottom detection process takes place. The resultant bottom detections (range and bearing) are sent via Ethernet deck lead to the Sonar Interface Module (SIM). The SIM then sends the data out to the sonic control software and the data acquisition software.

The R2 Sonic 2024 works on user selectable frequency ranges so it is adaptable to a wide range of survey depths and conditions. The frequency can be selected on-the-fly without having to shut down the sonar system, change hardware, or halt recording data. This system produces a user selectable swath width of 10° to 160° using all 256 beams; the desired angle can be selected on-the-fly. The selected swath angle can also be rotated port or starboard while recording to direct the highly concentrated beams towards the desired target.

Sound velocity profile (SVP) data was acquired using the AML Smart Probe, a hi-tech composite sound velocity sensor. The AML Smart Probe measures at a rate of 10 velocity and pressure observations per second, and responds to temperature changes immediately, maximizing its ability to identify and map thermoclines, a necessity for multibeam bathymetric data acquisition.

The Applanix POS MV was used to control motion and attitude for the R2 system. The POS MV delivers full 6-degree-of-freedom position and orientation solutions for marine survey vessels and outputs all motion variables at a high rate: position, velocity, heave, roll, pitch, true heading, acceleration vectors, and angular rate vectors. The system combines GPS/DGPS with rugged high-quality inertial sensors. The system measures true heading together will roll and pitch to 0.02 degree of accuracy or better under dynamic conditions including hard turns and rapid acceleration and deceleration with a heave accuracy of 5 centimeters or 5 percent all in real time. The POS MV system consisted of two GPS antennas mounted atop the vessel *Taku* (primary port), a processor, Version 5, and an Inertial Measurement Unit (IMU) mounted 71 centimeters directly above the transducer. Data was fed from the processor to Hypack via Ethernet at 25 hertz. Delayed heave and position data, used for the post-processing of data, were logged at 50 hertz.

A patch test was completed on May 1, 2012 as part of the system calibration procedures. The patch test used seafloor topology to bring multibeam swaths (run at varying speeds, headings, and overlaps) into coincidence. They are employed so that data can be corrected for timing latency, pitch, azimuth, and roll offsets, which may exist between the multibeam transducer and the IMU. Following this one-time calibration, the POS MV quickly and automatically initialized itself upon power-up, outputting accurate navigation data.

2.6 Grab Samples

A ponar grab sampler was used to collect 18 seabed sediment samples along both the primary and optional routes. Sample locations and sediment type identifications are listed in Section 4.4 below and are shown on all alignment charts.

3. DATA PROCESSING

3.1 Side Scan Sonar Data Processing

All side scan sonar data were processed using Chesapeake Technologies, Inc. Sonarwiz5. Raw side scan files were imported into the program and corrected for layback as well as proper bottom tracking and navigation review. The files were then slant range corrected and compiled into a preliminary mosaic for target location. The resulting files were normalized to construct a final side scan mosaic of the survey area. The complete mosaic image was imported into the ArcView system where the positions of seafloor anomalies were digitized.

3.2 Magnetometer Data Processing

Using Chesapeake Technologies, Inc. Sonarwiz5, the locations of observed magnetic anomalies were determined from the magnetometer data, utilizing anomaly-modeling techniques that incorporate the anomaly duration, signature, and peak-to-peak amplitudes. The interpreted location of bipolar (dipole) anomalies is an average of the anomaly duration midpoint and the peak-to-peak midpoint. Interpreted anomaly locations were cross-checked with the side scan sonar targets to determine if exposed targets had a ferrous content. The anomalies were plotted on the post plot navigation maps and imported to the ArcView software for final mapping.

3.3 Sub-bottom Profiler Data Processing

The sub-bottom profiler data were processed using the following procedures:

- Analyze SEG-Y file trace headers for valid data;
- Noted coordinates recorded in LL84 Arcseconds;
- Convert files to NAD83 CA State Plane Zone V (feet);
- Load corrected SEG-Y files to Kingdom Suite;
- Layback corrected position used as coordinate;
- Shotpoints from byte 5;
- Pick seafloor as horizon;
- Pick Horizon A along angular unconformity at top of bedrock on the shelf;
- Pick top of shallow gas as horizons;
- Pick Gas seeps as horizons;
- Math on two horizons by subtracting seafloor time values from Horizon A time values. Export resulting thickness of sediment above Horizon A as time values;
- Math on two horizons by subtracting seafloor time values from shallow gas time values. Export resulting depth below seabed to top of gas as time values;
- Output map images of shallow gas and gas seeps for digitizing polygons in AutoCAD;
- Insert gas seep symbols where gas seeps are present on map image;
- Convert thickness values to feet using a velocity function of 5,000 ft/second for both Horizon A and top of shallow gas;

- Produce contours of the thickness of sediment overlying Horizon A;
- Import points of depth from seabed to top of gas and convert to post values;
- Grid bathymetry and thickness values to same parameters on a 50-foot grid spacing. Subtract Horizon A from bathymetry to produce elevation of Horizon A;
- Produce profiles with seafloor and Horizon A (where present);
- Generate topographically-corrected images along route scaled to a 1:10 vertical exaggeration underlay the profiles with these images and manually draw lines along reflectors to produce interpreted profiles; and
- Annotate profiles with interpretation text.

3.4 Multibeam Bathymetry Data Processing

For the bathymetry, the HySweep software package by Hypack, Inc. was used to process and bin the raw data sets by first applying acquisition specific variables such as vessel offsets, seawater sound velocities, vessel draft, system calibration (patch test), and delayed heave values and then editing the data to remove spurious soundings.

The field-recorded raw sounding files were imported into HySweep and the acquisition variables were entered into the vessel configuration file. Once the sounding files were imported, the appropriate SVP file was then loaded into each line and the line corrected for sound refraction. Concurrent with SVP corrections, the bathymetry data was also corrected for dynamic vessel heave, pitch, and roll. The attitude, heading, navigation, and bathymetry data were then examined for noise and gaps. Nadir beam-filters were used to reject data from the outer reaches of the swaths.

After each individual line was examined and cleaned in the HySweep Swath editor, the lines were merged. Adjacent overlapping lines of corrected bathymetry data were examined to identify any vertical offsets, data gaps, sound velocity, and motion errors. Any residual noise in the data set was also rejected at this time.

After all data is filtered and processed, the final data set was binned to 5 m x 5 m cell size, using the average depth of all depths within the cell. The horizontal location of the representative average depth was the cell center.

The reduced and corrected soundings were then contoured using a TerraModel digital terrain modeling software package. The final bathymetric contours are plotted at 5 foot intervals with MLLW as the vertical datum on the bathymetry charts.

4. RESULTS

4.1 General

Several charts have been produced that depict survey acquisition information and results. Alignment Charts 1 through 7 consist of panels that display tracklines (navigation post plot) and bathymetry, seafloor features, side scan sonar mosaic, unconsolidated Holocene-aged sediment isopach and subsurface features, and interpretation profiles along both proposed subsea cable routes. Proposed Electrode Charts 1 through 3 display tracklines (navigation post plot) and bathymetry, seafloor features, side scan sonar mosaic, unconsolidated Holocene-aged sediment isopach and subsurface features for the survey area centered on the proposed electrode location.

Panel 1 shows the trackline post plots, bathymetry, and seafloor features. Features of note include but are not limited to topographic seafloor features such as mounds and rock outcrops. Debris and magnetic anomalies were also noted and mapped as part of the survey. These features are also discussed in Section 4.4 below.

Panel 2 - Side Scan Sonar Mosaic presents a side-scan-sonar mosaic for the survey area. This mosaic was created from side-scan-sonar images acquired along survey tracklines. The targets are analyzed and discussed in detail in other portions of the submittal package.

Panel 3 shows interpreted profiles from sub-bottom data collected by Fugro's 2012 survey. The interpretation incorporates regional and local geologic information as described below.

Panel 4 shows an isopach map (the thickness) of Holocene sediments within the project survey area and subsurface features such as gassy sediments. The map is contoured at an interval of 2 feet. Sub-bottom data were interpreted to produce this map as discussed in Section 4.2 below. Also displayed on this map are the vibracore and thermal resistivity sample sites.

4.2 RegionalGeology

Santa Monica Bay has formed at the triple junction of three geologic provinces: the Western Transverse Range (WTRP), Southern California Continental Borderlands (SCCBP) and Peninsular Ranges (PRP). The Los Angeles Basin extends southeastward from the Santa Monica Mountains near this junction to the San Joaquin Hills, and from the San Rafael and Chino Hills in the northeast to Point Dume, the Shelf Projection Anticlinorium (SPA) and the Palos Verdes Hills in the west and southwest (gray in Figure 4-1).

The geology of this basin generally comprises a thick sequence of Mio-Pliocene nearshore and marine sequences overlying Mesozoic basement rock, all successively rotated, folded, and thoroughly faulted throughout Neogene time (23-2.6 Ma) and subsequently covered by Quaternary sedimentary units in terrestrial and marine basins. Santa Monica Bay itself is prone to low-amplitude seismic events along its local fault zones, particularly in the region between the SPA and Point Dume. Earthquakes along regional fault zones crossing the bay have caused significant landside damage from ground shaking and tsunami. Figure 4-1 summarizes the regional geology.

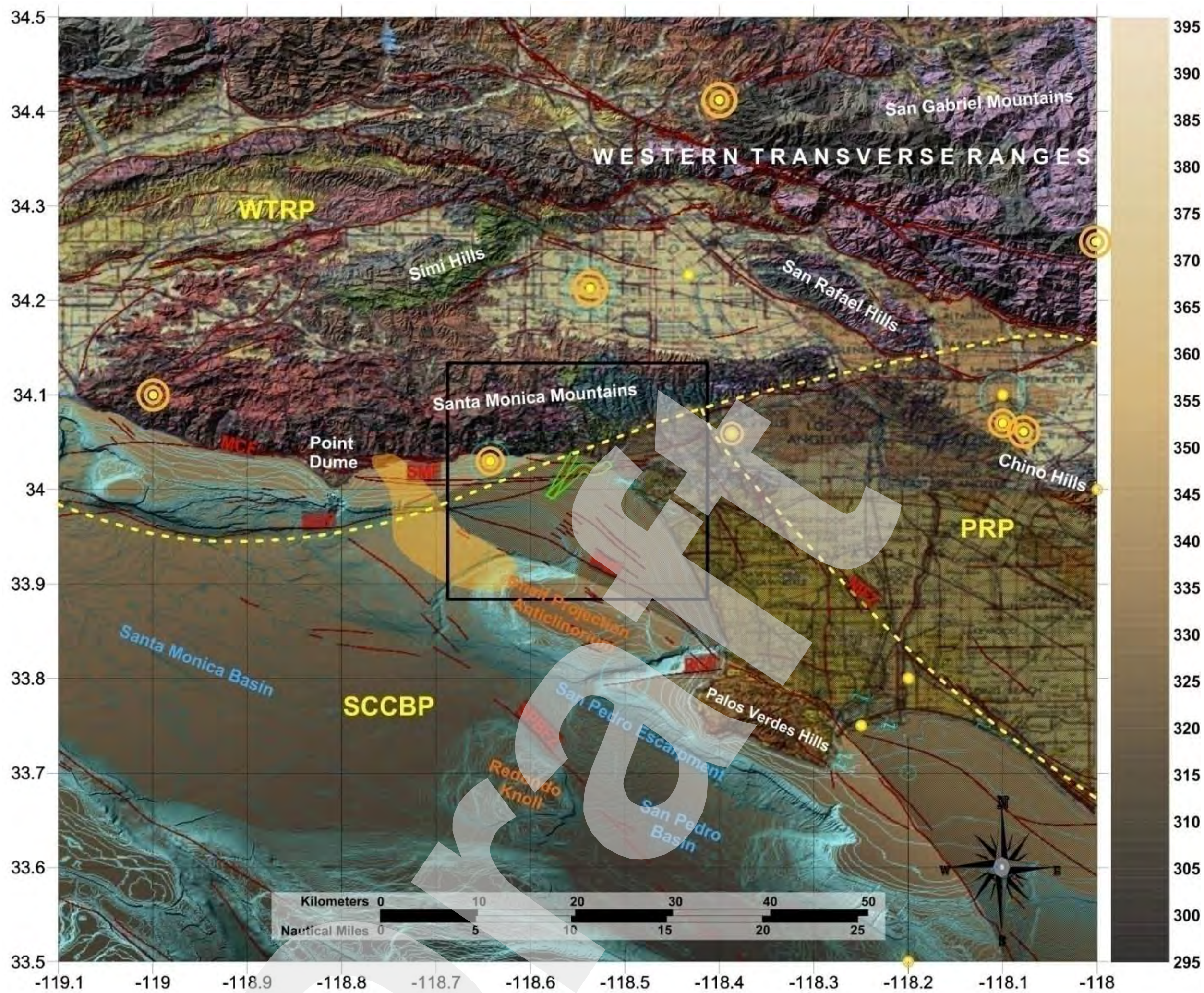


Figure 4-1. Geologic Summary Map

This figure compiles the efforts of the USGS (Yerkes and Campbell, 2005; Jennings, 1962; and Jennings and Strand, 1969), Bohannon, Gardner and Sliter (2004) and the NGDC (2012). The landside geology is various, but is generally keyed to the following index: yellow and orange shades are Quaternary continental deposits; peach and pink tones are Miocene marine strata and volcanic rocks; and green shades are Jurassic and Cretaceous marine strata. The yellow hashed lines and text indicate geologic provinces: WTRP is the Western Transverse Range Province; SCCBP is the South California Continental Borderlands Province; and PRP is the Peninsular Ranges Province. Red line trace known faults: MCF is the Malibu Coast Fault; ADF is the Anacapa-Dume Fault; SMF is the Santa Monica Fault; PVF is the Palos Verdes Fault; NIFZ is the Newport-Inglewood Fault Zone; and SPBFZ is the San Pedro Basin Fault Zone. The brown background depicts sediment thickness keyed to the color scale at right. Contour lines indicate bathymetry at a 10-m interval. Yellow closed circles indicate the locations of significant historical earthquakes with orange halos scaled to their magnitudes (if recorded). Cyan open circles show the sources of known historical tsunami scaled to earthquake magnitude (if recorded), and cyan waves indicate locations of tsunami run-up scaled to run-up height (if recorded). Orange patches indicate regions of dense seismic activity.

4.2.1 Tectonic Setting

4.2.1.1 Historical Geology

The Santa Monica Basin developed from a Mesozoic-Paleogene, north-south-trending, transtensional forearc basin (Drewry and Vicotr, 1995). The Transverse Ranges Block rotated clockwise during Oligo-Miocene time (~25-5 Ma) as the Outer Borderlands terrane moved northward against the North American plate (Bartolomeo and Longinotti, 2010). This rotation coincided with regional extensional processes that caused the adjacent basin to drop rapidly (Drewry and Victor, 1995). At the end of Miocene time (~5 Ma), movement along the (then) newly formed San Andreas Fault system created the Transverse Ranges and the adjacent Los Angeles, Santa Monica and San Pedro basins (countyofsb.org, 2011). Rapid relief changes and transtensional faulting strained the region throughout the Quaternary Period into its modern physiography (Bohannon et al., 2004).

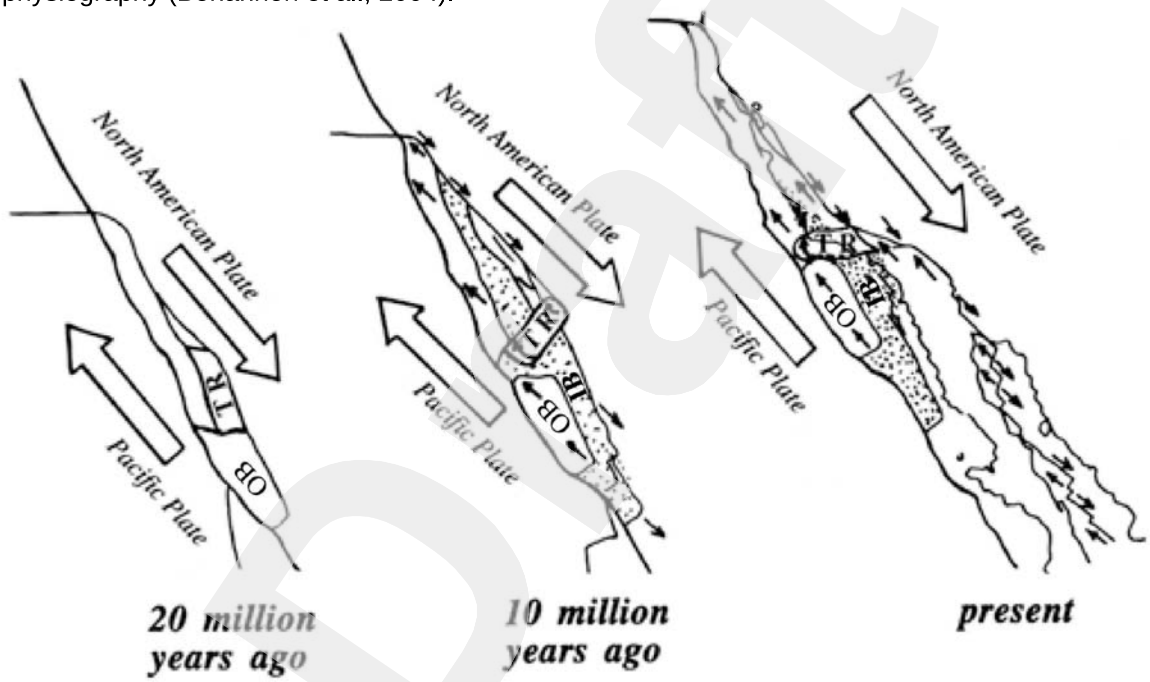


Figure 4-2. Tectonic Development

This figure depicts the Late Cenozoic development of the Santa Monica Basin from the initial collision of the Pacific and North American plates (left) through the transtensional rotation of the Transverse Ranges Block (center) to the development of the present dextral, transpressional San Andreas fault system. TR represents the Transverse Range Block; OB, the Outer Borderlands; IB, the Inner Borderlands. From Bortolomeo and Longinotti (2010).

4.2.1.2 Lithostratigraphy

The Los Angeles Basin's early Miocene (23-5.3 Ma) Topanga Gp and San Onofre Breccia are orogenic units that cover bedrock composed principally of plutonically intruded Cretaceous (146-66 Ma) Catalina Schist. The middle-late Miocene Monterey and Puente Fms and early Pliocene (5.3-2.6 Ma) Repetto Fm (grouped as the MPR Fm) overlay these stratigraphic packages, all comprising marine and marginal marine strata that attenuate southwestward against a fault-bound basement high (Catalina Schist), which projects southeastward to the Santa Monica Bay's pronounced submarine terrace. The shallow-water, late Pliocene (4-2.6 Ma) Pico Fm and equivalent strata wrap around this terrace in a seaward-thickening wedge that covers the Catalina Schist to the southwest of the basement high and the MPR Fms to the northeast.

Marine Pleio-Holocene (2.6-0 Ma) cover sediments are ubiquitous in extent but generally shallow except in bathymetric depressions, including the Santa Monica Apron Province (Figure 4-3).

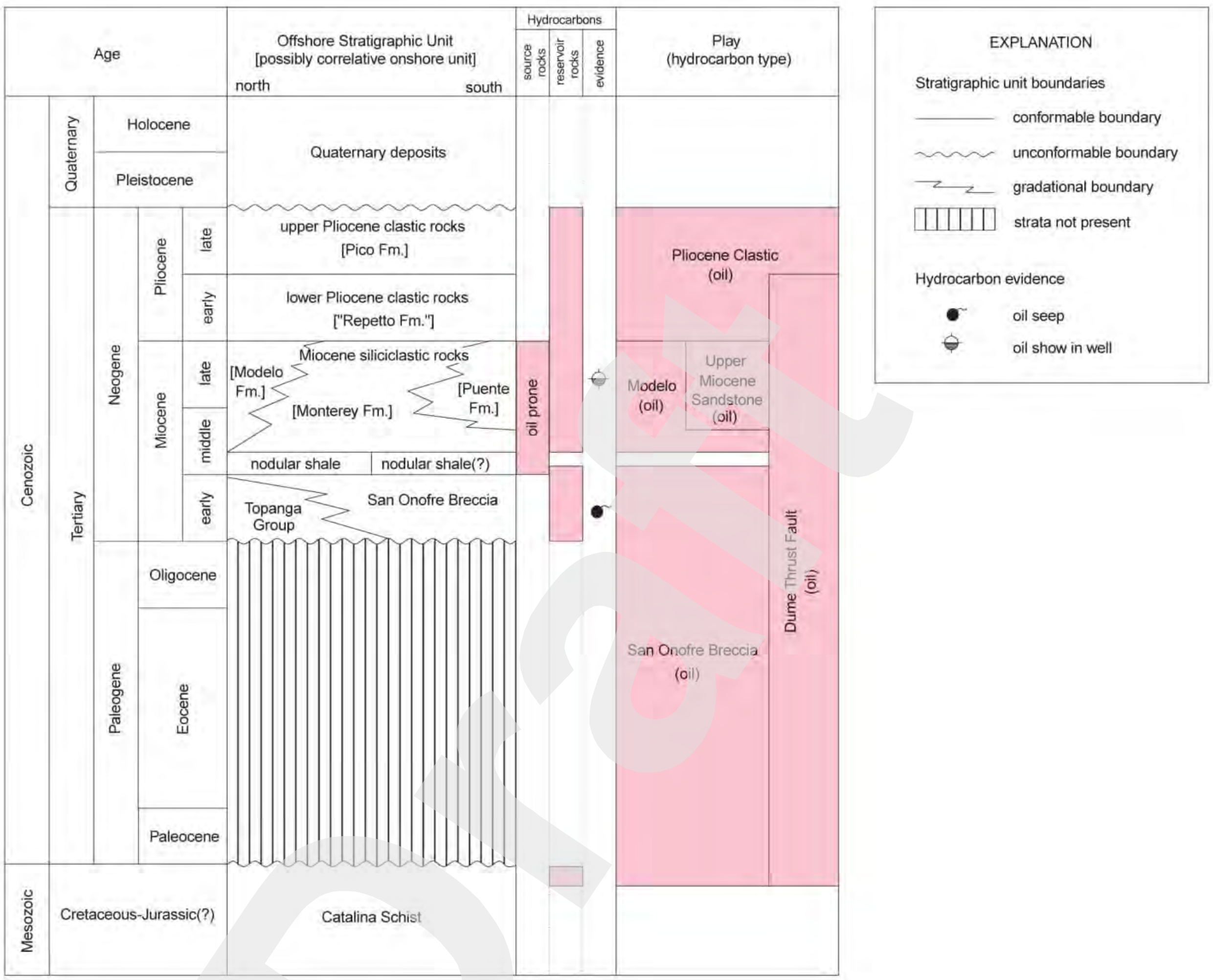


Figure 4-3. Stratigraphic Column
This figure summarizes the stratigraphy of the Santa Monica Basin; Modified from Drewry and Victor (1995).

4.2.2 Seismology

4.2.2.1 Seismicity

Despite the region's many active fault zones, only 14 significant earthquakes have historically impacted the study area. The most severe of these earthquakes, at M6.4, shook the Northridge region in 1994. Although the region experiences regular low-amplitude seismic activity, high-amplitude events appear restricted to the Anacapa-Dume, Santa Monica, and Newport-Inglewood fault zones (Figure 4-1).

Table 4-1. Significant Historical Earthquakes

Lat	Long	Magnitude	MMI	Depth (km)	Year	Location	Tsunami
34.1	-118.1	NR	8	NR	1855	California: Los Angeles	Yes
34.227	-118.433	NR	NR	NR	1879	California: San Fernando	Yes
34.03	-118.643	5.2	7	15	1930	California: Southern	Yes
33.75	-118.25	NR	5	NR	1949	California: Southern	No
33.5	-118.2	NR	5	NR	1951	California: Terminal Island	No
33.8	-118.2	NR	4	NR	1955	California: Terminal Island	No
34	-118	NR	NR	16	1961	California: Terminal Island	No
34.412	-118.4	6.4	11	8	1971	California: San Fernando	No
34.1	-119	5.9	7	8	1973	California: Oxnard	No
34.061	-118.078	5.9	8	10	1987	California: Whittier	No
34.07	-118.1	5.2		8	1987	California: Whittier, Pasadena	No
34.262	-118.002	5.8	7	11	1991	California: Arcadia, Glendale, Los Angeles	No
34.213	-118.537	6.4	9	18	1994	California: Northridge	Yes
34.059	-118.387	4.2	6	5	2001	California: Los Angeles	No

This table summarizes significant earthquakes; that is, those "that meet at least one of the following criteria: Moderate damage (approximately $1 million or more), 10 or more deaths, Magnitude 7.5 or greater, Modified Mercalli Intensity6X or greater, or the earthquake generated a tsunami." Source: NGDC.org (2012).

4.2.2.2 Tsunami

Six tsunami source events have been recorded within the study area (Table 4-2). Of these, the majority were caused by earthquake-induced landslides south of the Simi Hills and San Gabriel Mountains (Figure 4-1).

Table 4-2. Tsunami Source Events

Lat	Long	Cause	Primary Magnitude	Water Height (m)	Year	State	Location
34.1	-118.1	Earthquake and Landslide	6	NR	1855	CA	S. California
34.227	-118.433	Earthquake and Landslide	NR	NR	1879	CA	S. California
33.8	-118.5	Meteorological	6.4	NR	1899	CA	S. California
34.03	-118.643	Earthquake and Landslide	5.2	3.05	1930	CA	S. California
33.7	-118.2	Meteorological	NR	12	1934	CA	S. California
34.213	-118.537	Earthquake and Landslide	6.7	0.1	1994	CA	West Coast, Usa

"NR" indicates data that were not recorded. Data source: NGDC.org (2012).

Tsunami run-up events are far more common within the study area than source events. Since 1868, 102 run-ups have impacted the coastal areas of the Santa Monica and San Pedro Bays, originating from as far away as 14,558 km. Although run-up heights are generally on the order of 0.2-0.4 m, the highest level recorded was 3.05 m, and was the result of the 1930 earthquake along the Santa Monica fault (Table 4-3).

Table 4-3. Tsunami Runup Locations

Lat	Long	Source Distance (km)	Water Height (m)	Year	State	Location
33.707	-118.273	7677	0.76	1868	CA	San Pedro, Ca
33.78	-118.25	7681	0.76	1868	CA	Wilmington, Ca
33.707	-118.273	333	NR	1872	CA	San Pedro, Ca
33.741	-118.104	223	1.8	1877	CA	Anaheim Landing, Ca
33.78	-118.25	7960	1.68	1877	CA	Wilmington, Ca
33.707	-118.273	7956	2.07	1877	CA	San Pedro, Ca
33.78	-118.25	276	1	1878	CA	Wilmington, Ca
34.008	-118.5	25	NR	1879	CA	Santa Monica, Ca
33.717	-118.267	8586	NR	1922	CA	Los Angeles, Ca
33.717	-118.267	6467	NR	1923	CA	Los Angeles, Ca
33.717	-118.267	6309	NR	1923	CA	Los Angeles, Ca
33.75	-118.22	NR	0.34	1925	CA	Long Beach, Ca
33.707	-118.273	291	NR	1927	CA	San Pedro, Ca
34.008	-118.5	13	3.05	1930	CA	Santa Monica, Ca
33.988	-118.472	16	3.05	1930	CA	Venice, Ca
33.829	-118.391	32	NR	1930	CA	Redondo Beach, Ca
33.75	-118.22	2103	0.1	1932	CA	Long Beach, Ca
34.008	-118.5	8225	0.07	1933	CA	Santa Monica, Ca
33.717	-118.267	8261	0.1	1933	CA	Los Angeles, Ca
33.75	-118.22	8262	0.1	1933	CA	Long Beach, Ca
33.75	-118.22	28	0.1	1933	CA	Long Beach, Ca
34.02	-118.68	57	NR	1934	CA	Malibu Beach, Ca
33.75	-118.22	6	NR	1934	CA	Long Beach, Ca
34.008	-118.5	44	NR	1934	CA	Santa Monica, Ca
34.008	-118.5	12934	0.1	1938	CA	Santa Monica, Ca
34.008	-118.5	3868	0.05	1938	CA	Santa Monica, Ca
33.75	-118.25	8662	0.02	1943	CA	Terminal Island, Ca
33.75	-118.25	9139	0.02	1944	CA	Terminal Island, Ca
34.008	-118.5	9103	0.07	1944	CA	Santa Monica, Ca
33.75	-118.22	4133	0.2	1946	CA	Long Beach, Ca
33.717	-118.267	4133	0.34	1946	CA	Los Angeles, Ca

Table 4-3. Tsunami Run-up Locations (Continued)

Lat	Long	Source Distance (km)	Water Height (m)	Year	State	Location
33.707	-118.273	4133	0.38	1946	CA	San Pedro, Ca
34.008	-118.5	4095	NR	1946	CA	Santa Monica, Ca
33.75	-118.25	9317	0.1	1946	CA	Terminal Island, Ca
33.717	-118.267	8149	0.13	1952	CA	Los Angeles, Ca
33.75	-118.22	8150	0.1	1952	CA	Long Beach, Ca
33.717	-118.267	6601	0.38	1952	CA	Los Angeles, Ca
33.707	-118.273	6601	0.3	1952	CA	San Pedro, Ca
34.008	-118.5	6562	0.48	1952	CA	Santa Monica, Ca
33.75	-118.22	6601	0.24	1952	CA	Long Beach, Ca
33.73	-118.08	4958	0.2	1957	CA	Anaheim Bay, Ca
33.75	-118.22	4946	0.26	1957	CA	Long Beach, Ca
34.008	-118.5	4908	0.46	1957	CA	Santa Monica, Ca
33.707	-118.273	4946	0.18	1957	CA	San Pedro, Ca
33.717	-118.267	4945	0.18	1957	CA	Los Angeles, Ca
33.75	-118.12	9301	0.61	1960	CA	Alamitos Bay, Ca
33.75	-118.25	9307	0.95	1960	CA	Terminal Island, Ca
34.008	-118.5	9344	1.6	1960	CA	Santa Monica, Ca
33.707	-118.273	9305	0.46	1960	CA	San Pedro, Ca
33.717	-118.267	9305	0.76	1960	CA	Los Angeles, Ca
33.75	-118.22	9306	0.88	1960	CA	Long Beach, Ca
33.717	-118.267	7604	0.1	1963	CA	Los Angeles, Ca
34.008	-118.5	3659	1.03	1964	CA	Santa Monica, Ca
33.75	-118.12	3700	0.43	1964	CA	Alamitos Bay, Ca
33.75	-118.22	3696	NR	1964	CA	Long Beach Harbor, Ca
33.717	-118.267	3698	0.49	1964	CA	Los Angeles County Harbor, Ca
33.717	-118.267	5350	0.1	1965	CA	Los Angeles, Ca
34.008	-118.5	5313	0.08	1965	CA	Santa Monica, Ca
33.717	-118.267	6481	0.1	1966	CA	Los Angeles, Ca
33.75	-118.22	6481	0.1	1966	CA	Long Beach, Ca
34.008	-118.5	8236	0.2	1968	CA	Santa Monica, Ca
33.717	-118.267	8273	0.1	1968	CA	Los Angeles, Ca
33.75	-118.22	8274	0.1	1968	CA	Long Beach, Ca
33.75	-118.22	10182	0.1	1971	CA	Long Beach, Ca
33.717	-118.267	10177	0.05	1971	CA	Los Angeles, Ca

Table 4-3. Tsunami Run-up Locations (Continued)

Lat	Long	Source Distance (km)	Water Height (m)	Year	State	Location
33.975	-118.449	3956	NR	1975	CA	Marina Del Rey, Santa Monica, Ca
33.75	-118.22	3970	0.07	1975	CA	Long Beach, Ca
33.717	-118.267	3965	0.15	1975	CA	Los Angeles, Ca
33.717	-118.267	8763	0.05	1977	CA	Los Angeles, Ca
33.75	-118.22	8769	0.12	1977	CA	Long Beach, Ca
34.13	-118.03	889	0.11	1992	CA	Arcadia, Ca
34.008	-118.5	7777	0.09	1994	CA	Santa Monica, Ca
33.717	-118.267	7814	0.06	1994	CA	Los Angeles, Ca
34.008	-118.5	8164	0.13	1995	CA	Santa Monica, Ca
33.717	-118.267	8126	0.05	1995	CA	Los Angeles, Ca
34.008	-118.5	7591	0.1	1995	CA	Santa Monica, Ca
34.008	-118.5	11404	0.05	1996	CA	Santa Monica, Ca
34.008	-118.5	5047	NR	1996	CA	Santa Monica, Ca
33.717	-118.267	7298	0.05	2001	CA	Los Angeles, Ca
34.008	-118.5	7336	0.1	2001	CA	Santa Monica, Ca
33.717	-118.267	14558	0.13	2004	CA	Los Angeles, Ca
34.008	-118.5	14520	0.19	2004	CA	Santa Monica, Ca
33.717	-118.267	8422	0.08	2006	CA	Los Angeles, Ca
34.008	-118.5	8424	0.1	2006	CA	Santa Monica, Ca
33.717	-118.267	7258	0.11	2006	CA	Los Angeles, Ca
34.008	-118.5	7221	0.15	2006	CA	Santa Monica, Ca
34.008	-118.5	10030	0.11	2007	CA	Santa Monica, Ca
33.717	-118.267	6849	0.06	2007	CA	Los Angeles, Ca
34.008	-118.5	6887	0.07	2007	CA	Santa Monica, Ca
33.717	-118.267	7902	0.13	2009	CA	Los Angeles, Ca
34.008	-118.5	7903	0.15	2009	CA	Santa Monica, Ca
34.008	-118.5	9479	0.05	2009	CA	Santa Monica, Ca
34.008	-118.5	9123	0.66	2010	CA	Santa Monica, Ca
33.717	-118.267	9084	0.41	2010	CA	Los Angeles, Ca
33.75	-118.22	8481	0.7	2011	CA	Long Beach Marina, Ca
33.717	-118.267	8480	0.49	2011	CA	Los Angeles, Ca
33.975	-118.449	8449	1	2011	CA	Marina Del Rey, Ca
34.0333	-118.35	8453	0.6	2011	CA	Ballona Creek, Ca

Table 4-3. Tsunami Run-up Locations (Continued)

Lat	Long	Source Distance (km)	Water Height (m)	Year	State	Location
33.75	-118.22	8481	NR	2011	CA	Port Of Long Beach, Ca
33.7211	-118.064	8495	0.72	2011	CA	Huntington Harbor, Ca
33.829	-118.391	8463	0.7	2011	CA	King Harbor , Redondo Beach, Ca
34.008	-118.5	8443	0.84	2011	CA	Santa Monica, Ca

"NR" indicates data that were not recorded. Data source: NGDC.org (2012).

4.2.3 Seafloor Morphology

4.2.3.1 Kelp forests

Though threatened, giant kelp forests thrive on the shallow (< 20 m deep) rocky areas of Santa Monica Bay (Figure 4-4). The shallow inshore edge of kelp forests are typically set by wave action, where as the offshore edge is limited by the extent of light penetration. The high productivity and unique three-dimensional structure of kelp forests provide an important habitat for numerous algae, invertebrates, near-shore fishes, marine birds, and marine mammals (Santa Barbara Coastal LTER, 2006).

Figure 4-4. Kelp Forest
Left: Drifting kelp raft in the Santa Barbara Channel. Right: Inferior view of kelp canopy and schooling fish. Sources: laureola.tumblr.com (2012) and sbc.lternet.edu (2012).

4.2.3.2 Submarine Channels

Numerous channels incise the shelf apron south of the proposed routes, many feeding into the much larger Santa Monica Canyon, which extends eastward from the shelfbreak (near the 60-m isobath) and generally parallels the curvature of the SPA as it descends some 900 m to the Santa Monica Basin below. The canyon and its feeder channels all are migrating shoreward at a rate proportional to their width, but they likely pose no immediate threat to the proposed routes (Figure 4-5).

4.2.3.3 Submerged Islands

The upper surface of the SPA is comprised of a platform of Quaternary shelf sediments (Qms) through which protrude outcrops of the MPR Fms (Tmu; Figure 4-5). These are rugged exposures that, at a depth of approximately 60 m, stood above sea level as islands during the eustatic low-stands of the Pleistocene ice ages. As of this writing, these features have not been formally named.

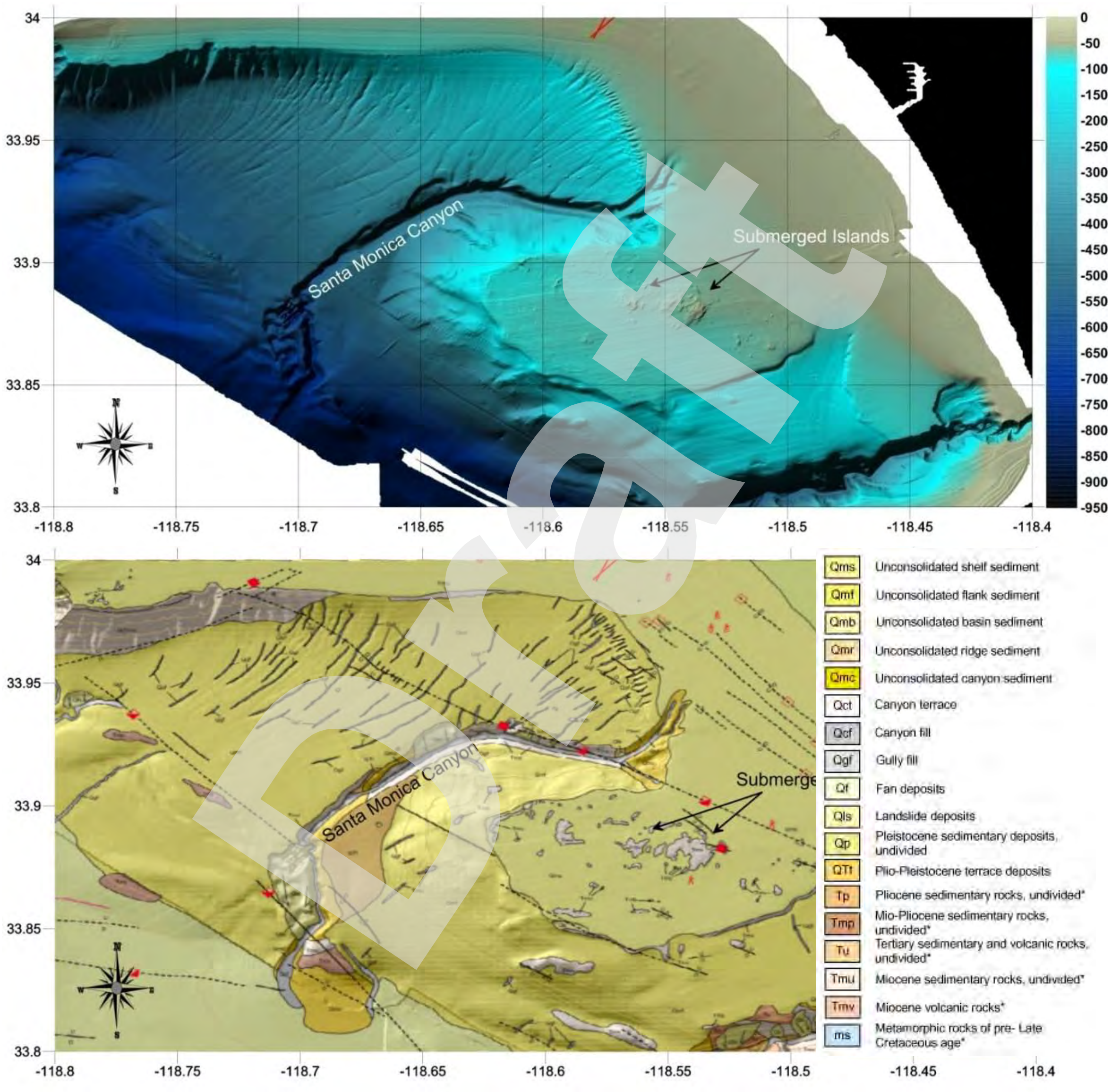


Figure 4-5. Seachannels and Submarine Canyons
Bathymetric data and their geologic interpretation are from the Coastal and Marine Geology Program Internet Map Server: U.S. Pacfiic West Coast (2009) and Sauceto et al (2003).

4.2.4 Route Geology

4.2.4.1 Surface Morphology

The proposed routes make landfall near a parking lot at the intersection of Sunset Boulevard and the Pacific Coast Highway and near the Beach Club at the northern end of Santa Monica Beach. The routes join approximately 5.5 km from shore atop shelf deposits of unconsolidated silt and sand. The first 1 to 2 kms of both routes apparently passes over Pleistocene sedimentary deposits consisting principally of sand. The unconformable surface of this unit descends seaward beneath the more recent Holocene shelf sediments. The routes cross at least three reported faults in the Santa Monica (SMF) and Anacapa-Dume (ADF) fault zones (Figure 4-6).

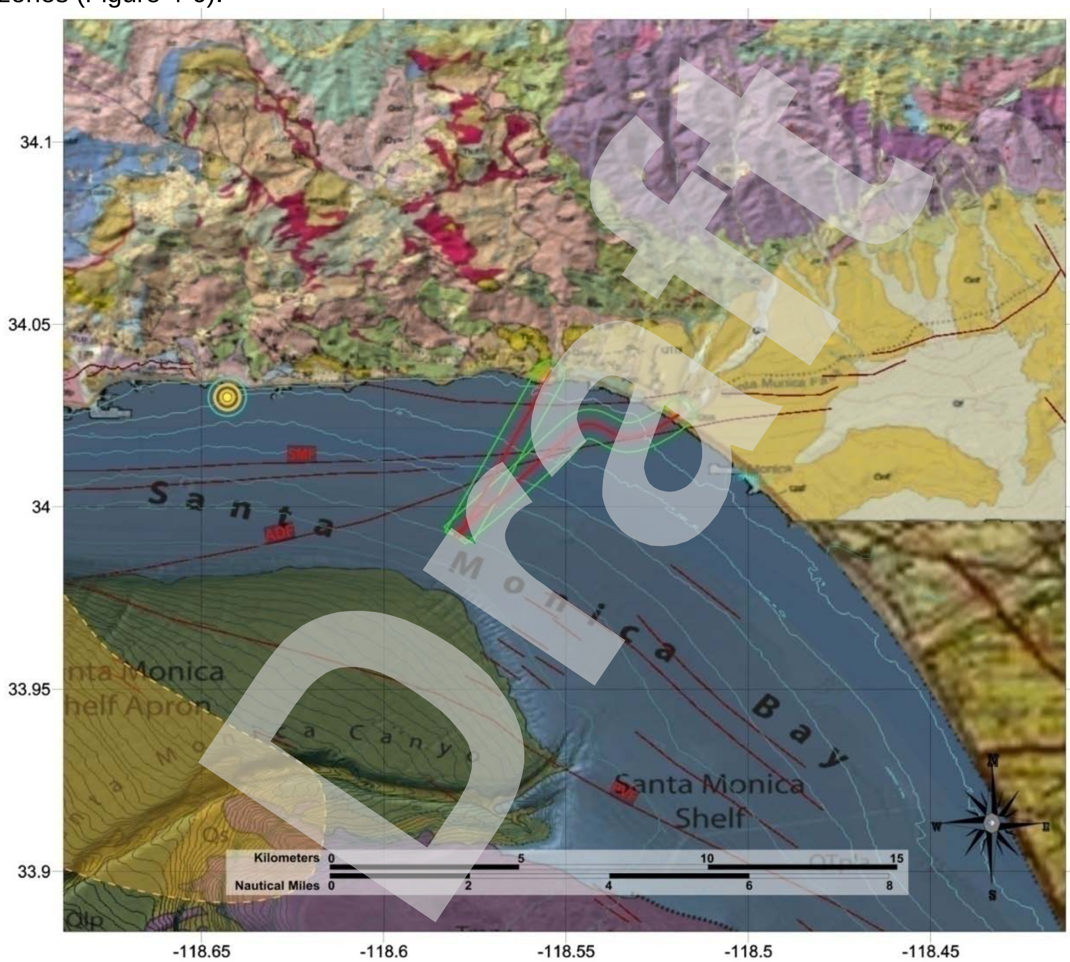


Figure 4-6. Route Conditions

This figure compiles the efforts of the USGS (Yerkes and Campbell, 2005; Jennings, 1962; and Bohannon, Gardner and Sliter (2004) and the NGDC (2012). The landside geology is various, but is generally keyed to the following index: yellow and orange shades are Quaternary continental deposits; peach and pink tones are Miocene marine strata and volcanic rocks; and green and purple shades are Jurassic and Cretaceous marine strata. Offhsore, the blue region (QTpla) is the Pico Fm overlain by thin Quaternary sediment; the green region (Qlp) is Plei-Holocene sediments on the Santa Monica Apron; the purple region (Tmpr) is the Miocene MPR Fms. Red line trace known faults: ADF is the Anacapa-Dume Fault; SMF is the Santa Monica Fault; and PVF is the Palos Verdes Fault. Contour lines indicate bathymetry at a 10-m interval. Yellow closed circles indicate the locations of significant historical earthquakes with orange halos scaled to their magnitudes (if recorded). Cyan open circles show the sources of known historical tsunami scaled to earthquake magnitude (if recorded), and cyan waves indicate locations of tsunami run-up scaled to run-up height (if recorded). The orange patch indicates a region of dense, low-amplitude seismic activity.

4.2.4.2 Shallow Subsurface

Shallow subsurface geology is discussed in two subsections for each route. Sub-seabed interpretation is based on sub-bottom profiler data acquired during the surveys of both routes. The associated charts and interpreted profiles (Alignment Charts 1 through 7) are referenced in this discussion.

4.2.4.3 Primary Route

Sandy seabed characterizes the inner shelf near the landfall location. Isolated bedrock is exposed in a patch in the side-scan-sonar records where this cover layer thins near shore. The sub-bottom profiles indicate that bedrock extends up to the seabed at Station 13076 and continues to be exposed all the way to the shoreward end of the data at Station 16000. The side scan sonar records indicate a single isolated patch of exposed bedrock immediately east of the route between Stations 13500 and 15200 with sediment cover elsewhere. It is likely that bedrock is blanketed by a veneer of sediment from Station 13076 to Station 16000 near shore. The sub-bottom profiler resolution is unable to determine the absolute thickness of this veneer.

From Station 13076 seaward, the surficial sediment thickens along the route to a maximum of 32.2 feet at Station 7000, where the sediment cover thins again in a seaward direction. Sediment thickness at Station 0 is 7 feet. Sediments probably transition from sand near shore to silt and clay at Station 0 offshore. As part of Alignment Charts 1 through 3, the Isopach Panel contours the thickness of the unconsolidated Holocene sediment in the surveyed corridor. The contour interval on this chart is 2 feet with index contours every 10 feet.

There is evidence of gas in the shallow unconsolidated Holocene sediments along the route and throughout the surveyed corridor. The Isopach Panel (Alignment Charts 1 through 3) plots the locations and depths beneath the seabed to the top of shallow gassy sediments. Only those gassy sediments that occur in the shallow unconsolidated sediment (above Horizon A) are plotted. Gas was seen at depth within bedrock strata, but this deeper gas is not plotted. In addition to shallow gas entrained in the sediments, several gas seeps were noted in the water column of the sub-bottom profiles. These seeps are included on Alignment Charts 1 through 3. The interpreted profile of Figure 4-7 depicts the sub-bottom profiler data along the primary route centerline as well as the features mentioned above.

Horizon A lies along the base of the unconsolidated Holocene sediments in the survey area; this horizon lies along an angular unconformity where the underlying strata are dipping towards the south out near Station 0. This bedrock is probably part of the Pico Formation. The southward dip decreases gradually towards shore and eventually parallels Horizon A near Station 7000. The dip again increases towards the south in the region where the bedrock outcrops the seabed (near shore). These dipping strata are incised by paleochannels seaward of Station 5000. Paleochannels may occur shoreward of Station 5000; however, shallow gas tends to obscure channel structures beneath Horizon A.

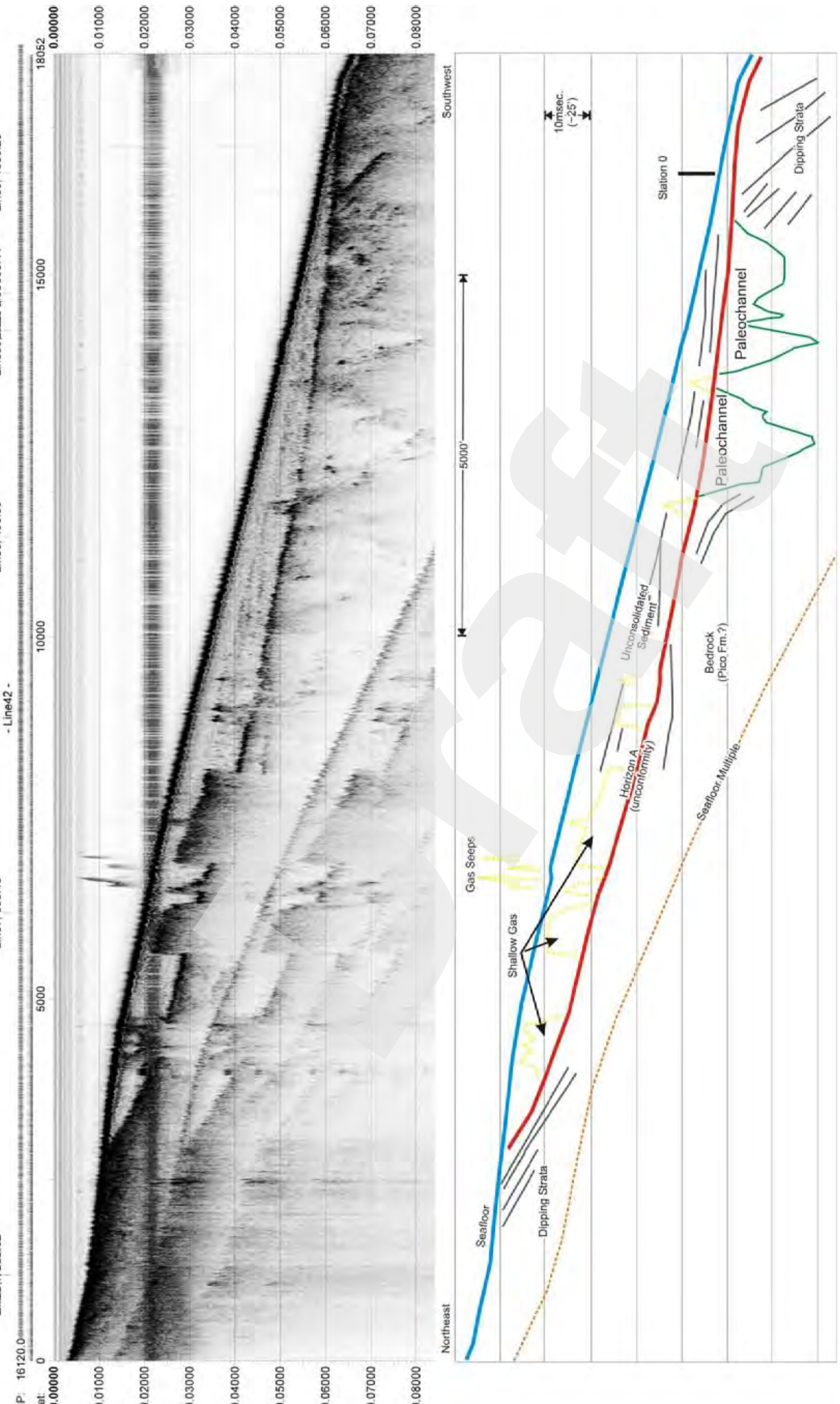


Figure 4-7. Interpreted Centerline Profile - Primary Route

4.2.4.4 Optional Route

Sandy seabed characterizes the inner shelf near the landfall location. Isolated bedrock is exposed in two patches in the side-scan-sonar records where this cover layer thins near shore. The sub-bottom profiles indicate that bedrock extends up to the seabed at Station 19000 and continues to be exposed all the way to the shoreward end of the data at Station 22127. The side-scan-sonar records indicate a prominent outcropping of bedrock 140 feet southeast of Station 22500, and another smaller patch 850 feet northeast of the route at station 17000; with sediment cover elsewhere. It is likely that bedrock is blanketed by a veneer of sediment from Station 19000 to Station 22127 near shore. The sub-bottom profiler resolution is insufficient to determine the absolute thickness of this veneer.

From Station 19000 seaward, the surficial sediment thickens from nil to 8 feet as the route curves towards the northwest. As the route starts the curve towards the southwest, the sediment thickness increases to 10 feet and continues to increase in thickness towards the southwest along the route. A maximum sediment thickness of 46.5 feet is encountered at Station 8400, where the sediment cover thins again in a seaward direction. Sediment thickness at Station 0 is 7 feet. Sediments probably transition from sand near shore to silt and clay at Station 0 offshore. The Isopach Panel (Alignment Charts 4 through 7) contours the thickness of the unconsolidated Holocene sediment in the surveyed corridor. The contour interval on this chart is 2 feet with index contours every 10 feet.

There is evidence of gas in the shallow unconsolidated Holocene-aged isopach sediments along the route and throughout the surveyed corridor. The Isopach Panel (Alignment Charts 4 through 7) plots the locations and depths beneath the seabed to the top of shallow gassy sediments. Only those gassy sediments that occur in the shallow unconsolidated sediment (above Horizon A) are plotted. Gas was seen at depth within bedrock strata, but this deeper gas is not plotted. In addition to shallow gas entrained in the sediments, a few gas seeps were noted in the water-column of the sub-bottom profiles near Station 0. These seeps are included on Alignment Charts 4 through 7. It is apparent that shallow gas and gas seeps are more prevalent in the primary route than the optional route. The interpreted profile of Figure 4-8 depicts the sub-bottom profiler data for Line 36 along the majority of the optional route centerline as well as the features mentioned above. The scaled interpreted profile of Alignment Charts 1 through 7 shows features along the entire route

Horizon A lies along the base of the unconsolidated Holocene sediments in the survey area; this horizon lies along an angular unconformity where the underlying strata are dipping towards the south near Station 0. This bedrock is probably part of the Pliocene-aged Pico Formation. The southward dip decreases gradually towards shore and eventually parallels Horizon A near Station 8000. The dip again increases towards the south in the region where the bedrock outcrops the seabed (near shore). These dipping strata are incised by paleochannels seaward of Station 6000. Paleochannels may occur shoreward of Station 6000; however, shallow gas tends to obscure channel structures beneath Horizon A.

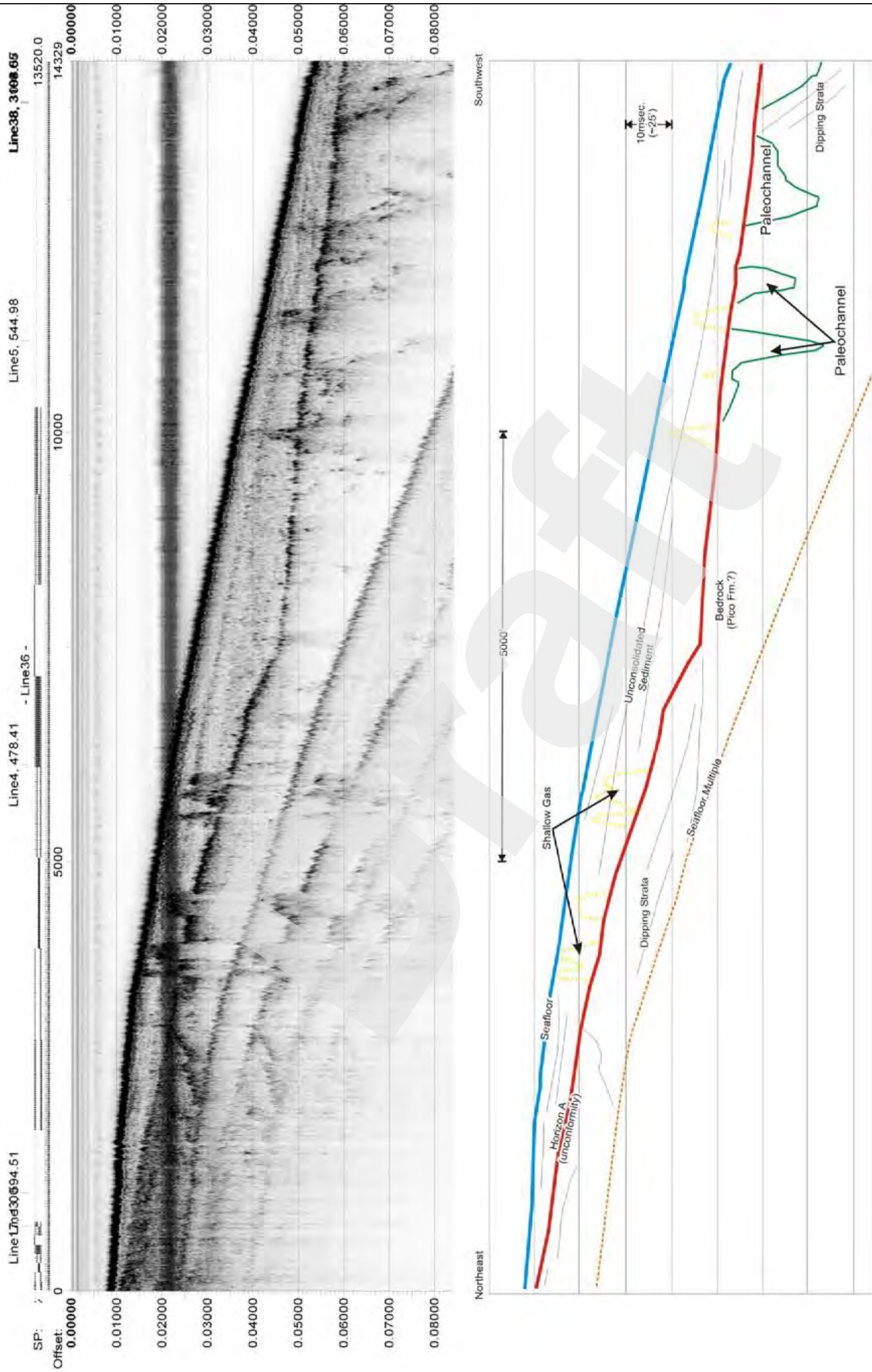


Figure 4-8.Interpreted Centerline Profile - Optional Route (Line 36)

4.3 Bathymetry

The following summarzies the bathymetry in the survey area. All water depths are referenced to MLLW.

Depth at proposed electrode location: 157 ft
Minimum depth within survey area: 20 ft
Maximum depth within survey area: 170 ft
Gradient at proposed electrode location: < 0.5°
Maximum gradient within area: < 0.5°

4.4 Seabed Features

The following table summarizes the laboratory test results of the grab samples along with the location of each sample.

Table 4-4. Summary of Grab Sample Laboratory Test Results

Grab Sample	NAD 83, California Zone 5, U.S. Feet		Material Description
	Easting	Northing	
P-1	6392651	1835407	Dark olive gray sand (SP)
P-2	6391268	1832490	Very dark gray silty sand (SM)
P-3	6390592	1831072	Very dark gray silty sand (SM)
P-5	6389300	1828353	Very dark gray sandy silt (ML)
P-6	6388656	1826994	Very dark gray sandy silt (ML)
P-7	6387994	1825600	Very dark gray sandy silt (ML)
P-8	6387347	1824248	Very dark gray sandy silt (ML)
P-9	6386752	1822986	Very dark gary clay with sand (CL)
P-12	6386352	1820652	Very dark gray sandy clay (CL)
P-14	6388136	1823846	Very dark gray sandy silt (ML)
P-16	6390172	1826025	Very dark gray sandy silt (ML)
P-18	6392239	1828082	Black sandy silt (ML)
P-20	6394453	1830256	Very dark gray silty sand (SM)
P-22	6397443	1831582	Black silty sand (SM)
P-23	6398648	1830756	Very dark gray silty sand (SM)
P-24	6400316	1830661	Very dark gray silty sand (SM)
P-25	6401763	1831374	Very dark gray silty sand (SM)
P-26	6402863	1831998	Very dark gray silty sand (SM)

Three individual unidentified magnetic anomalies were noted from the magnetometer data set. In all cases, no side scan sonar feature is seen in the proximity of the magnetic anomaly. We infer in each case that the anomaly is caused by a small ferrous object. The following tabulates the locations and additional data concerning the three individual magnetic anomalies.

Table 4-5. Summary of Mapped Magnetic Anomalies

Anomaly Number	Anomaly Magnitude (g)	NAD 83, California Zone 5, U.S. Feet	
		Easting	Northing
M-1	57.6	6398674	1831510
M-2	21.3	6398924	1831369
M-3	25.5	6397358	1831145

As mentioned in Section 4.2, outcroppings of rock were identified nearshore on both proposed subsea cable routes. In addition, 15 unidentified side-scan-sonar targets were noted in the side scan sonar data set. The following tabulates the locations and additional data concerning the 15 side-scan-sonar targets.

Table 4-6: Summary of Side Scan Sonar Targets

Target No.	Target Length (ft)	Target Width (ft)	Target Height (ft)	NAD 83, California Zone 5, U.S.Feet		Description
				Easting	Northing	
T-1	84.6	19.6	12.7	6395901	1831234	Unidentified Target - Possible tar mound
T-2	84.3	29.0	10.2	6395948	1831212	Unidentified Target - Possible tar mound
T-3	120.1	17.7	15.9	6383730	1819961	Possible Shipwreck
T-4	27.1	10.4	3.4	6384970	1821905	Unidentified Debris
T-5	4.4	3.6	0.9	6385540	1823268	Unidentified Target
T-6	3.7	3.3	1.2	6385332	1823658	Unidentified Target
T-7	9.8	1.8	0.9	6386163	1821901	Unidentified Target
T-8	5.9	2.1	1.5	6387317	1825049	Unidentified Target
T-9	6.2	3.3	1.3	6387486	1824070	Unidentified Target
T-10	8.5	5.3	0.6	6389865	1826212	Unidentified Target
T-11	6.6	8.1	0.6	6389887	1826160	Unidentified Target
T-12	0.0	0.0	0.0	6393148	1834856	Unidentified Target - Possible abandoned crab pot with cut off buoy line
T-13	6.4	2.8	1.8	6393055	1834903	Unidentified Target
T-14	0.0	0.0	0.0	6393150	1834830	Unidentified Linear Target - Possible cut-off line from crab pot
T-15	8.3	1.7	0.7	6385912	1820484	Unidentified Target

APPENDICES

A REFERENCES CITED

Bohannon, R.G., J.V. Gardner and R.W. Sliter (2004), Holocene and Pliocene tectonic evolution of the region offshore of the Los Angeles urban corridor, southern California. Tectonics, V. 23, TC1016.

Bartolomeo, E.S. and N. Longinotti (2010), Tectonic history of the Transverse Ranges: Rotation and deformation on the plate boundary. Chapter 2 of Geology and Geomorphology of Eastern Santa Cruz Island. University of California.

Dayton, P.K. (1985), Ecology of kelp communities. Annual Review of Ecology and Systematics 16: 215-245.

Divins, D.L. (2011), NGDC Total Sediment Thickness of the World's Oceans & Marginal Seas. Retrieved 10/2011 from http://www.ngdc.noaa.gov/mgg/sedthick/sedthick.html.

Drewry, S.D. and F.W. Victor (1995), Inner Borderlands Province in OCS Report MMS 97-0019 Petroleum Geology and Resource Estimates (1995), Dunkel C. and K. Piper (Eds).

Jennings, C.W. (1959), Geologic map of California : Santa Maria sheet: California Division of Mines and Geology, scale 1:250000.

Jennings, C.W. (1962), Geologic map of California : Long Beach sheet: California Division of Mines and Geology, scale 1:250000.

Jennings, C.W. and R.G. Strand (1969), Geologic map of California : Los Angeles sheet: California Division of Mines and Geology, scale 1:250000.

NGDC (2011), National Geophysical Data Center. Natural Hazards Data, Images and Education. Retrieved 10/2011 from http://www.ngdc.noaa.gov/hazard/hazards.shtml.

Santa Barbara Coastal LTER. (2006), Retrieved April, 2012 from http://sbc.lternet.edu/sites/biome_kelpforest.html.

Saucedo, G.J., H.G. Greene, M.P. Kennedy and S.P. Bezore (2003), Geologic Map of the Long Beach 30' x 60' Quadrangle, California. USGS and USDI, scale 1:100,000.

Yerkes, R.F. and R.H. Campbell (2005), Preliminary Geologic Map of the Los Angeles 30' x 60' Quadrangle, Southern California. USGS and USDI, scale 1:100,000.

B RESOURCES

Personnel	
Principal-In-Charge	Jeff Carothers
Operations Manager / QC Review	Eddie Stutts
Party Chief	Herb Tovar
Senior Hydrographic Surveyor	Gilbert Suarez
Hydrographic Surveyor	Jeff Babbitt
Hydrographic Surveyor	Daniel Ebuna
Geophysical Operator	Mark Williams
Survey Vessel - Side Scan/Sub-bottom	*M/V Westerly*
Survey Vessel - Multibeam Bathymetry	*M/V Taku*
Positioning Equipment	
Navigation Software	HYPACK 2012
Primary Positioning	Trimble AG332 DGPS System
Geophysical Equipment	
Heading Device	TSS Meridian Survey Grade Gyro
Sub-bottom Profiler	Edgetech X-Star Full Spectrum Profiler
Sub-bottom Towfish	Edgetech, Model SB-216S
Sub-bottom Acquisition Software	Edgetech Discover
Side Scan Sonar	Klein 3000
Side Scan Sonar Software	SonarPro
Magnetometer	Geometrics 882 Marine Magnetometer
Multibeam Bathymetry System	R2Sonic 2024
Motion Reference Unit	Applanix POS MV
Multibeam Acquisition Software	HYPACK/HYSWEEP 2012
SVP Profiler	AML Smart Probe

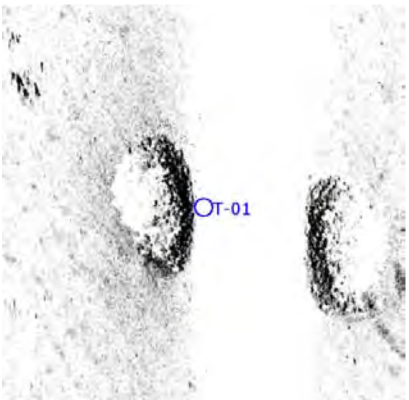
C SIDE SCAN SONAR TARGET REPORT

LADWP Side Scan Sonar Target Report

Projected Coordinates are in UTM NAD 83 Zone 11 Meters

Generated on: 05/04/2012 10:18:47 AM by SonarWiz.MAP targetReportGen2 V3.15.08

Contact Image



Contact Info

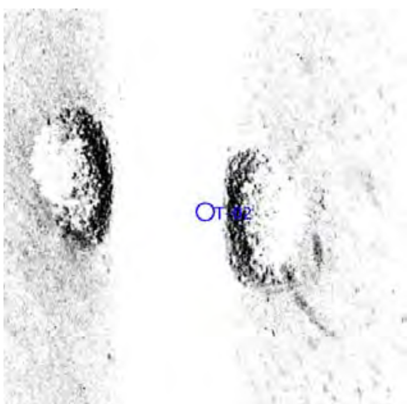
T-01

- Sonar Time at Target: 04/28/2012 14:44:11
- Click Position (Lat/Lon Coordinates)
  34° 01.38519' N   118° 32.82302' W (Local)
- Click Position (Projected Coordinates)
  (X) 357165.16 (Y) 3765794.75
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_31.sdf
- Ping Number: 263497
- Range to Target: 12.66 Meters
- Fish Height: 9.68 Meters
- Heading: 40.000 degrees
- Event Number: 0
- Line Name: line_31

User Entered Info

Dimensions

Target Height: = 4 Meters
Target Length: 26 Meters
Target Shadow: 8 Meters
Target Width: 6 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target - Possible tar mound



T-02

- Sonar Time at Target: 04/28/2012 14:44:13
- Click Position (Lat/Lon Coordinates)
  34° 01.38153' N   118° 32.81387' W (Local)
- Click Position (Projected Coordinates)
  (X) 357179.41 (Y) 3765787.75
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_31.sdf
- Ping Number: 263524
- Range to Target: 11.68 Meters
- Fish Height: 9.63 Meters
- Heading: 41.900 degrees
- Event Number: 0
- Line Name: line_31

Dimensions

Target Height: = 3 Meters
Target Length: 26 Meters
Target Shadow: 6 Meters
Target Width: 9 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target - Possible Tar Mound

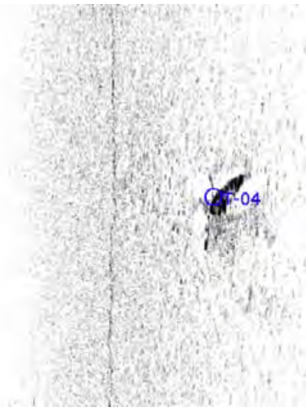
T-03

- Sonar Time at Target: 04/26/2012 09:43:08
- Click Position (Lat/Lon Coordinates)
  33° 59.51522' N   118° 35.21987' W (Local)
- Click Position (Projected Coordinates)
  (X) 353422.94 (Y) 3762395.25
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_51120426094100.sdf
- Ping Number: 78081
- Range to Target: 32.01 Meters
- Fish Height: 10.51 Meters
- Heading: 13.500 degrees
- Event Number: 0
- Line Name: line_51120426094100

Dimensions

Target Height: = 5 Meters
Target Length: 37 Meters
Target Shadow: 27 Meters
Target Width: 5 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Possible Shipwreck

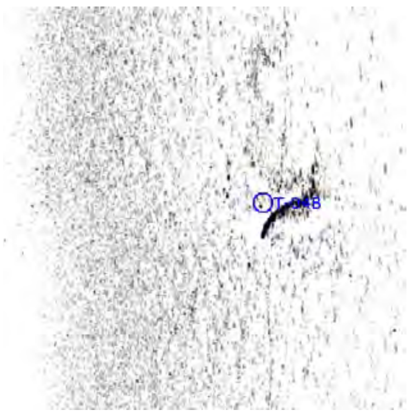
T-04



- Sonar Time at Target: 04/26/2012 10:04:18
- Click Position (Lat/Lon Coordinates)
  33° 59.83680' N   118° 34.97680' W (Local)
- Click Position (Projected Coordinates)
  (X) 353806.72 (Y) 3762983.75
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_52.sdf
- Ping Number: 90662
- Range to Target: 55.04 Meters
- Fish Height: 12.98 Meters
- Heading: 188.700 degrees
- Event Number: 0
- Line Name: line_52

Dimensions
Target Height: = 1 Meters
Target Length: 8 Meters
Target Shadow: 5 Meters
Target Width: 3 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Debris

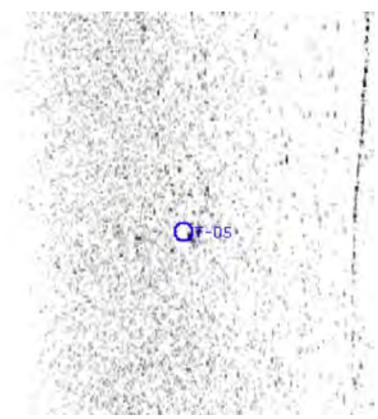
T-04B



- Sonar Time at Target: 04/26/2012 09:48:23
- Click Position (Lat/Lon Coordinates)
  33° 59.83726' N   118° 34.98092' W (Local)
- Click Position (Projected Coordinates)
  (X) 353800.59 (Y) 3762984.50
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_51120426094100.sdf
- Ping Number: 81203
- Range to Target: 40.09 Meters
- Fish Height: 8.09 Meters
- Heading: 12.800 degrees
- Event Number: 0
- Line Name: line_51120426094100

Dimensions
Target Height: = 1 Meters
Target Length: 9 Meters
Target Shadow: 7 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Debris - View 2

T-05



- Sonar Time at Target: 04/26/2012 09:51:41
- Click Position (Lat/Lon Coordinates)
  34° 00.06225' N   118° 34.86557' W (Local)
- Click Position (Projected Coordinates)
  (X) 353984.19 (Y) 3763397.75
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_51120426094100.sdf
- Ping Number: 83168
- Range to Target: 24.45 Meters
- Fish Height: 7.26 Meters
- Heading: 14.100 degrees
- Event Number: 0
- Line Name: line_51120426094100

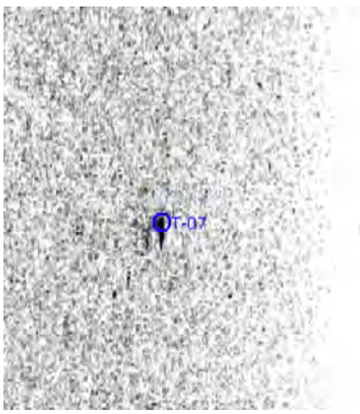
Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target

T-06

- Sonar Time at Target: 04/26/2012 08:40:28
- Click Position (Lat/Lon Coordinates)
  34° 00.12611' N   118° 34.90722' W (Local)
- Click Position (Projected Coordinates)
  (X) 353922.13 (Y) 3763517.00
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_48.sdf
- Ping Number: 40861
- Range to Target: 19.38 Meters
- Fish Height: 8.17 Meters
- Heading: 14.600 degrees
- Event Number: 0
- Line Name: line_48

Dimensions
Target Height: = 0 Meters
Target Length: 1 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target

T-07



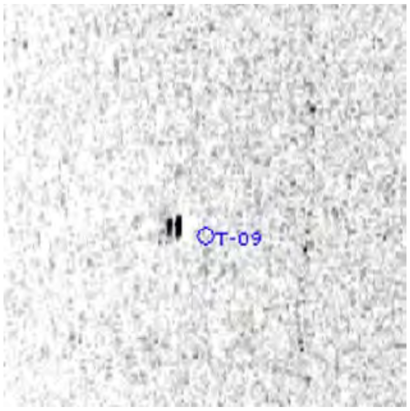
- Sonar Time at Target: 04/26/2012 11:32:30
- Click Position (Lat/Lon Coordinates)
  33° 59.83749' N   118° 34.74060' W (Local)
- Click Position (Projected Coordinates)
  (X) 354170.28 (Y) 3762979.25
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_26_12_SSS\line_47.sdf
- Ping Number: 143057
- Range to Target: -33.72 Meters
- Fish Height: 16.26 Meters
- Heading: 187.200 degrees
- Event Number: 0
- Line Name: line_47

Dimensions
Target Height: = 0 Meters
Target Length: 3 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target

T-08

- Sonar Time at Target: 04/28/2012 08:18:37
- Click Position (Lat/Lon Coordinates)
  34° 00.35728' N   118° 34.51583' W (Local)
- Click Position (Projected Coordinates)
  (X) 354531.00 (Y) 3763935.00
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_46.sdf
- Ping Number: 34452
- Range to Target: 17.90 Meters
- Fish Height: 11.72 Meters
- Heading: 185.700 degrees
- Event Number: 0
- Line Name: line_46

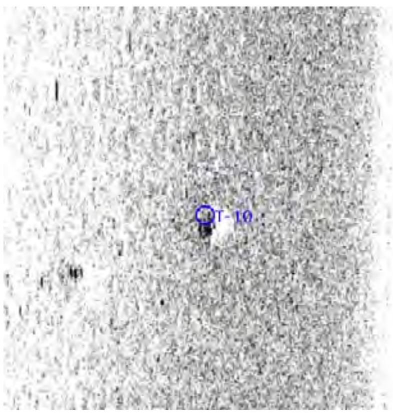
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target



T-09

- Sonar Time at Target: 04/28/2012 08:50:25
- Click Position (Lat/Lon Coordinates)
  34° 00.19615' N   118° 34.48104' W (Local)
- Click Position (Projected Coordinates)
  (X) 354579.66 (Y) 3763636.25
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_40.sdf
- Ping Number: 53341
- Range to Target: 38.61 Meters
- Fish Height: 11.10 Meters
- Heading: 13.300 degrees
- Event Number: 0
- Line Name: line_40

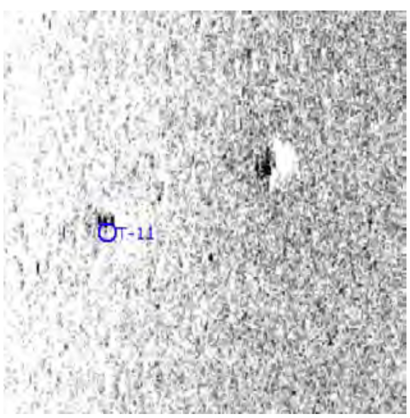
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target



T-10

- Sonar Time at Target: 04/29/2012 07:48:14
- Click Position (Lat/Lon Coordinates)
  34° 00.55160' N   118° 34.01275' W (Local)
- Click Position (Projected Coordinates)
  (X) 355311.03 (Y) 3764282.00
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LAWDP_4_29_12_SSS\line_34.sdf
- Ping Number: 18485
- Range to Target: -31.37 Meters
- Fish Height: 10.43 Meters
- Heading: 204.500 degrees
- Event Number: 0
- Line Name: line_34

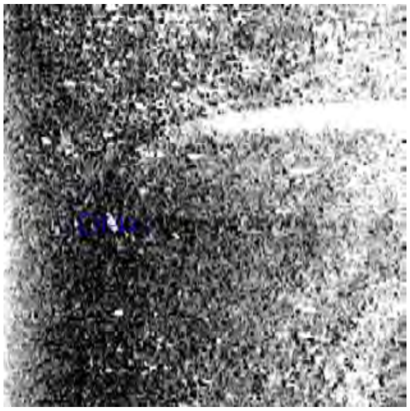
Dimensions
Target Height: = 0 Meters
Target Length: 3 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target



T-11

- Sonar Time at Target: 04/29/2012 07:48:17
- Click Position (Lat/Lon Coordinates)
  34° 00.54313' N   118° 34.00817' W (Local)
- Click Position (Projected Coordinates)
  (X) 355317.66 (Y) 3764266.25
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LAWDP_4_29_12_SSS\line_34.sdf
- Ping Number: 18515
- Range to Target: -46.43 Meters
- Fish Height: 10.53 Meters
- Heading: 205.400 degrees
- Event Number: 0
- Line Name: line_34

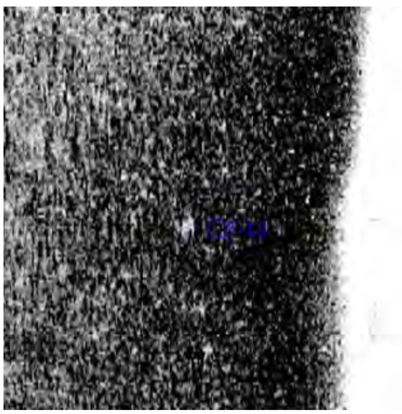
Dimensions
Target Height: = 0 Meters
Target Length: 2 Meters
Target Shadow: 1 Meters
Target Width: 2 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target



T-12

- Sonar Time at Target: 04/28/2012 12:03:12
- Click Position (Lat/Lon Coordinates)
  34° 01.97982' N   118° 33.37234' W (Local)
- Click Position (Projected Coordinates)
  (X) 356337.03 (Y) 3766906.50
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_38.sdf
- Ping Number: 167871
- Range to Target: 15.70 Meters
- Fish Height: 6.68 Meters
- Heading: 19.100 degrees
- Event Number: 0
- Line Name: line_38

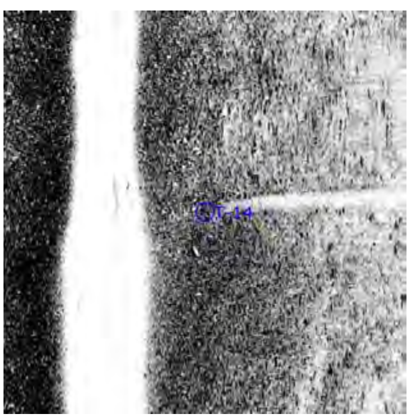
Dimensions
Target Height: = 0 Meters
Target Length: 0 Meters
Target Shadow: 0 Meters
Target Width: 0 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target - Possible abandoned crab pot with cut off buoy line



T-13

- Sonar Time at Target: 04/28/2012 12:03:13
- Click Position (Lat/Lon Coordinates)
  34° 01.98738' N   118° 33.39065' W (Local)
- Click Position (Projected Coordinates)
  (X) 356308.81 (Y) 3766921.25
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_38.sdf
- Ping Number: 167874
- Range to Target: 19.23 Meters
- Fish Height: 6.76 Meters
- Heading: 17.400 degrees
- Event Number: 0
- Line Name: line_38

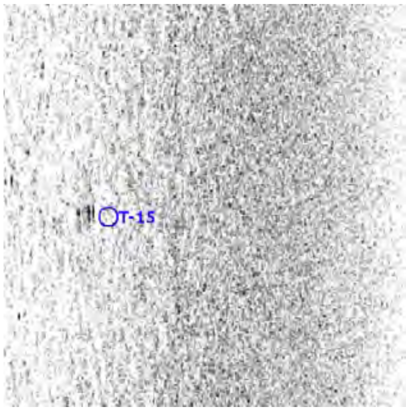
Dimensions
Target Height: = 1 Meters
Target Length: 2 Meters
Target Shadow: 2 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target



T-14

- Sonar Time at Target: 04/28/2012 12:03:09
- Click Position (Lat/Lon Coordinates)
  34° 01.97547' N   118° 33.37188' W (Local)
- Click Position (Projected Coordinates)
  (X) 356337.47 (Y) 3766898.50
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_38.sdf
- Ping Number: 167842
- Range to Target: 18.86 Meters
- Fish Height: 6.06 Meters
- Heading: 20.200 degrees
- Event Number: 0
- Line Name: line_38

Dimensions
Target Height: = 0 Meters
Target Length: 0 Meters
Target Shadow: 0 Meters
Target Width: 0 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Linear Target - Possible cut-off line from crab pot



T-15

- Sonar Time at Target: 04/28/2012 10:04:59
- Click Position (Lat/Lon Coordinates)
  33° 59.60334' N   118° 34.78866' W (Local)
- Click Position (Projected Coordinates)
  (X) 354089.59 (Y) 3762548.00
- Map Proj: UTM83-11
- Acoustic Source File: C:\SonarWiz-Projects\0464110025\XTF\LADWP_4_28_12_SSS\line_43.sdf
- Ping Number: 97637
- Range to Target: 49.44 Meters
- Fish Height: 12.04 Meters
- Heading: 188.600 degrees
- Event Number: 0
- Line Name: line_43

Dimensions

Target Height: = 0 Meters
Target Length: 3 Meters
Target Shadow: 1 Meters
Target Width: 1 Meters
Mag Anomaly:
Avoidance Area:
Classification 1:
Classification 2:
Area:
Block:
Description: Unidentified Target

D MARINE WILDLIFE MONITORING REPORT

padre
associates, inc.
ENGINEERS, GEOLOGISTS &
ENVIRONMENTAL SCIENTISTS

May 9, 2012

Padre Project No. 1102-1891 and -1892

Mr. Jeff Carothers, Survey Manager
Fugro Consultants, Inc.
4820 McGrath Street, Suite 100
Ventura, CA 93003-7778

Subject: Marine Wildlife Monitoring Report
Los Angeles Department of Water and Power (LADWP)
Santa Monica Bay Geophysical Survey

Dear Mr. Carothers:

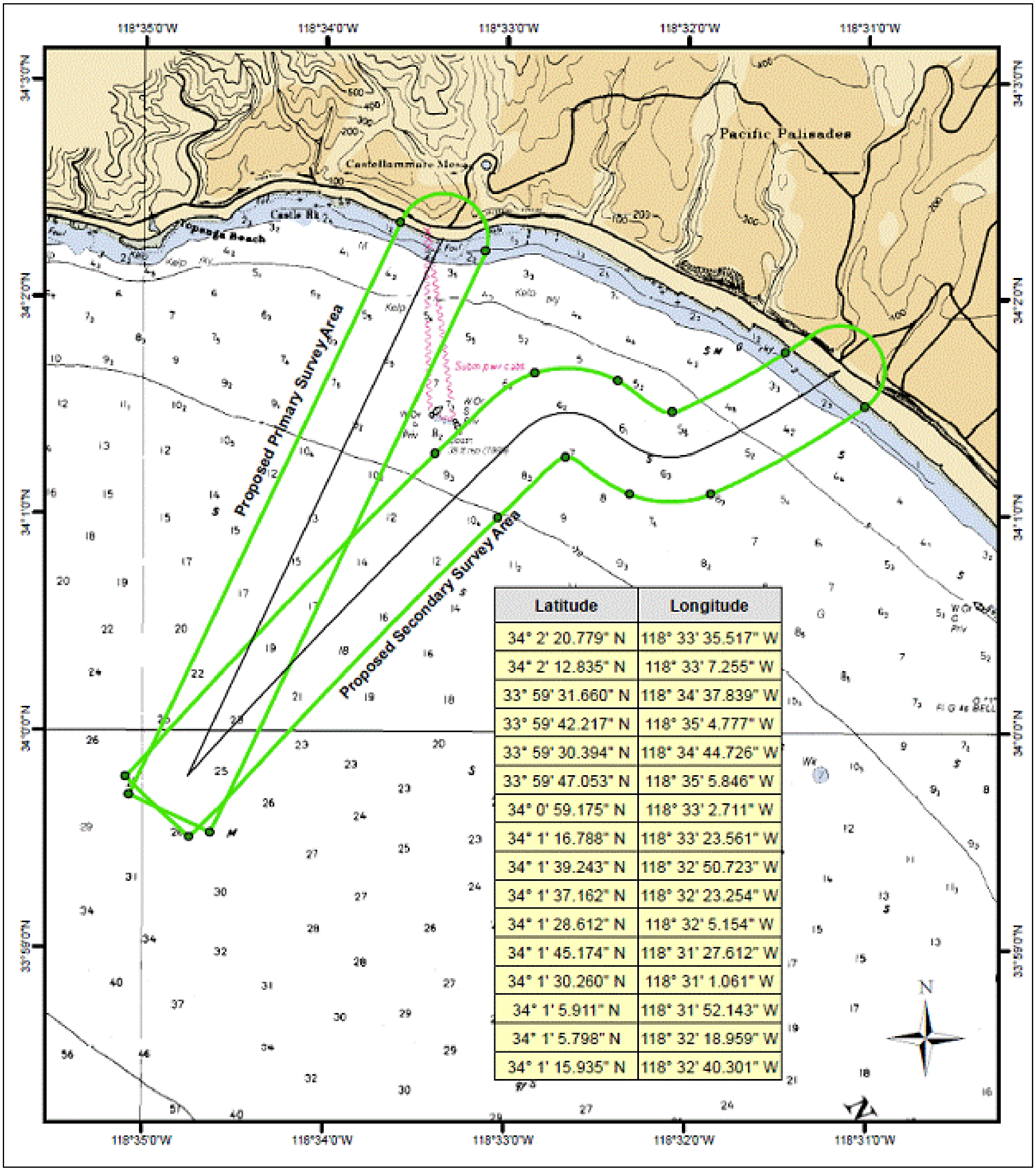
In accordance with the procedures outlined in the California State Lands Commission (CSLC)-approved project-specific Marine Wildlife Contingency Plan (MWCP), Padre Associates, Inc. (Padre) is pleased to submit this monitoring report for incorporation into Fugro's Field Operations Report. This report summarizes observations made by Padre's onboard marine wildlife monitor during: vessel transit to and from the survey area (Figure 1), geophysical data collection (April 25 through April 30, 2012), and multibeam data collection (May 1 through May 3, 2012). Both surveys were conducted during daylight hours (no nighttime operations) in water depths from approximately 15 to 100 feet (ft) (4.5 to 30 meters [m]) offshore Santa Monica, in Los Angeles County.

SURVEY METHODS AND EQUIPMENT

Geophysical Survey

The geophysical survey utilized the R/V *Westerly*, a 50 ft (15 m) vessel owned and operated by Zephyr Marine, Ventura. During the observation period, geophysical equipment consisted of a subbottom profiling (CHiRP) system, a magnetometer, and a side scan sonar system. The survey vessel initially mobilized from Ventura Harbor, Ventura County and transited to Marina del Rey (Los Angeles County). The vessel transited between Marina del Rey and the project site during each of the survey days. Each evening the survey vessel was docked in Marina del Rey.

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS



Latitude	Longitude
34° 2' 20.779" N	118° 33' 35.517" W
34° 2' 12.835" N	118° 33' 7.255" W
33° 59' 31.660" N	118° 34' 37.839" W
33° 59' 42.217" N	118° 35' 4.777" W
33° 59' 30.394" N	118° 34' 44.726" W
33° 59' 47.053" N	118° 35' 5.846" W
34° 0' 59.175" N	118° 33' 2.711" W
34° 1' 16.788" N	118° 33' 23.561" W
34° 1' 39.243" N	118° 32' 50.723" W
34° 1' 37.162" N	118° 32' 23.254" W
34° 1' 28.612" N	118° 32' 5.154" W
34° 1' 45.174" N	118° 31' 27.612" W
34° 1' 30.260" N	118° 31' 1.061" W
34° 1' 5.911" N	118° 31' 52.143" W
34° 1' 5.798" N	118° 32' 18.959" W
34° 1' 15.935" N	118° 32' 40.301" W

Figure 1 - Survey Area

Multibeam Survey

The multibeam survey utilized S/V *Taku,* a 36.0 ft (10.8 m) aluminum boat owned by Zephyr Marine, Ventura. During the observation period, survey equipment consisted of a multibeam bathymetry system. The survey vessel initially mobilized from Ventura Harbor, Ventura County and transited to Marine del Rey (Los Angeles County). The vessel also transited between Marina del Rey and the project site during each of the survey days. Each evening the survey vessel was docked in Marina del Rey.

MARINE WILDLIFE MONITORING METHODOLOGY

Transit Periods

While the survey vessels were in transit between Marina del Rey and the project site, the onboard wildlife monitor was located where observations of marine wildlife could be made within an approximately 200^o view area, centered on the direction of vessel travel. Marine wildlife observed while the vessel was transiting were noted on the observer's reporting form and the vessel operator was informed if an animal was observed and if a collision with the animal was imminent. A monitor was not onboard the vessels during transit to and from Ventura Harbor and Marine del Rey

Survey Periods

Once onsite and prior to initiating geophysical or multibeam data collection, the onboard marine wildlife observer was located amidships and surveyed the surrounding area while the survey crew readied the equipment for deployment. Once the survey equipment was deployed, the observer and s urvey chief coordinated the startup of the equipment. The survey chief informed the observer when the vessel was 10 minutes from the start point at which time the observer initiated observations within the 330 ft- (100 m-) radius safety zone utilizing 10 X 50 reticular binoculars. One minute prior to start up of geophysical equipment, the survey chief informed the observer and the equipment was turned on only after the observer indicated that there was no marine wildlife (defined herein as mammals or reptiles) within the safety zone. The 330 ft- (100 m-) radius safety zone was based on a previously-completed analysis of the distance between the sound source (survey equipment) and the 160 dBA re 1µPa rms sound level.

If marine wildlife was observed outside of the safety zone, the survey chief was informed and warned of possible alteration or termination of the data collection if the animals moved into the safety zone during equipment operation and displayed unusual behavior. The observer continued monitoring and recording the presence and activities of marine wildlife throughout geophysical data collection and also during vessel maneuvering when the equipment was "turned off". If marine wildlife approached the safety zone, the observer notified the survey chief who informed the vessel captain and s urvey crew, and an al ert of possible data collection termination was forwarded to all crew members. All observations were recorded on pre-printed log sheets.

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

Fishing Gear Clearance

In accordance with Section 3.3 of the project-specific MWCP, prior to the initiation of the geophysical data collection, the onboard observer noted the presence of commercial fishing gear within the survey area. For each fishing buoy observed within the project site, the location, the buoy number and water depth were recorded.

RESULTS

Appendix A provides two tables that detail the observations recorded by the onboard observer during the geophysical and multibeam surveys. Table A1 lists the observations during transit activities, and Table A2 details observations made during the two survey periods. The following summarizes the observations made during those periods.

Transit observations were made between Marina del Rey and the project site during each of the survey days. No observations were made during initial transit from Ventura Harbor to Marina del Rey. Marine mammal species observed during project area vessel transit were: California sea lions (*Zalophus californianus*), common dolphins (*Delphinus* spp), bottlenose dolphins (*Tursiops truncatus*), and unidentified dolphin species.

Observations recorded by the monitor during geophysical data collection (survey) activities included: California sea lions, and common and bottlenose dolphins.

During the pre-deployment observations, no commercial fishing gear was observed within the project site.

SUMMARY AND CONCLUSIONS

An estimated 375 individual marine mammals representing three identified taxa and one unidentified taxon were recorded during the approximately 64 hours of observations within the nine-day survey period (including transit and survey periods). No marine reptiles were observed during those periods. The mammals observed included two toothed whale species (common and bottlenose dolphin), and one pinniped (California sea lion). The two most commonly observed species were the common dolphin (250 individuals) and California sea lion (60 individuals). Table 1 below summarizes the number individuals recorded during the transit and survey periods.

During the nine observation days, on one occasion the survey observations were delayed due to the presence of a marine mammals within the safety zone. In addition, on one occasion, the onboard observer requested that the survey vessel's speed be slowed to less than three knots and that the operator alter vessel course during transit to avoid potential vessel interaction with marine mammals. These actions were precautionary as no negative effects from the vessel or related to the geophysical equipment on marine wildlife were observed throughout the survey and transit periods. It is important to note that on several occasions, the

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

marine mammals swam directly under or were immediately adjacent to the deployed and operating equipment, but displayed no apparent negative behaviors or effects.

Table 1 Summary of Marine Mammals Recorded

Taxa	Number of Individuals		
	Transit	Survey	Total
Common dolphin[1]	125	125	250
California sea lion[1]	50	10	60
Unidentified dolphins	55	0	55
Bottlenose dolphin	5	5	10
Total	*235*	*140*	*375*

[1] Multiple observations of same individuals could have occurred.

In summary, the animals observed during the transit and survey periods are considered relatively common within Santa Monica Bay and the Southern California Bight and no unusual marine mammal behavior was recorded. Based on the observations of Padre's marine wildlife monitor, and with the cooperative efforts of the Fugro survey team and vessel crew, no significant negative, survey-related effects to marine wildlife were observed.

Please feel free to contact me should you or your staff have any questions or should you require additional information.

Sincerely,
PADRE ASSOCIATES, INC.

Jennifer Klaib
Staff Marine Biologist

Attachments: Appendix A. Table A1 - Marine Wildlife Observations During Vessel Transit
Table A2 - Marine Wildlife Observations During Geophysical and Multibeam Surveys

cc: S. Poulter (Padre, Goleta)
R. de Wit (Padre, Concord)

padre associates, inc.
ENGINEERS, GEOLOGISTS &
ENVIRONMENTAL SCIENTISTS

APPENDIX A

Marine Wildlife Observations Tables

Table A1 - Marine Wildlife Observations During Vessel Transit

Date	Total Transit Time	Marine Wildlife Observed During Transit	Action Taken/Notes
Geophysical Survey			
April 25, 2012	1 hour (hr) 2 minutes (min)	17 California sea lions 75 Common dolphins 55 Unidentified dolphins	
April 26, 2012	1 hr 1 min	3 California sea lions 50 Common dolphins 5 Bottlenose dolphins	A group of 50 common dolphins were observed feeding approximately 500 feet (ft) (152 meters [m]) off the bow of the vessel. The vessel captain was requested to reduce speed and to maintain a 330 ft (100 m) distance. The captain altered the course of the vessel and maintained a 330 ft (100 m) distance. No disturbance was observed
April 27, 2012	1 hr 3 min	6 California sea lions	
April 28, 2012	58 min	3 California sea lions	
April 29, 2012	1 hr 5 min	7 California sea lions	
April 30, 2012	1 hr 10 min	8 California sea lions	
Multibeam Survey			
May 1, 2012	55 min	2 California sea lions	
May 2, 2012	1 hr 5 min	3 California sea lions	
May 3, 2012	1 hr 15 min	1 California Sea lions	

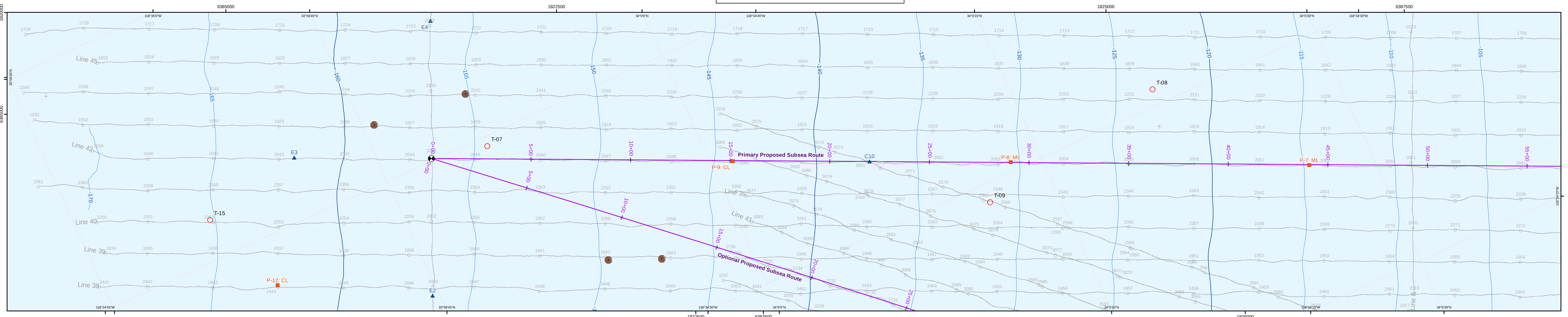
Table A2 - Marine Wildlife Observations During Geophysical and Multibeam Surveys

Date	Total Survey Time	Marine Wildlife observed in Safety Zone	Action Taken/Notes
Geophysical Survey			
April 25, 2012	2 hrs 12 min	4 California sea lions	No distress observed.
April 26, 2012	8 hrs 33 min	2 California sea lions 3 Bottlenose dolphins	No distress observed.
April 27, 2012	14 min	None observed	
April 28, 2012	9 hrs 30 min	1 California sea lion 2 Bottlenose dolphins	2 Bottlenose dolphins were observed within the safety zone prior to equipment start-up. Equipment start-up was delayed by 10 min until dolphins were observed outside of safety zone. No distress observed.
April 29, 2012	9 hrs 56 min	125 Common dolphins	No distress observed.
April 30, 2012	5 hrs 41 min	None observed	
Multibeam Survey			
May 1, 2012	3 hrs 50 min	None observed	
May 2, 2012	7 hrs 21 min	2 California sea lions	No distress observed
May 3, 2012	7 hrs 14 min	1 California sea lion	No distress observed

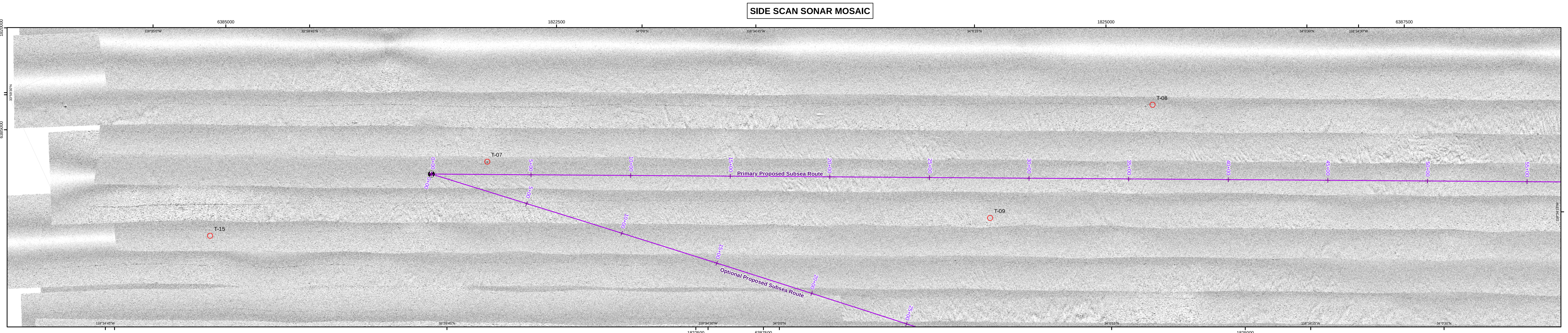
E DIGITAL FILES (To be included in Final Report)

F PLATES

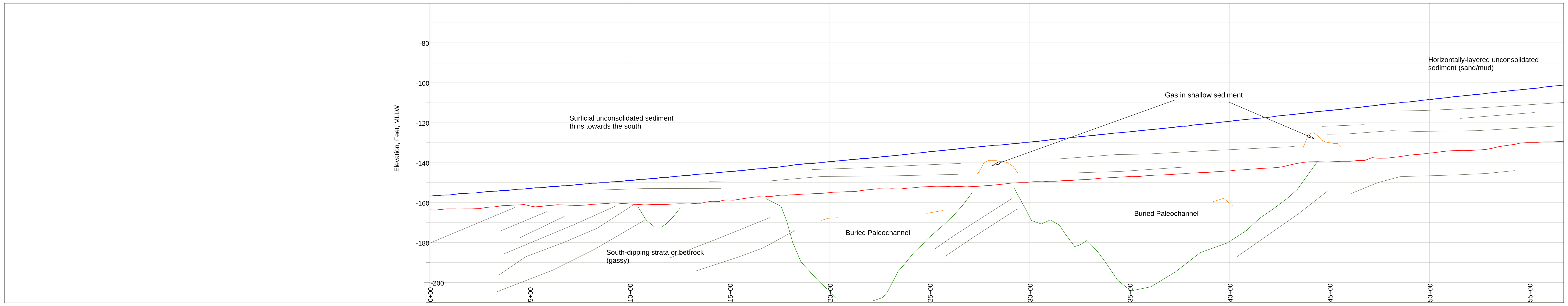
BATHYMETRY AND SEAFLOOR FEATURES



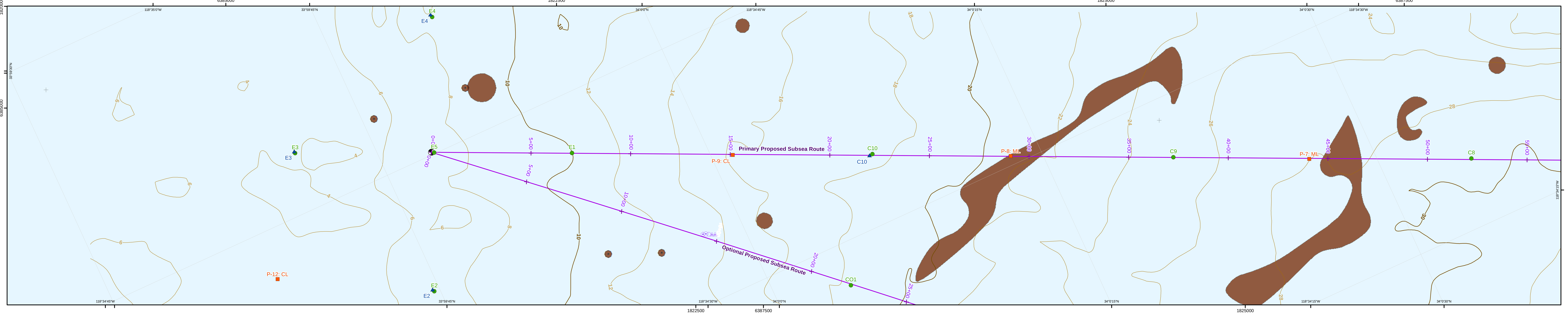
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)

- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey

- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach

- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure

- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations

- P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features

- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles

- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)

- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

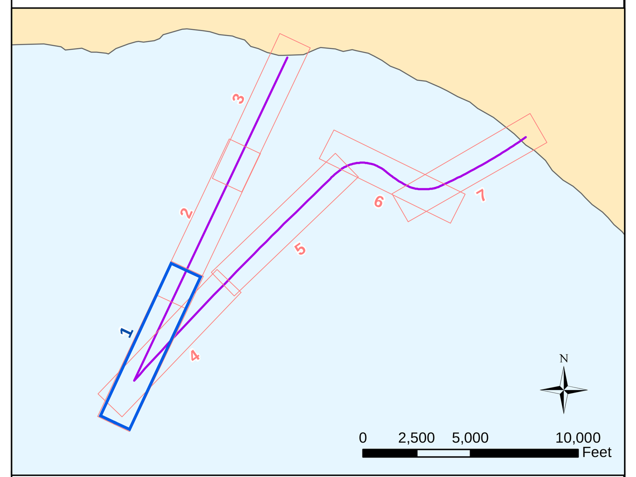
4. PRIMARY PROPOSED SUBSEA ROUTE STATION 166+27 LOCATION: E 6393232, N 1836640, 34° 2.279' N, 118° 33.356' W .

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012
Santa Monica Basin, California

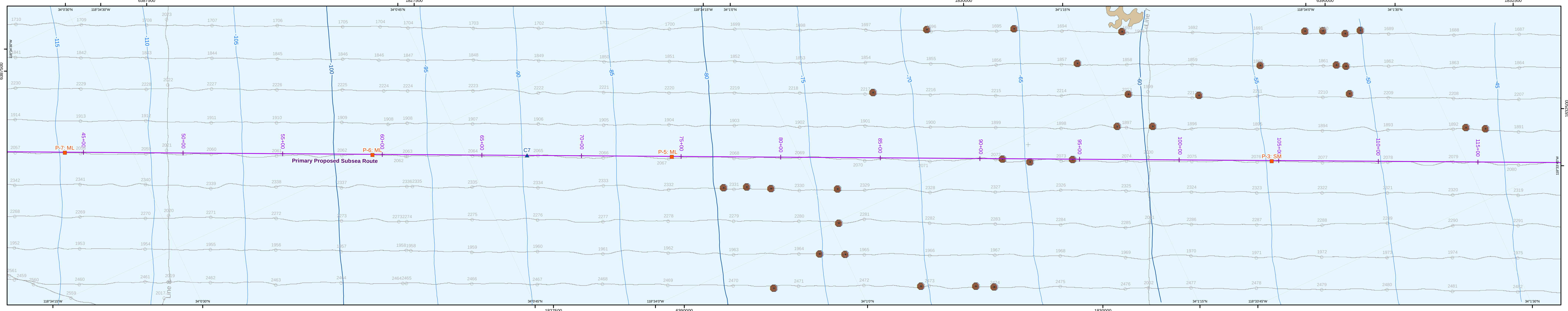
SCALE : 1 in = 200 ft

200 100 0 200 400 600 800 Feet

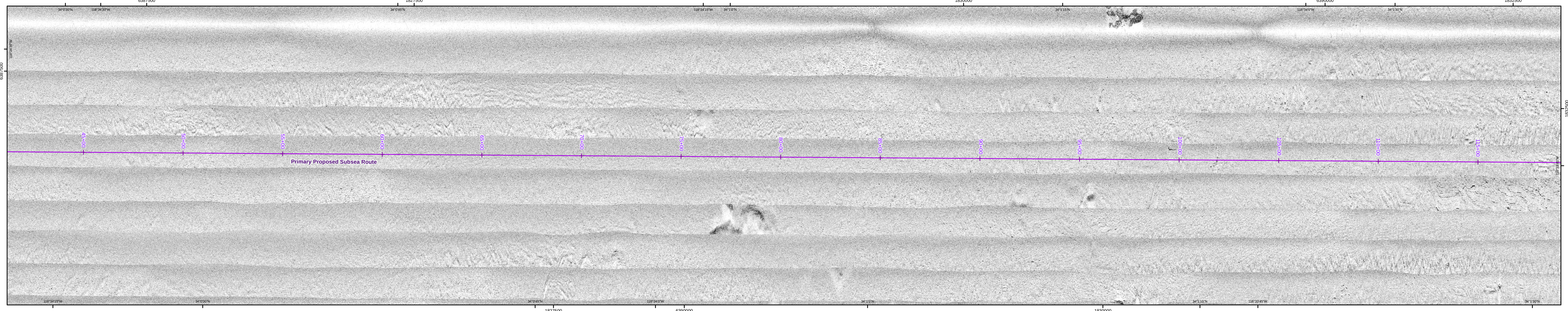
REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

PROJECT NO.: 04.64110025-1 PLATE NO.: **1 of 7**

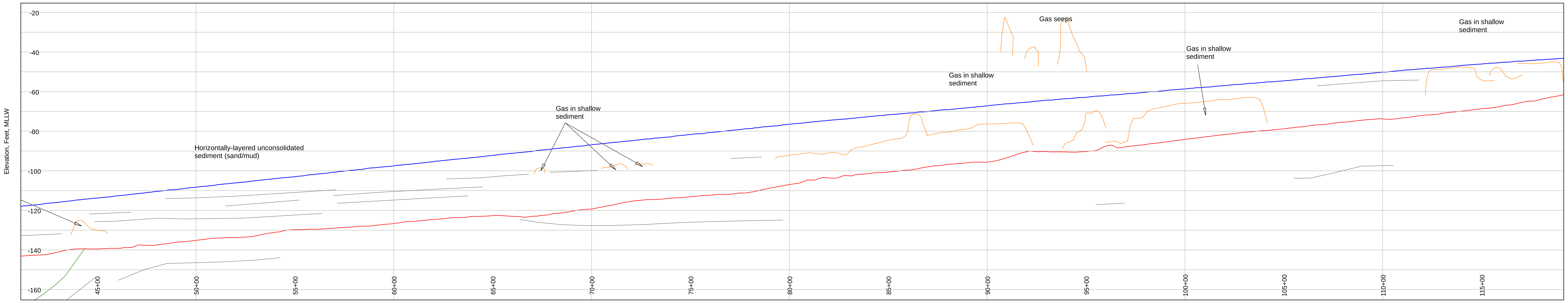
BATHYMETRY AND SEAFLOOR FEATURES



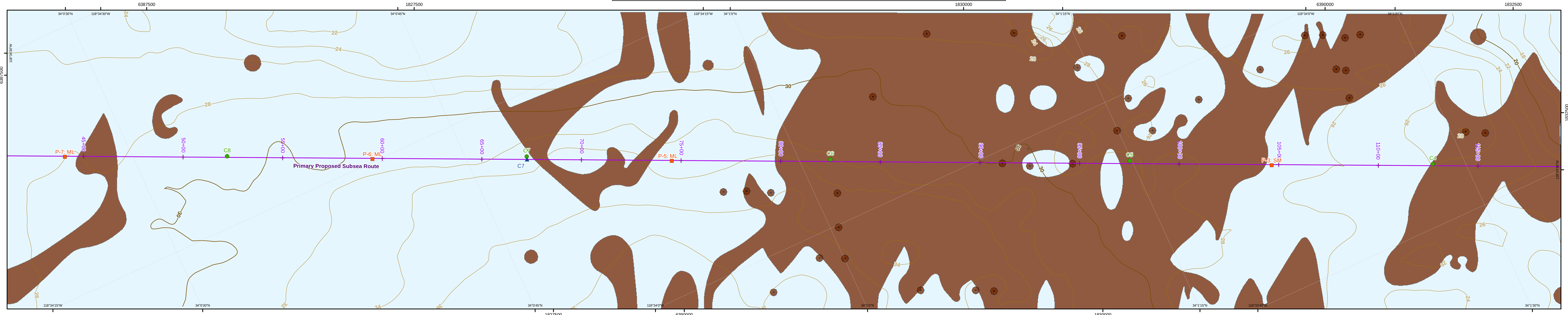
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)

- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey

- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach

- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure

- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations

- P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features

- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles

- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)

- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

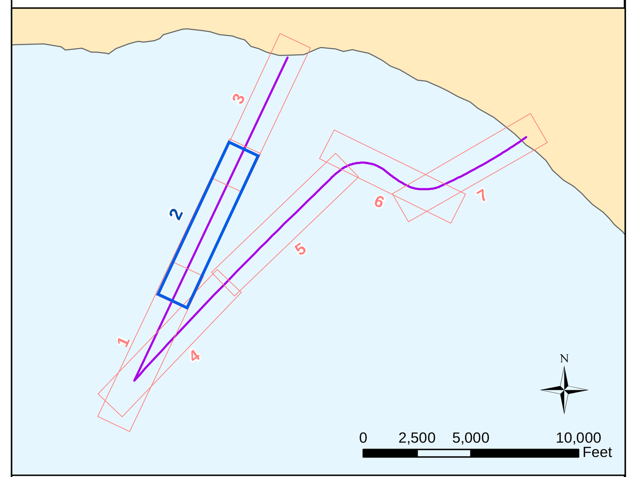
4. PRIMARY PROPOSED SUBSEA ROUTE STATION 166+27 LOCATION: E 6393232, N 1836640, 34° 2.279' N, 118° 33.356' W .

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

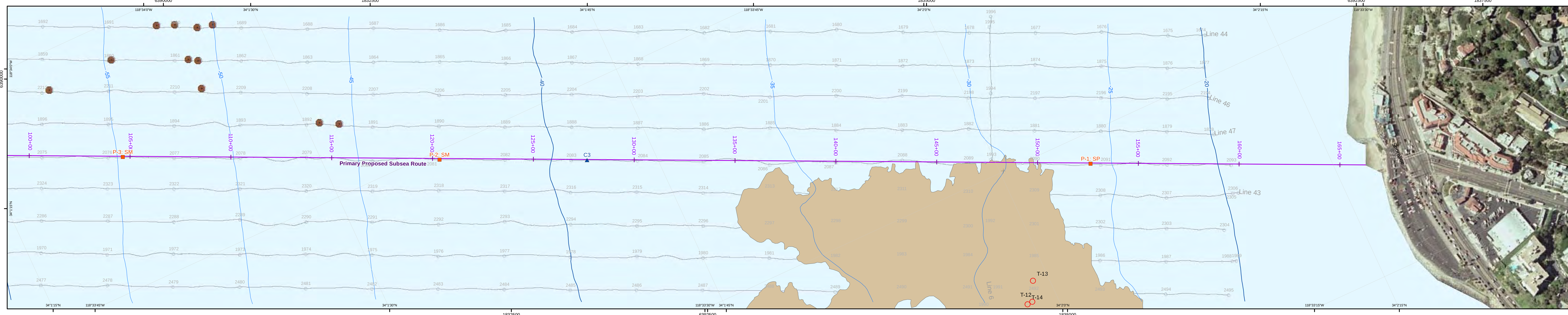
June 2012
Santa Monica Basin, California

SCALE : 1 in = 200 ft

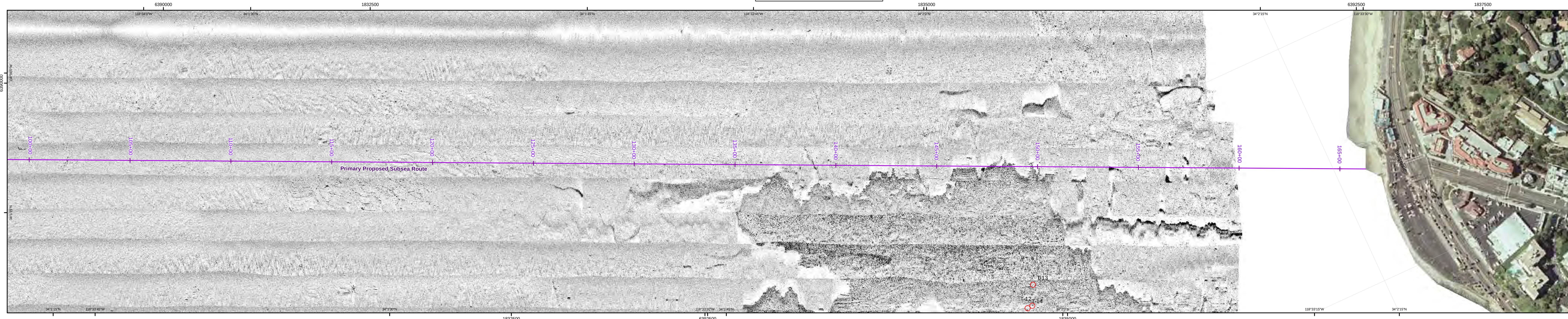
REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

PROJECT NO.: 04.64110025-1

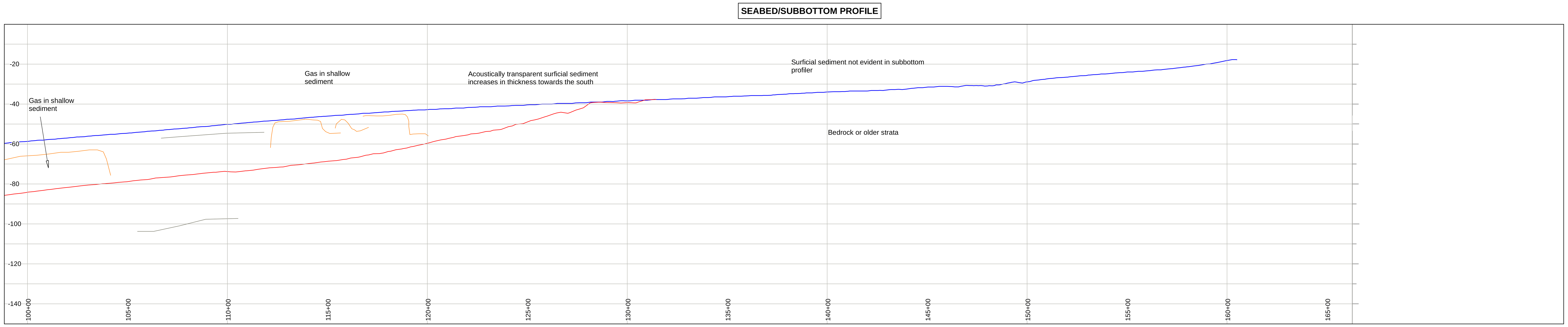
BATHYMETRY AND SEAFLOOR FEATURES



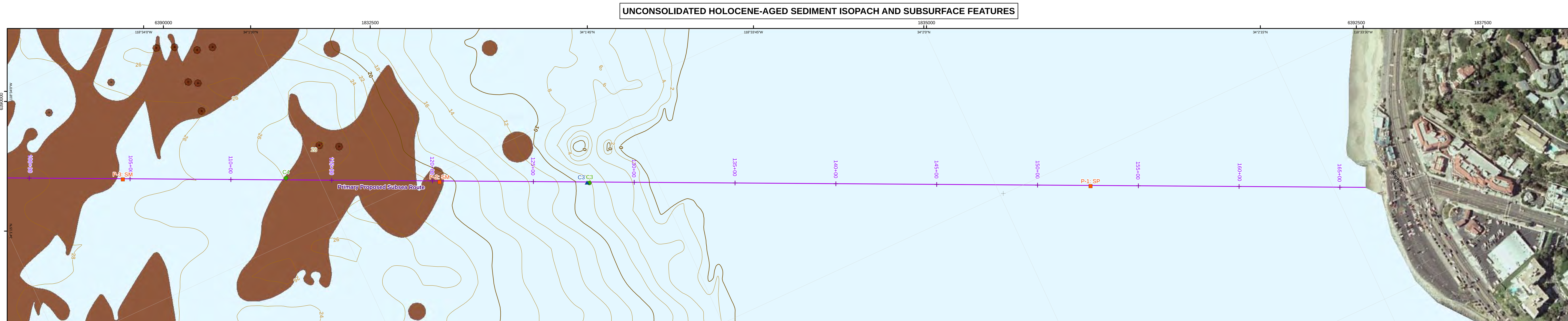
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)

- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey

- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach

- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure

- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations

- P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features

- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles

- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)

- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

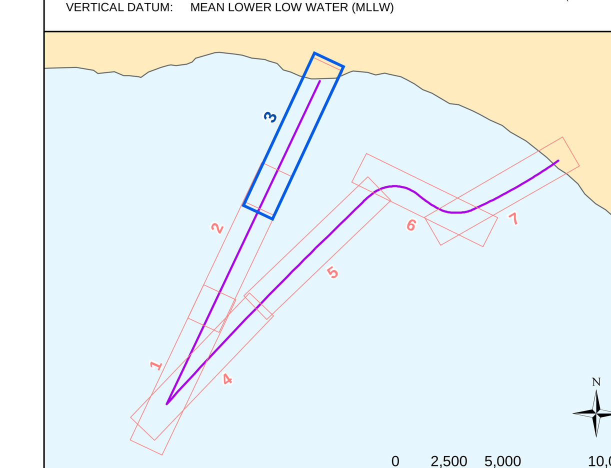
4. PRIMARY PROPOSED SUBSEA ROUTE STATION 166+27 LOCATION: E 6393232, N 1836640, 34° 2.279' N, 118° 33.356' W .

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012
Santa Monica Basin, California

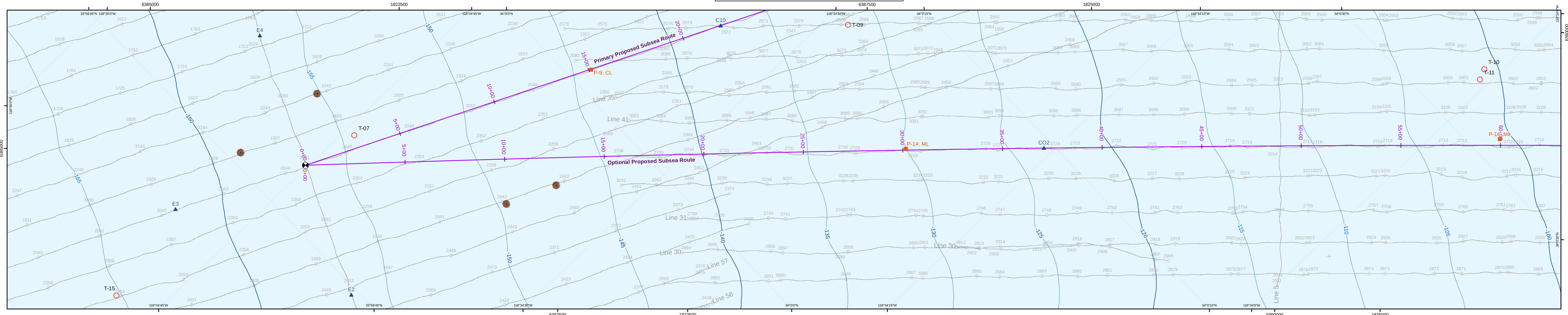
SCALE : 1 in = 200 ft

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

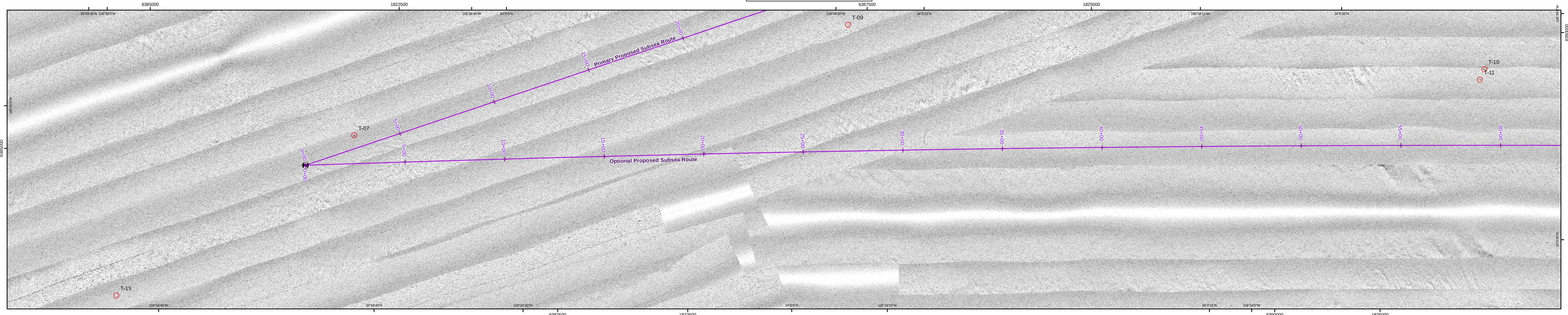
PROJECT NO.: 04.64110025-1

PLATE NO.: 3 of 10

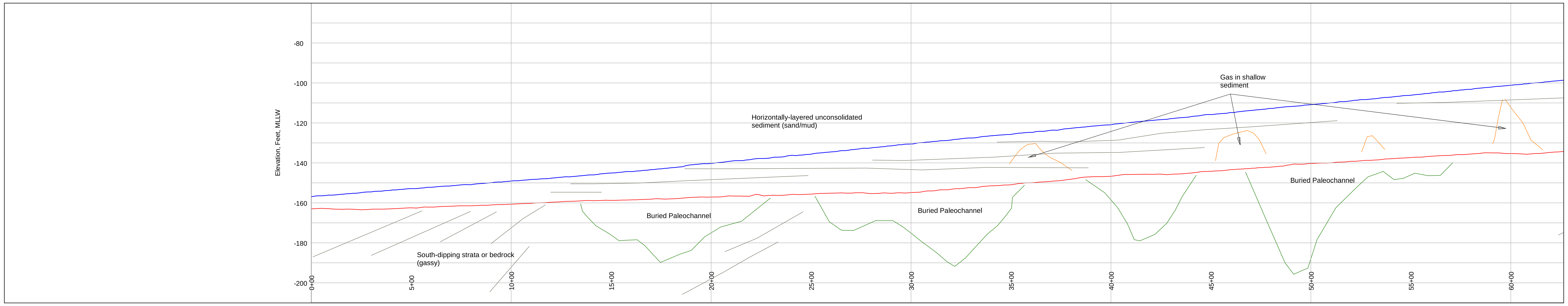
BATHYMETRY AND SEAFLOOR FEATURES



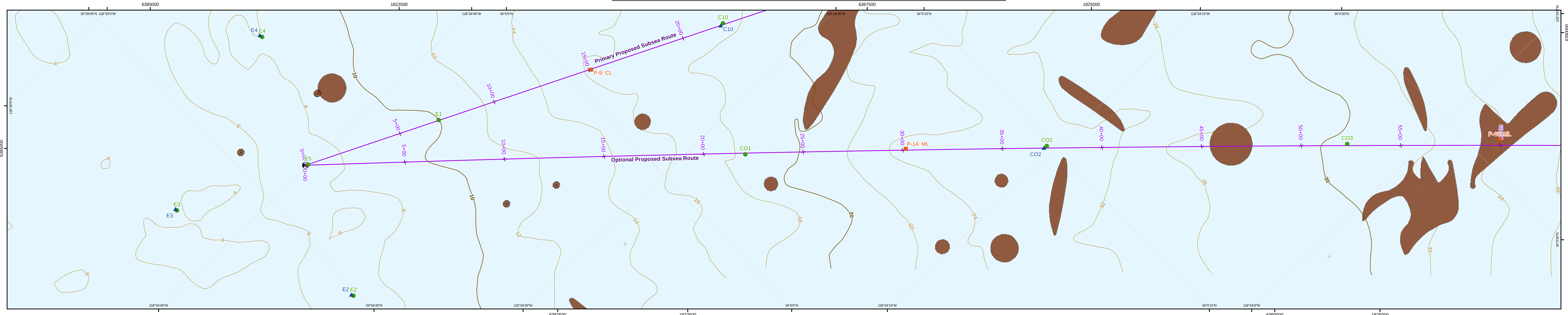
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)
- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey
- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach
- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure
- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations
- P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features
- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles
- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)
- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

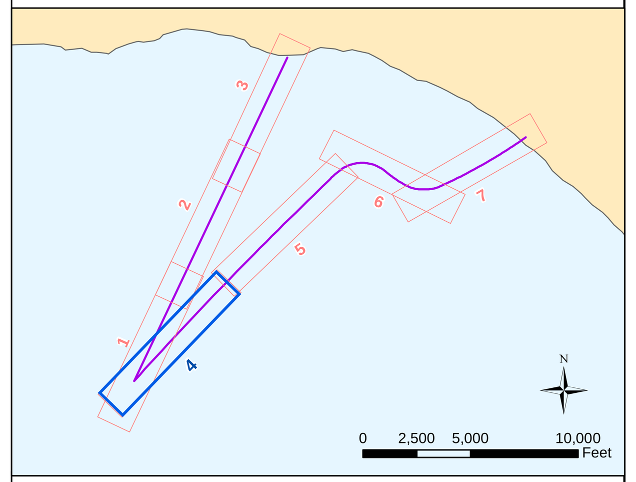
4. OPTIONAL PROPOSED SUBSEA ROUTE STATION 233+69 LOCATION: E 6404313, N 1832938, 34° 1.673' N, 118° 31.159' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012
Santa Monica Basin, California

SCALE : 1 in = 200 ft

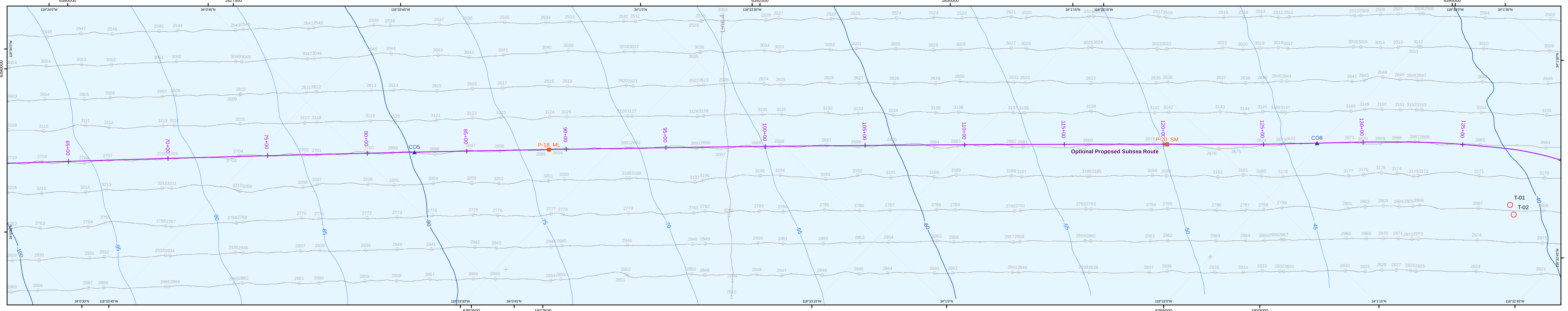
200 100 0 200 400 600 800 Feet

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

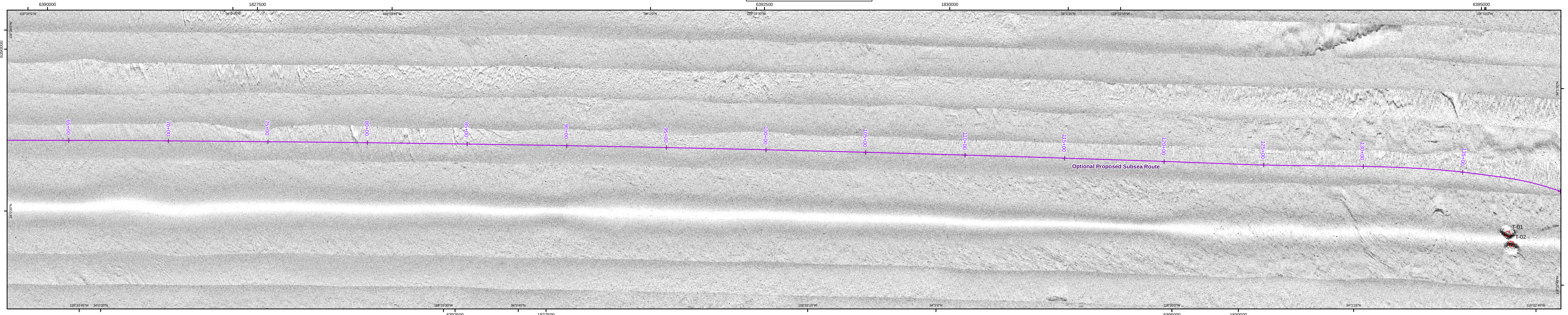
PROJECT NO.: 04.64110025-1

PLATE NO.: 4 of 7

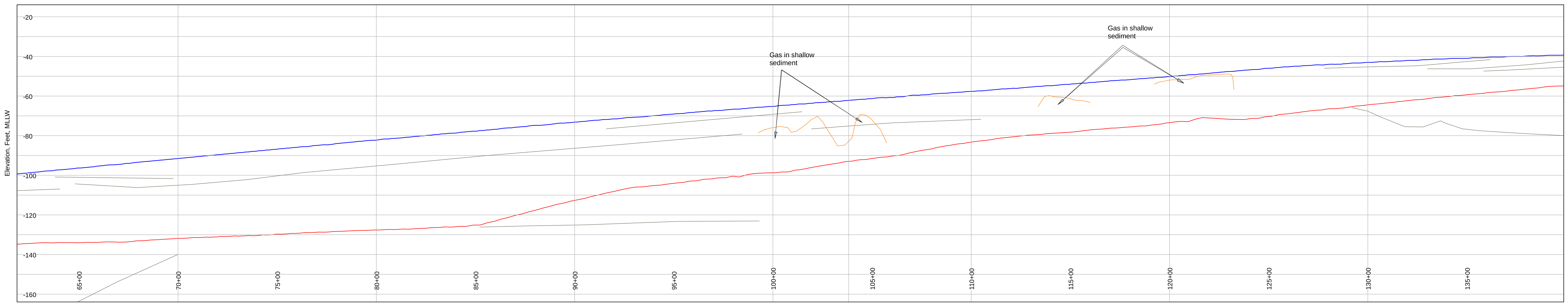
BATHYMETRY AND SEAFLOOR FEATURES



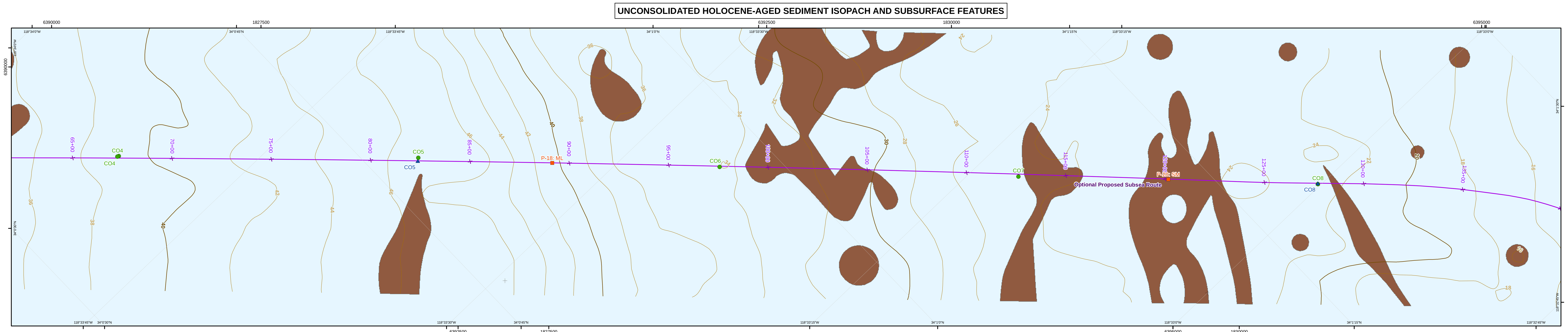
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)

- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey

- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach

- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure

- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations

P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features

- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles

- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)

- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

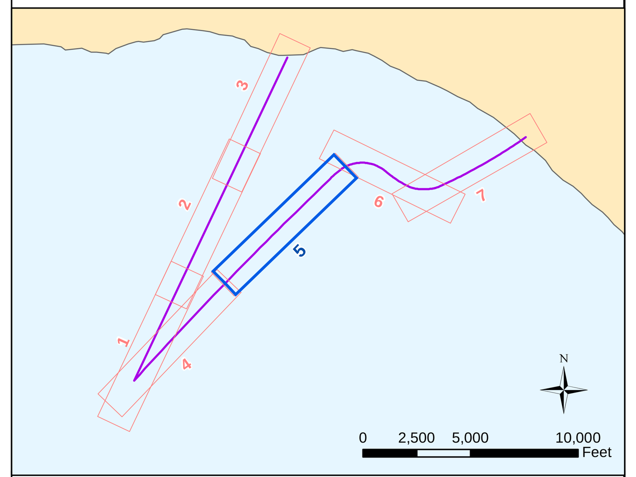
4. OPTIONAL PROPOSED SUBSEA ROUTE STATION 233+69 LOCATION: E 6404313, N 1832938, 34° 1.673' N, 118° 31.159' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012
Santa Monica Basin, California

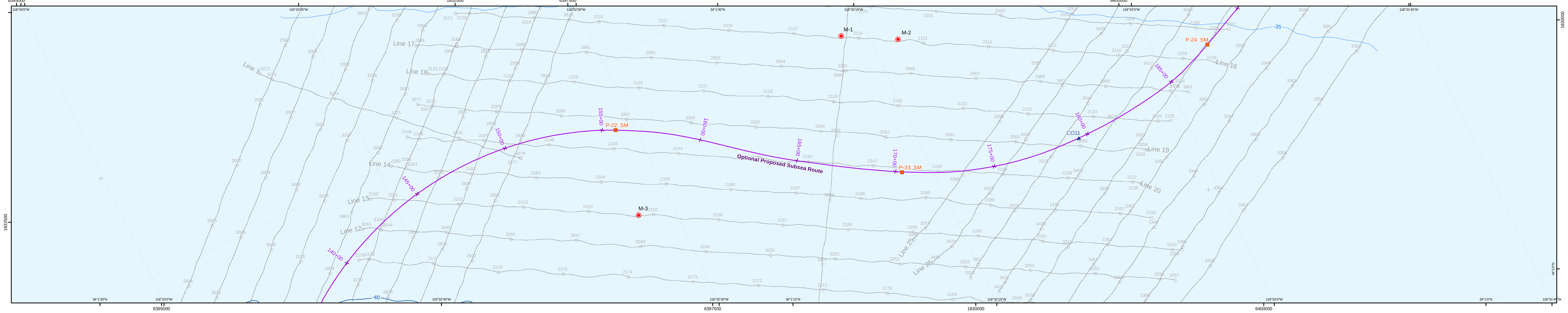
SCALE : 1 in = 200 ft

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

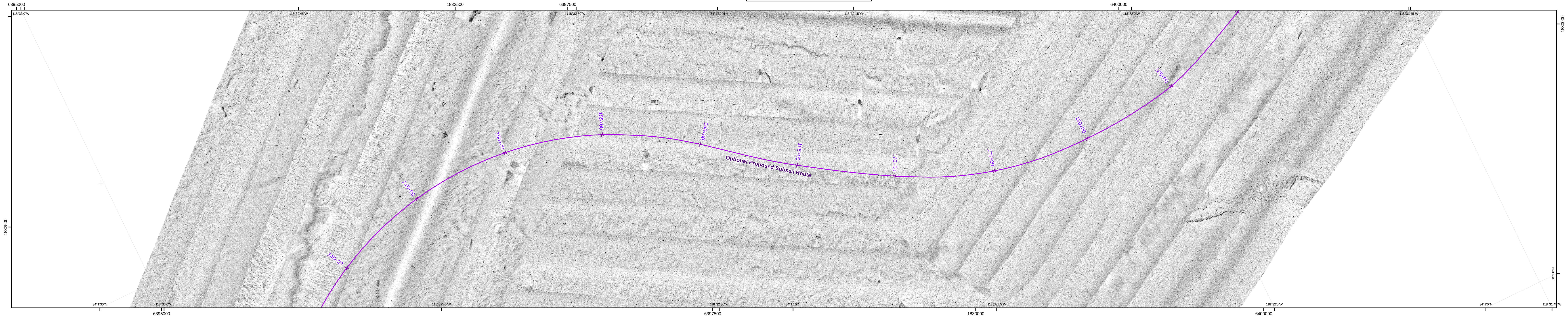
PROJECT NO.: 04.64110025-1

PLATE NO.: 5 of 7

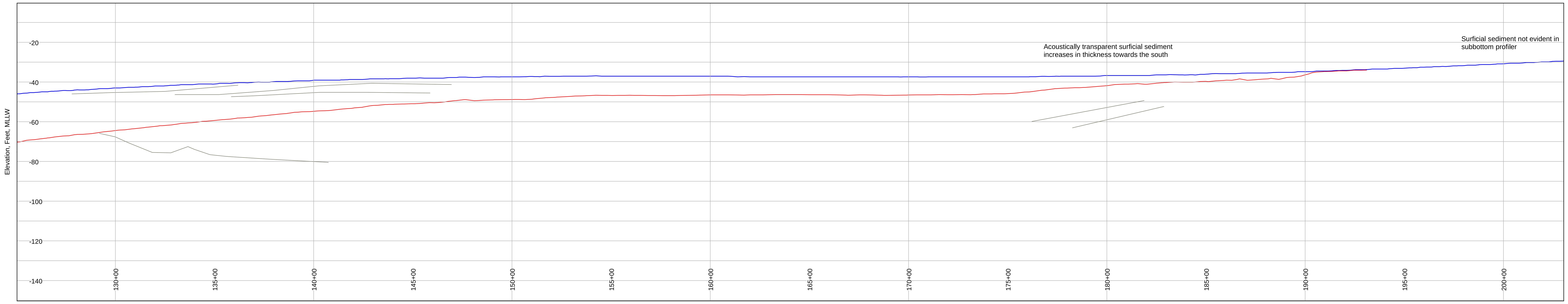
BATHYMETRY AND SEAFLOOR FEATURES



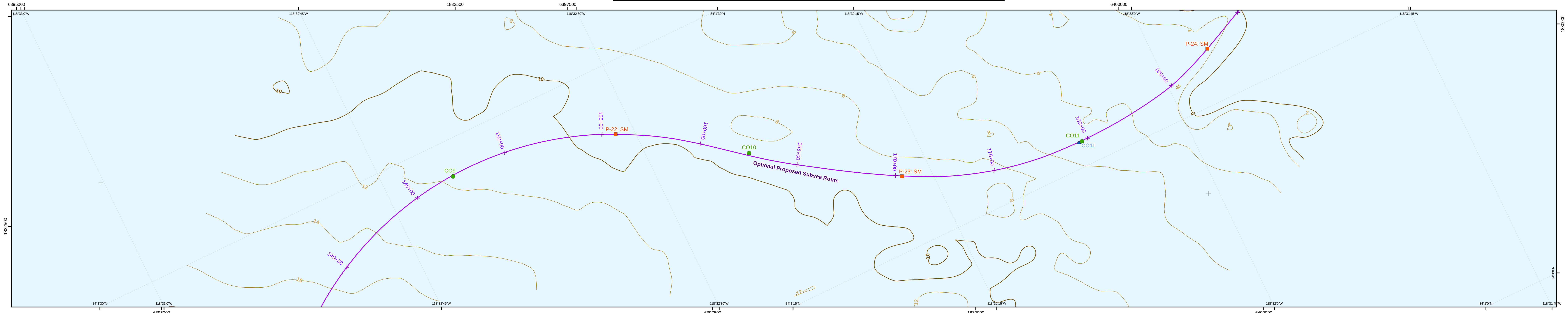
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)
- Major Contours- contour interval = 20'
- Minor Contours- contour interval = 5'

Geophysical Survey
- LINE 701 — Trackline and Line Number
- 300 — Shotpoint and Label

Sediment Isopach
- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Infrastructure
- 230+00 — Proposed Subsea Cable Route and Stationing
- Proposed Electrode Site

Explorations
- P-1: Identification — Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Seafloor Features
- T-004 Side Scan Sonar Target with ID
- M-01 Magnetometer Anomaly with ID
- Gas Seeps
- Gassy Sediments
- Area of Rock Outcropping

Profiles
- Seafloor
- Gas in Shallow Sediment
- Apparent Dip of Reflectors
- Buried Paleochannel
- Horizon A

Map Extents (in Key Map)
- Map Extents
- Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

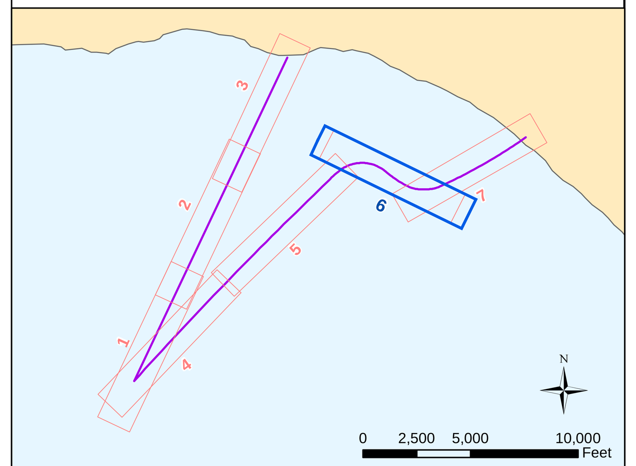
1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.
2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.
3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.
4. OPTIONAL PROPOSED SUBSEA ROUTE STATION 233+69 LOCATION: E 6404313, N 1832938, 34° 1.673' N, 118° 31.159' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012
Santa Monica Basin, California

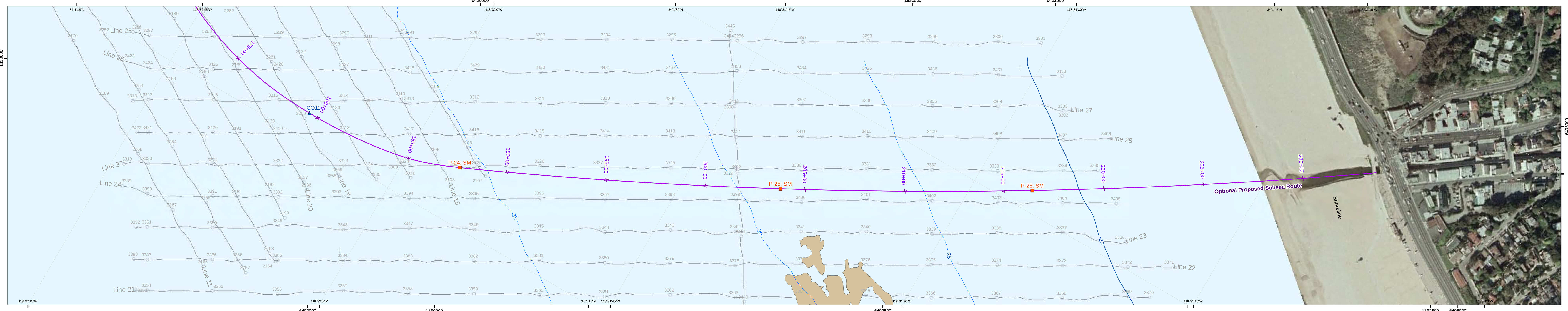
SCALE : 1 in = 200 ft

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

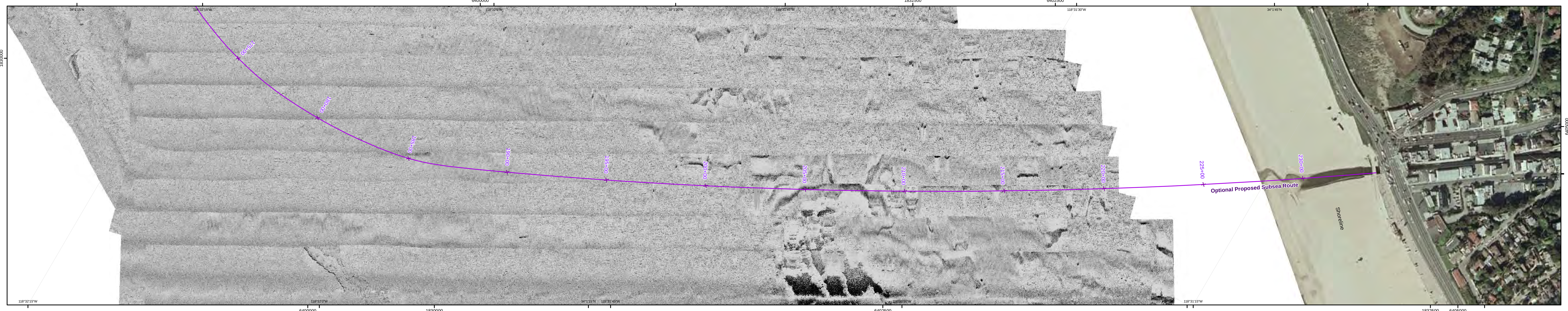
PROJECT NO.: 04.64110025-1

PLATE NO.: 6 of 7

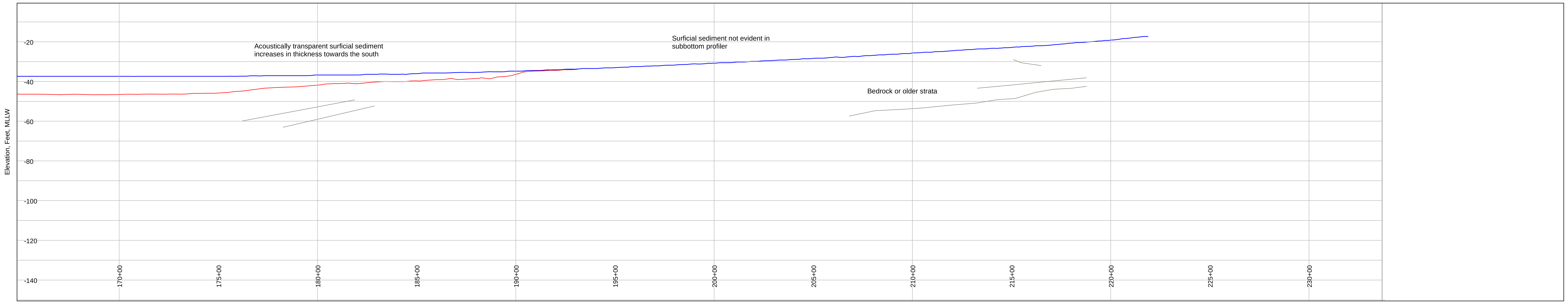
BATHYMETRY AND SEAFLOOR FEATURES



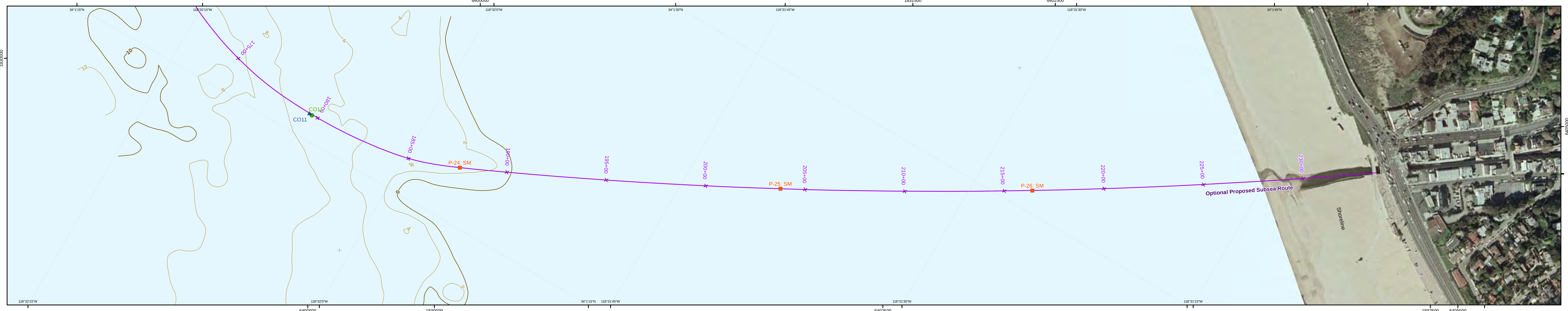
SIDE SCAN SONAR MOSAIC



SEABED/SUBBOTTOM PROFILE



UNCONSOLIDATED HOLOCENE-AGED SEDIMENT ISOPACH AND SUBSURFACE FEATURES



Legend

Bathymetry (Feet, MLLW)

Major Contours- contour interval = 20'
Minor Contours- contour interval = 5'

Geophysical Survey

LINE 701 Trackline and Line Number
300 Shotpoint and Label

Sediment Isopach

Major Contours- contour interval = 10'
Minor Contours- contour interval = 2'

Infrastructure

230+00 Proposed Subsea Cable Route and Stationing
Proposed Electrode Site

Explorations

P-1: Identification
Grab Sample Location and Identification

Identification	Description
SP	Sand
SM	Silty Sand
ML	Sandy Silt
CL	Clay with Sand

C10 Vibracore Location
C10 Thermal Resistivity Location

Seafloor Features

T-004 Side Scan Sonar Target with ID
M-01 Magnetometer Anomaly with ID
Gas Seeps
Gassy Sediments
Area of Rock Outcropping

Profiles

Seafloor
Gas in Shallow Sediment
Apparent Dip of Reflectors
Buried Paleochannel
Horizon A

Map Extents (in Key Map)

Map Extents
Current Map Extent

Note: All legend items will not appear on all maps.

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

DRAFT

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

4. OPTIONAL PROPOSED SUBSEA ROUTE STATION 233+69 LOCATION: E 6404313, N 1832938, 34° 1.673' N, 118° 31.159' W.

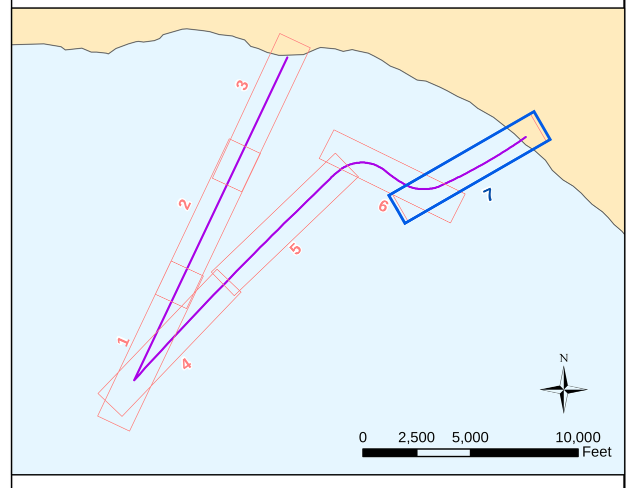
This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM: NAD83
PROJECTION: LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE: 5
UNITS: US SURVEY FEET
VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW)

N



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100
Ventura, California 93003
Tel: (805) 650-7000
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

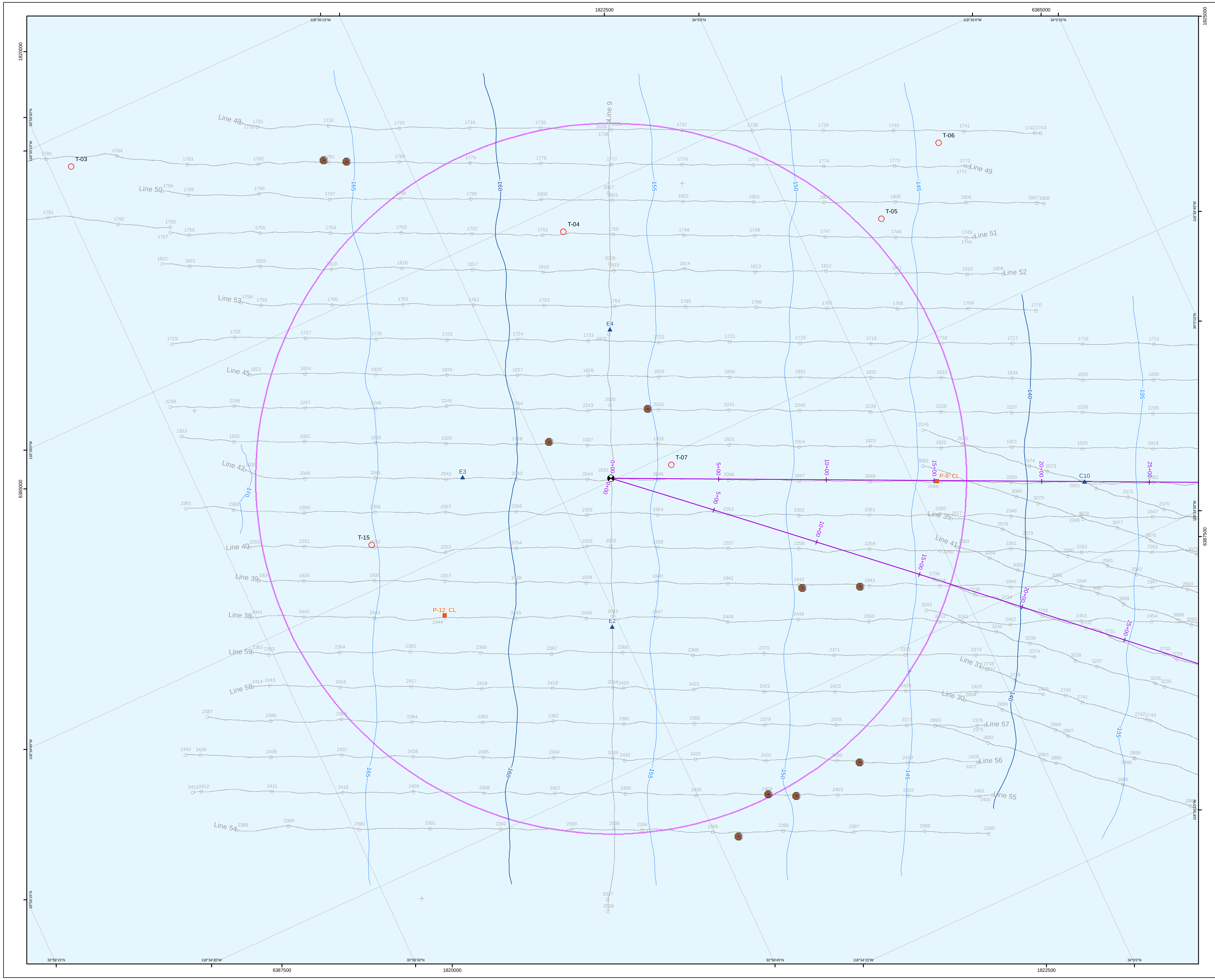
June 2012
Santa Monica Basin, California

SCALE : 1 in = 200 ft

200 100 0 200 400 600 800 Feet

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Alignment Charts	DRP	CLP	ES

PROJECT NO.: 04.64110025-1 | PLATE NO.: 7 of 7



Legend

Bathymetry (Feet, MLLW)
- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 5'

Geophysical Survey
- LINE 701 — Trackline and Line Number
- 300 Shotpoint and Label

Seafloor Features
- T-004 Side Scan Sonar Target with ID
- M-01 Magnetometer Anomaly with ID
- Gas Seeps

Explorations
- P-1: Identification — Grab Sample Location and Identification (CL = Clay with Sand)
- C10 Vibracore Location
- C10 Thermal Resistivity Location

Infrastructure
- 230+00 Proposed Subsea Cable Route and Stationing
- Electrode Survey Extents
- Proposed Electrode Site

Map Extents (in Key Map)
- Map Extents
- Current Map Extent

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)

FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100,
Ventura, California 93003
Tel: (805) 650-7000,
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell
SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012

Santa Monica Basin, California

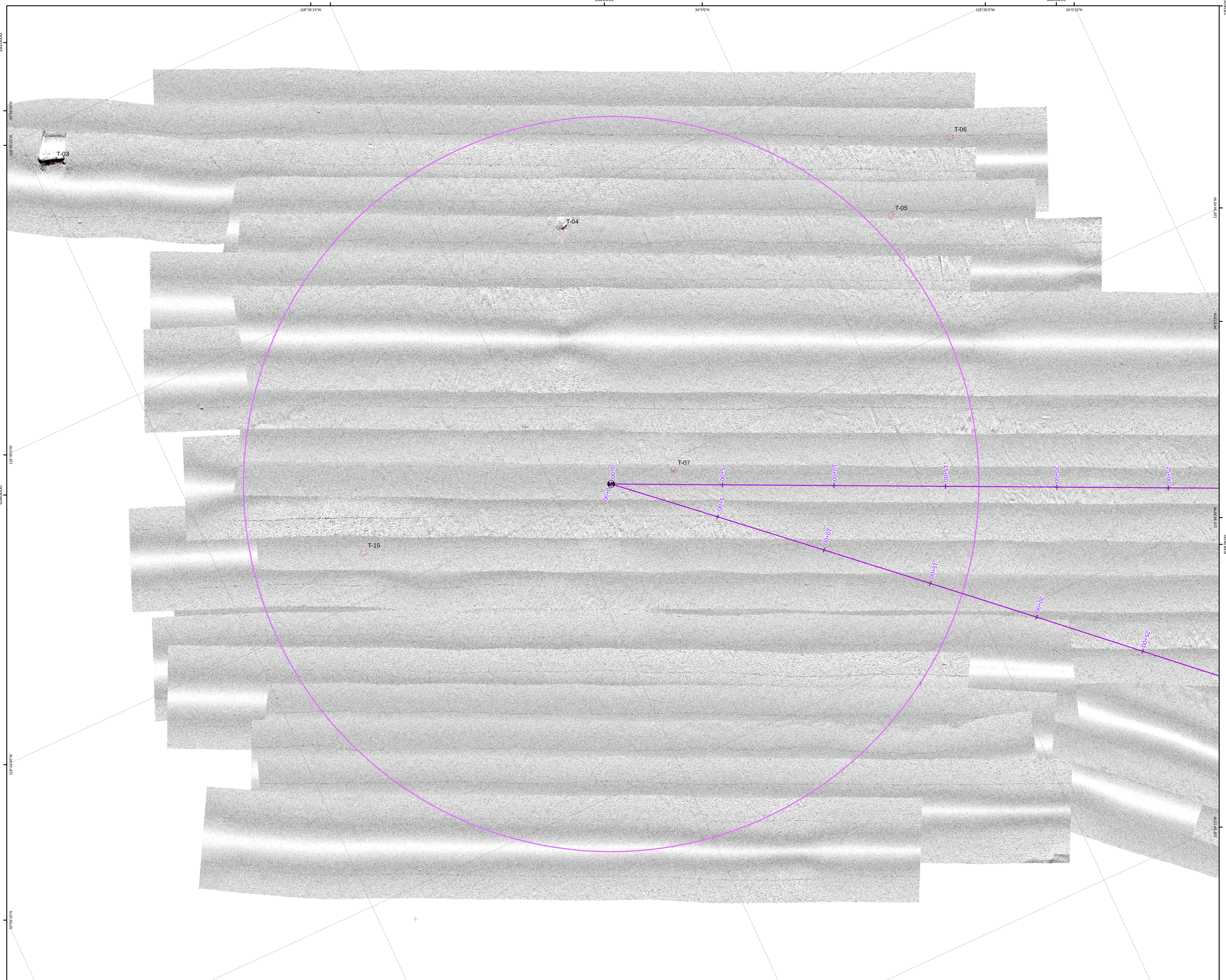
SCALE : 1 inch = 200 feet

200 100 0 200 400 Feet

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Electrode Location Map - Bathymetry/Seafloor Features	DRP	CLP	DES

04.64110025-2 CHART NO.: 1 of 3

N:\Projects\04_2011\04_6411_0025_LADWP_GeoSurvey\Outputs\03May12_DraftReport\mxd\Ch&O-1_ProposedElectrode.mxd, 06/11/12, cpratt



Legend

Seafloor Features

- T-004 — Side Scan Sonar Target with ID
- M-01 — Magnetometer Anomaly with ID

Infrastructure

- 230+00 — Proposed Subsea Cable Route and Stationing
- Electrode Site Survey Extents
- Proposed Electrode Site

Map Extents (in Key Map)

- Map Extents
- Current Map Extent

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.

2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.

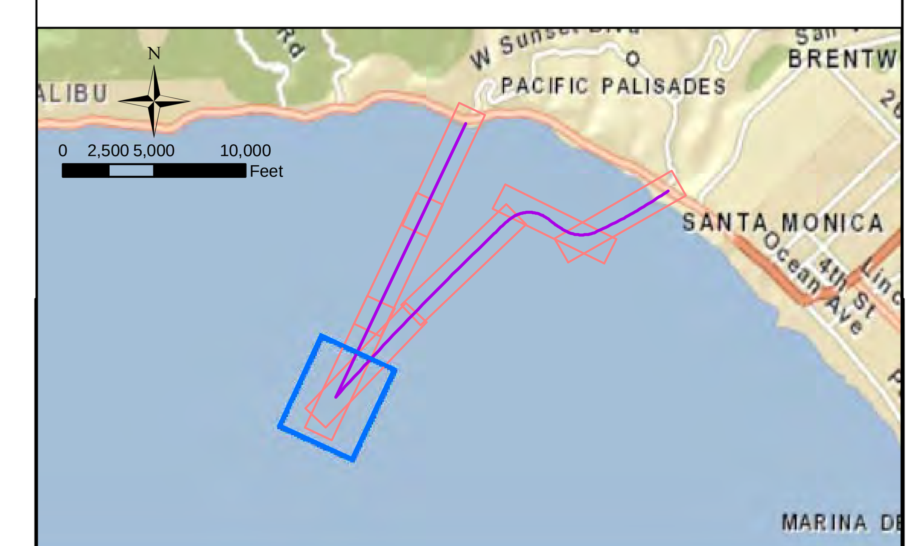
3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)



FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100,
Ventura, California 93003
Tel: (805) 650-7000,
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell
SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012

Santa Monica Basin, California

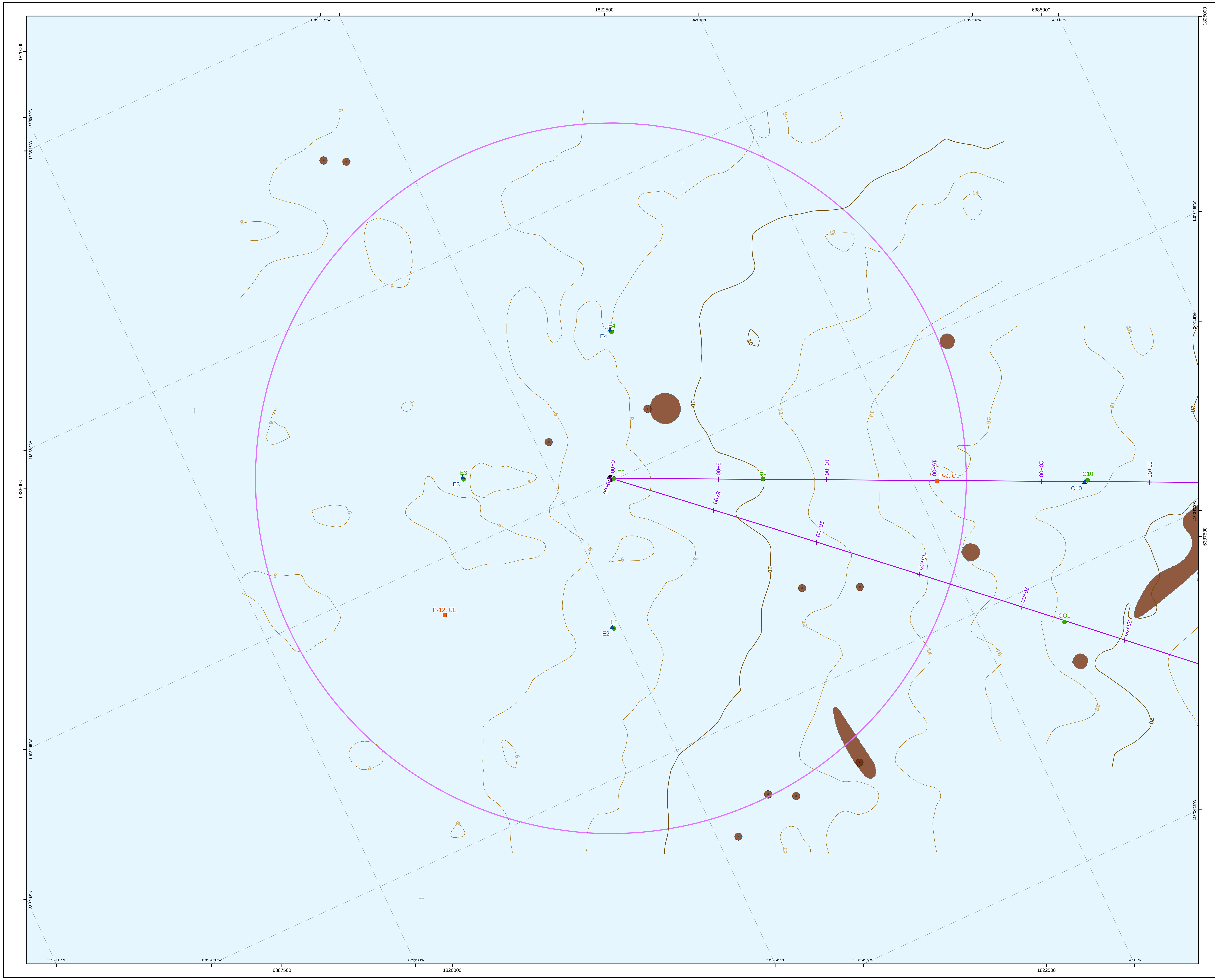
SCALE : 1 inch = 200 feet

200 100 0 200 400 Feet

REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Electrode Location Map - Side Scan Sonar Mosaic	DRP	CLP	DES

04.64110025-2

CHART NO.: **2 of 3**



Legend

Sediment Isopach
- Major Contours- contour interval = 10'
- Minor Contours- contour interval = 2'

Seafloor Features
- Gas Seeps
- Gassy Sediments

Explorations
- P-1: Identification — Grab Sample Location and Identification (CL = Clay with Sand)
- C10 — Vibracore Location
- C10 — Thermal Resistivity Location

Infrastructure
- 230+00 — Proposed Subsea Cable Route and Stationing
- Electrode Site Survey Extents
- Proposed Electrode Site

Map Extents (in Key Map)
- Map Extents
- Current Map Extent

Coordinate Grids:
1. NAD83 State Plane California Zone V, US Survey Feet
2. WGS84, Degrees Minutes Seconds

NOTES

1. GEOPHYSICAL DATA WERE COLLECTED ON APRIL 26-29, 2012 ABOARD THE M/V WESTERLY AND ON APRIL 30 - MAY 4, 2012 ABOARD THE M/V TAKU.
2. BATHYMETRIC CONTOURS ARE MAPPED AT 5 FOOT INTERVALS, REFERENCED TO MLLW DATUM.
3. STATION 0+00 IS THE PROPOSED ELECTRODE LOCATION: E 6386101, N 1821620, 33° 59.791' N, 118° 34.753' W.

This hydrographic survey was completed under the direction of an ACSM/THSOA, Certified Hydrographer

Eddie Stutts, C.H. (224)

GEODETIC INFORMATION

DATUM:	NAD83
PROJECTION:	LAMBERT CONFORMAL CONIC CALIFORNIA COORDINATE SYSTEM
ZONE:	5
UNITS:	US SURVEY FEET
VERTICAL DATUM:	MEAN LOWER LOW WATER (MLLW)

FUGRO CONSULTANTS, INC.
4820 McGrath St., Suite 100,
Ventura, California 93003
Tel: (805) 650-7000,
Fax: (805) 650-7010
www.fugroconsultants.com

Burns & McDonnell
SINCE 1898

LADWP

GEOPHYSICAL SURVEY OF LADWP CAT2010 PROPOSED SUBSEA CABLE ROUTES

June 2012

Santa Monica Basin, California

SCALE : 1 inch = 200 feet

200 100 0 200 400 Feet

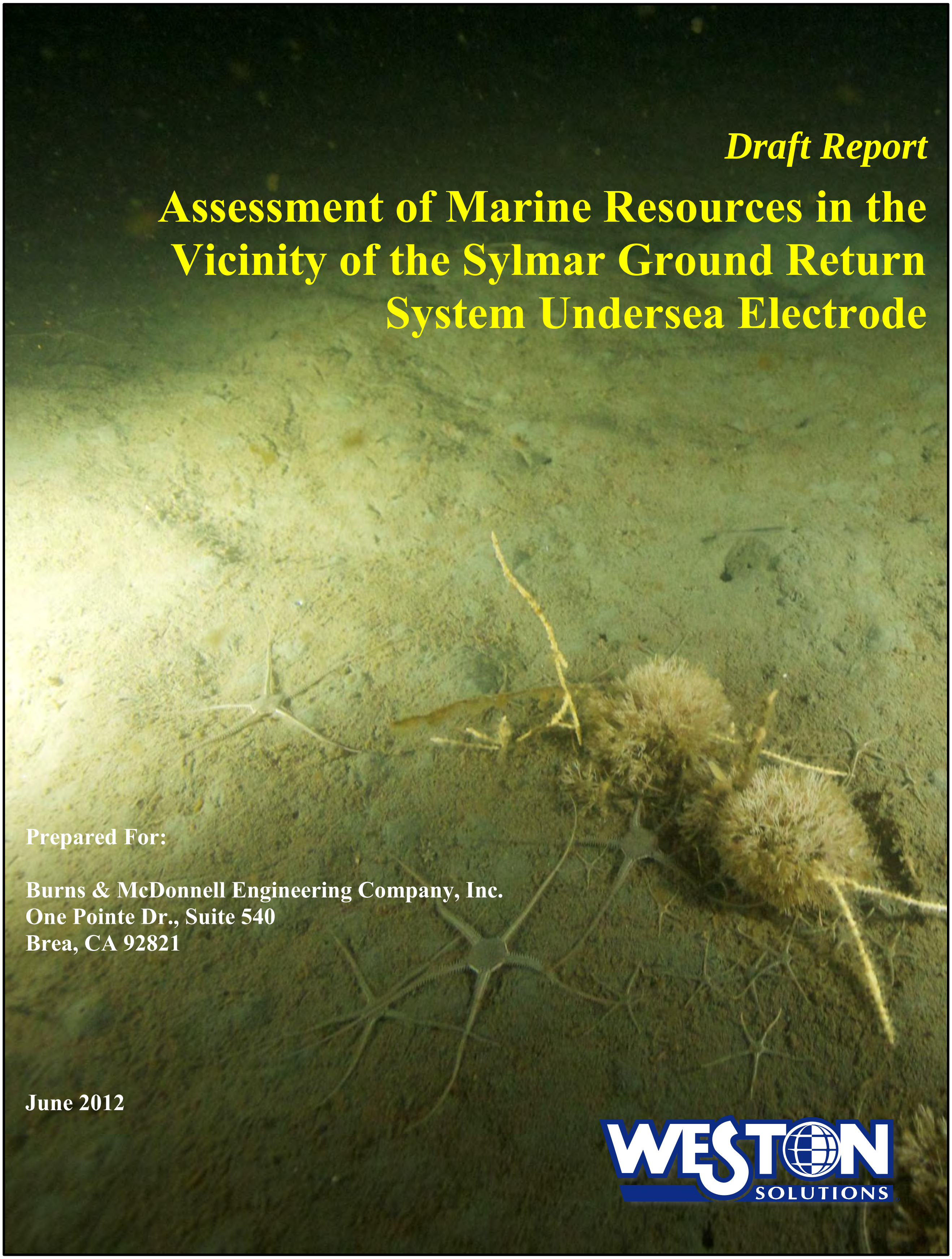
REV:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
1	June 2012	Electrode Location Map - Unconsolidated Holocene-Aged Sediment Isopach and Subsurface Features	DRP	CLP	DES

04.64110025-2 CHART NO.: 3 of 3

N:\Projects\04_2011\04_6411_0025_LADWP_GeoSurveys\Output\03May12_DraftReport\mxd\Chart3_ProposedElectrode.mxd 06/11/12, cpratt

D2: MARINE RESOURCES ASSESSMENT

THIS PAGE INTENTIONALLY LEFT BLANK



Draft Report

Assessment of Marine Resources in the Vicinity of the Sylmar Ground Return System Undersea Electrode

Prepared For:

Burns & McDonnell Engineering Company, Inc.
One Pointe Dr., Suite 540
Brea, CA 92821

June 2012

WESTON SOLUTIONS

Draft Report

Assessment of Marine Resources in the Vicinity of the Sylmar Ground Return System Undersea Electrode

Prepared For:

Burns & McDonnell Engineering Company, Inc.
One Pointe Dr., Suite 540
Brea, CA 92821

Prepared By:

Weston Solutions, Inc.
2433 Impala Drive
Carlsbad, California 92010

June 2012

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
ASTM	American Society for Testing and Materials
Bight '08	Southern California Bight 2008 Regional Monitoring Project
BIO	Biological Community
BMP	Best Management Practices
BRI	Benthic Response Index
Calscience	Calscience Environmental Laboratories, Incorporated
CEQA	California Environmental Quality Act
COC	chain of custody
COP	California Ocean Plan
CTD	conductivity, temperature, depth probe
DDT	dichlorodiphenyltrichloroethane
DGPS	Differential Global Positioning System
DO	dissolved oxygen
EA	electrode array
EIR	Environmental Impact Report
EMF	electro-magnetic field
ER-L	effects range- low
ER-M	effects range- medium
HU	Human Uses
ID	identification
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IS	Initial Study
LADWP	Los Angeles Department of Water and Power
LC50	Lethal Concentration 50
MM	mitigation measures
MRL	method reporting limit
NELAP	National Environmental Laboratory Accreditation Program
NOEC	no observable effect concentration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pH	hydrogen ion concentration
PDCI	Pacific DC Intertie
QA	quality assurance
QC	quality control
ROV	remotely operated vehicle
SAP	sampling and analysis plan
SCAMIT	Southern California Marine Invertebrate Taxonomists
SCCWRP	Southern California Coastal Water Research Project
SCUBA	self-contained underwater breathing apparatus
SOP	standard operating procedure
SP	solid phase
SWAMP	Surface Water Ambient Monitoring Program
SWQ	sediment and water quality

ACRONYMS AND ABBREVIATIONS

THM	trihalomethane
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
WESTON	Weston Solutions, Inc.

UNITS OF MEASURE

A	ampere
cm	centimeter
°C	degrees Celsius
ft	feet or foot
g	gram
gal	gallon
in	inch
kg	kilogram
km	kilometer
kW	kilowatt
L	liter
m	meter
m^2	square meters
m^3	cubic meters
mi	mile
µg	microgram
µT	microTesla
mg	milligram
mL	milliliter
mm	millimeter
MW	megawatt
nV	nanovolt
oz	ounce
ppt	parts per thousand
sec	second
V	volt
%	percent

1.0 INTRODUCTION

1.1 Background and History

Los Angeles Department of Water and Power (LADWP) is engaged in studies to support upgrading its Pacific Direct Current Intertie (PDCI) by approximately 600 megawatts (MW) to accommodate the transfer of wind and hydroelectric power to its Sylmar Power Station. This upgrade will require both land-based and ocean-based enhancements to the existing PDCI electrode system that currently terminates approximately 1.8 kilometers (km) (1.1 miles (mi)) offshore from the coast of Santa Monica, California. The ocean-based enhancement includes replacement and relocation of two subsea electrical cables, which currently extend seaward from the Gladstone Vault in Santa Monica. Option 1 for the new cable route would begin at the Gladstone Vault and extend in a straight line approximately 5 km (3.1 mi) offshore in a southwesterly direction, and would terminate at an electrical array located on the floor of Santa Monica Bay (Figure 1-1). Option 2 for the new cable route would begin at the intersection of Chautauqua Blvd., Channel Blvd., and Pacific Coast Highway, and would extend in a west-southwesterly direction for approximately 2.8 km (1.7 mi), circumventing two artificial reef areas before straightening out and arriving at the proposed location of the electrode array, approximately 7 km (4.3 mi) from shore. The design of the new electrical array will differ from the previous electrical array, and will consist of 88 electrode elements placed within cylindrical vaults that are spaced at regular intervals on the seafloor in a large circular pattern that will have a radius of 210 meters (689 feet (ft)) (see Appendix A for electrode array design specifications).

An Initial Study (IS) prepared by LADWP determined that the Project will require an Environmental Impact Report (EIR) based on identification of site-specific impacts and evaluations of potential significance under the California Environmental Quality Act (CEQA). The IS determined that replacement or rehabilitation of the cables and electrode array has the potential to significantly impact marine resources due to construction-related impacts. The proposed Sylmar Electrode System will extend approximately 5 km (3.1 mi) offshore along a new cable route and is projected to be operated at a maximum of 3,650 amps (A) for approximately 50 hours per year. When in use, the subsea system has the potential to produce electromagnetic fields (EMFs) and electrochemical reactions that may impact marine organisms and the surrounding environment.

Weston Solutions (WESTON) was contracted by LADWP (under prime contractor, Burns and McDonnell) to determine the potential impacts on marine life, humans, and surroundings within Santa Monica Bay resulting from the installation of a new offshore segment for the Sylmar Electrode System. A scientifically-defensible study design that consisted of both field surveys and existing literature and data reviews was developed by WESTON to assess project impacts within the marine environment of Santa Monica Bay. Results of the field surveys are presented and discussed in the main body of this report, while the findings of the literature review are presented in Appendix A.

1.2 Objectives

The primary objective of this study was to determine the potential impacts of installing a new offshore segment of the Sylmar Electrode System on marine life, humans, and surroundings within Santa Monica Bay. To accomplish this, existing biological resources and activities within the Area of Potential Effect (APE) were assessed through video surveillance, direct observation, sample collection and analysis, and a literature review. Potential impacts to these resources and activities from short-term construction of the cable route and placement of the electrode array and potential long-term effects of electrode operation were also assessed. A secondary objective for this project included recommending strategies to mitigate any potential project impacts to these resources.

Figure 1-1. Project Location in Santa Monica Bay, Santa Monica, California

2.0 METHODS

Sampling and observational methods were used to assess the existing conditions within the proposed cable path and electrode array footprints. Field methods included:

- Collecting water chemistry samples at the proposed Electrode Array Area and adjacent Reference Area to determine chemical constituents in the water column prior to electrode operation (i.e., assessment of baseline conditions);
- Collecting water quality measurements at all stations to assess baseline water column conditions and physical factors (i.e., resistivity) that can affect the size and strength of the electric field. This will also help to document if short-term construction activities (i.e., trenching and laying of cables and placement of concrete vaults housing the electrode array) are impacting the water quality within the APE;
- Collecting sediment chemistry and benthic infauna samples at all stations, and toxicity at ten stations, to assess the potential release of chemicals of concern into the water column during construction activities. Benthic infauna was assessed to determine the anticipated level of impact to the soft bottom community associated with trenching and construction of the electrode array; and
- Capturing video footage and still footage from remote operated vehicle (ROV) surveys and diver surveys to assess local fish and invertebrate species, algae, and habitat within the APE.

A detailed description of the sampling and survey design used to assess the marine resources within the project footprint is provided as follows.

2.1 Overview of Field Sampling and Survey Design

Field surveys were conducted in the APE, extending from the shoreline to approximately 5 km miles (3.1 miles) offshore, to determine the existing baseline biological conditions in the vicinity of the proposed cable route and electrode array placement. Surveys consisted of visual assessments of the two cable route options as well as the footprint of the electrode array by divers and an ROV to document habitat quality and record observed species; sediment sampling to determine benthic community structure, chemistry, toxicity, and physical properties; and physical water quality assessments with a conductivity temperature depth (CTD) sensor. Data collected from field surveys were compared to the findings of previous studies at the site and regional studies that have characterized the biota within Santa Monica Bay.

Sampling and dive surveys were performed within five transect areas placed at regular intervals along each of the respective cable route options, three transects within the Electrode Array Area, and one transect within the Reference Area to assess and document the biological resources and habitat within the project footprint (Figure 2-1 and Figure 2-2). Video surveillance of the entire length of the cable routes and of the Electrode Array Area was performed using an ROV. Since the vast majority of both of the cable route options occurred over soft-bottom habitat, one or more transects were subject to relocation to include rocky reef habitat discovered during ROV surveys. All sampling locations were randomly placed within each of the transect areas prior to the start of field collection activities.

Water quality measurements were collected from a total of 16 sites─ 13 sites located within the project footprint (5 sites along the Option 1 proposed cable route, 5 sites along the Option 2 cable route, and 3 sites at the proposed location of the electrode array) and 3 sites within a nearby Reference Area located at an equivalent depth to the proposed Electrode Array Area. Water quality measurements were taken throughout the entire water column at each site using a CTD probe. Water chemistry samples were collected at depth (within two meters of the bottom) from the Electrode Array Area (3 samples) and the Reference Area (1 sample).

Sediment sampling was conducted using a Van Veen grab sampler at five sites along each of the cable routes and at three sites within the Electrode Array Area and three sites at the Reference Area. Sediment chemistry, grain size, and benthic infauna analyses were performed on samples collected at each of the 16 sites, while benthic toxicity was assessed at two sites along each of the cable routes (4 samples total), at the electrode array station (3 samples) and at the reference location (3 samples).

Dive Surveys of both of the proposed alternative cable routes and electrode array were performed to visually assess the biological community. Five replicate survey areas of 91.4 m (300 ft) in length and 30.5 m (100 ft) in width were sampled along each of the proposed cable route options. Survey locations were positioned along the proposed cable routes so that both hard-bottom rocky habitat and soft-bottom sandy habitat would be surveyed. Three 198-m (650-ft) long by 45.7-m (150-ft) wide areas within the proposed 1-km (0.62 mi) radius Electrode Array Area were also surveyed by divers. The dive survey team consisted of four different divers, and included two divers conducting the survey and one support diver. Divers recorded all observed flora and fauna to the lowest possible taxonomic unit. Video from the dive surveys was used to document the existing habitat and to supplement the list of observed species and their relative abundance as identified on data sheets by the dive team.

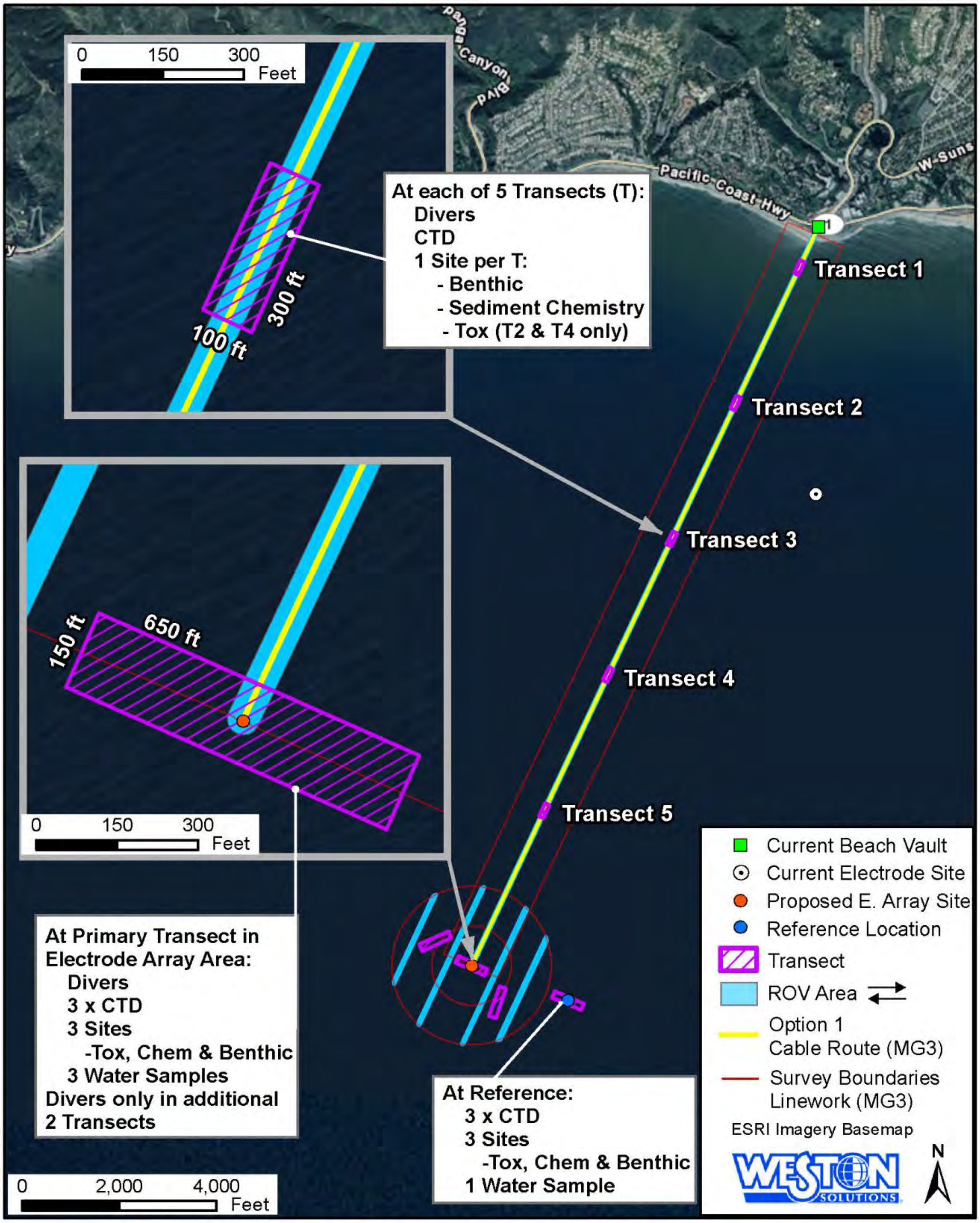


Figure 2-1. Pre-plotted Monitoring Locations along the Option 1 Cable Route

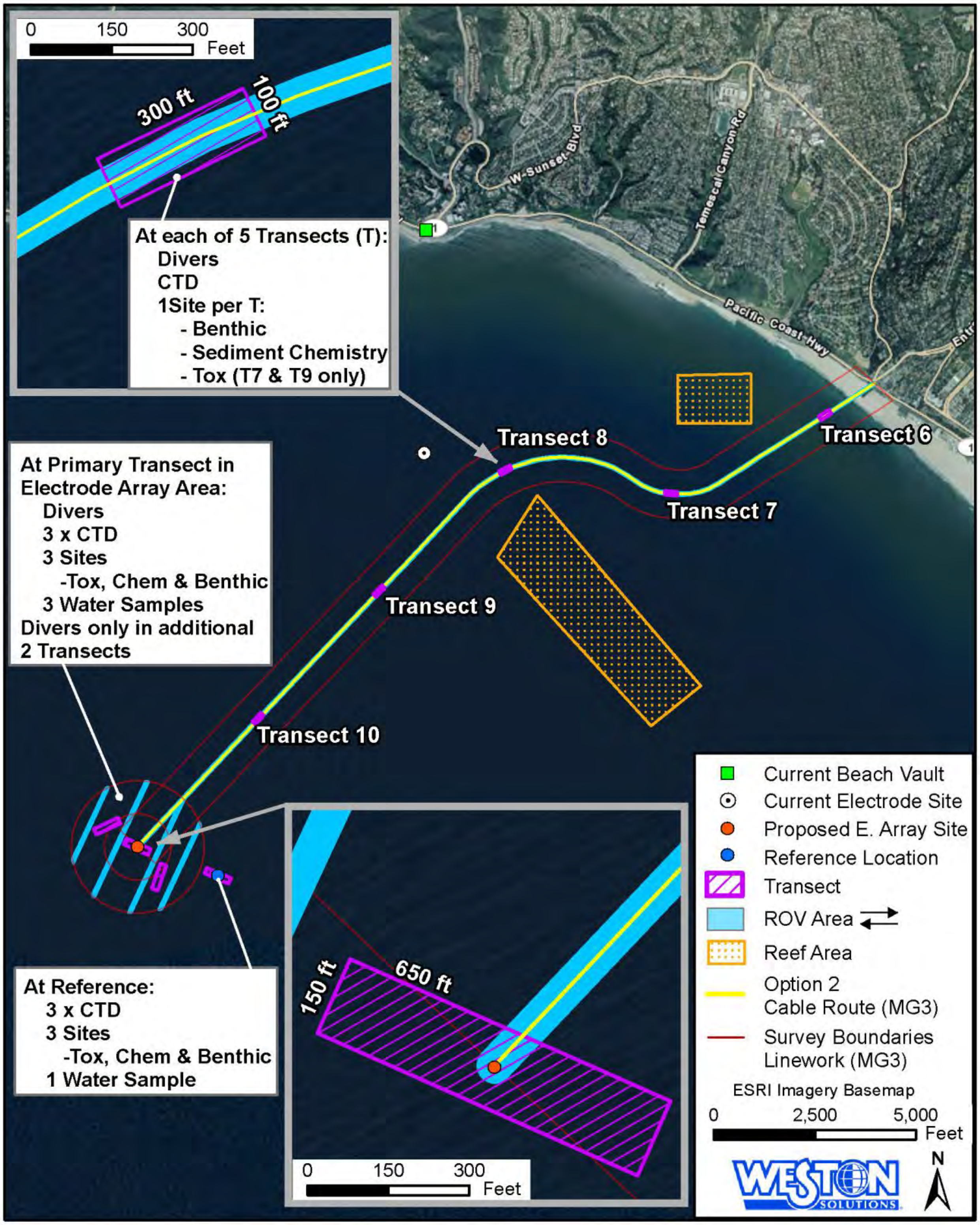


Figure 2-2. Pre-plotted Monitoring Locations along the Option 2 Cable Route

Field coordinates for sampling points within transect areas and analyses that were performed are provided in Table 2-1.

Table 2-1. Sampling Point Locations and Analyses

Area	Sampling point	Latitude	Longitude	Sediment Analyses	Water Analyses
(Option 1) Transect 1	TRANS-1	34.035735	-118.557110	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
(Option 1) Transect 2	TRANS-2	34.028722	-118.561385	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)
(Option 1) Transect 3	TRANS-3	34.020903	-118.566032	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
(Option 1) Transect 4	TRANS-4	34.013042	-118.569672	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)
(Option 1) Transect 5	TRANS-5	34.005652	-118.574692	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
(Option 2) Transect 6	TRANS-6	34.026108	-118.523128	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
(Option 2) Transect 7	TRANS-7	34.020630	-118.535232	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)
(Option 2) Transect 8	TRANS-8	34.022282	-118.549652	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
(Option 2) Transect 9	TRANS-9	34.013905	-118.559173	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)
(Option 2) Transect 10	TRANS-10	34.004880	-118.569503	Grain Size, Chemistry, Infauna	Water Quality Parameters (CTD)
Central Electrode Array	EA-1	33.996177	-118.579417	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD), Chemistry
	EA-2	33.996545	-118.580027	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD), Chemistry
	EA-3	33.995830	-118.578388	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD), Chemistry
West Electrode Array	No Samples				
East Electrode Array	No Samples				

Table 2-1. Sampling Point Locations and Analyses

Area	Sampling point	Latitude	Longitude	Sediment Analyses	Water Analyses
Reference	REF-1	33.995153	-118.573397	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD), Chemistry
	REF-2	33.995342	-118.572468	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)
	REF-3	33.994735	-118.572682	Grain Size, Chemistry, Infauna, Toxicity	Water Quality Parameters (CTD)

2.1.1 Sampling Equipment

All water and sediment samples were collected from the *R/V Early Bird II*, a 12.8-m (42-ft) research vessel modified for environmental sampling (Figure 2-3). Sediment samples were collected using a stainless steel double Van Veen grab sampler (Figure 2-4), while water samples were collected using a 10-L Niskin Bottle. Water quality parameters were measured using a Seabird SBE 25 Sealogger (Figure 2-5). All sampling equipment was deployed from the stern of the vessel using the vessel's hydraulic A-frame and deck winch. Adequate water and sediment volumes were collected to allow for all testing described in the Sampling and Analysis Plan (WESTON, 2012), as well as re-testing of the samples, if necessary. All sampling equipment was cleaned prior to sampling. Between stations, sampling equipment and the deck of the vessel were rinsed with site water. Similarly, all stainless steel bowls and spoons used in transferring sediment from the grab sampler to the sample containers were cleaned with soapy water, and rinsed three times with tap water.

Figure 2-3. Sampling Vessel *R/V Early Bird II*

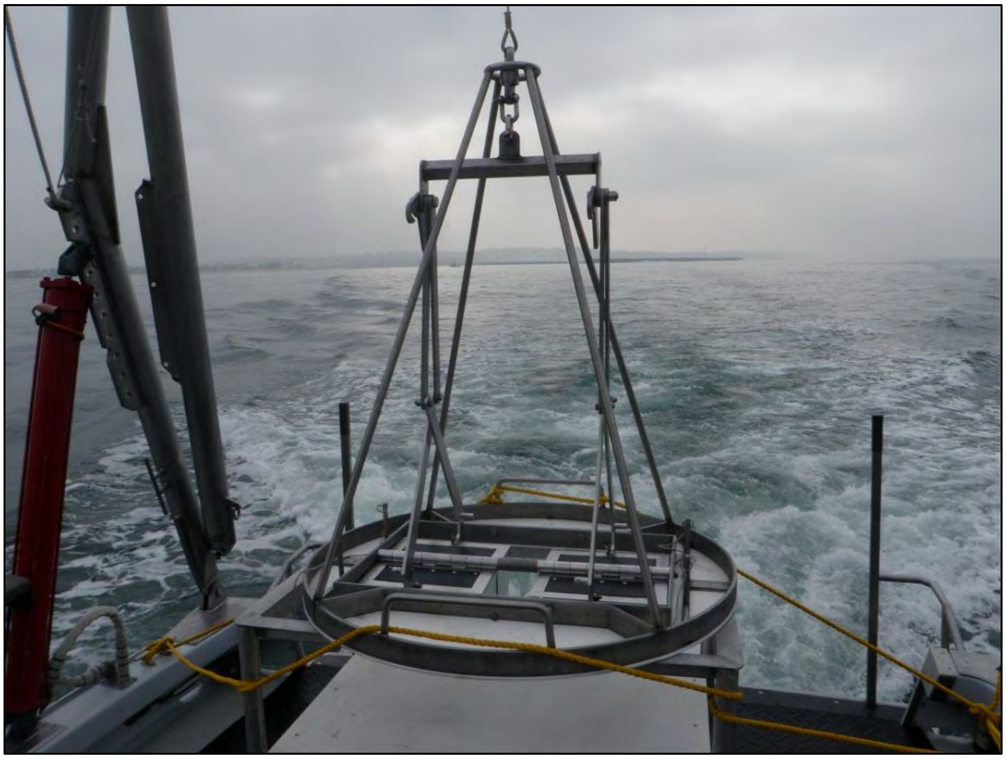


Figure 2-4. Double Van Veen Grab Sampler

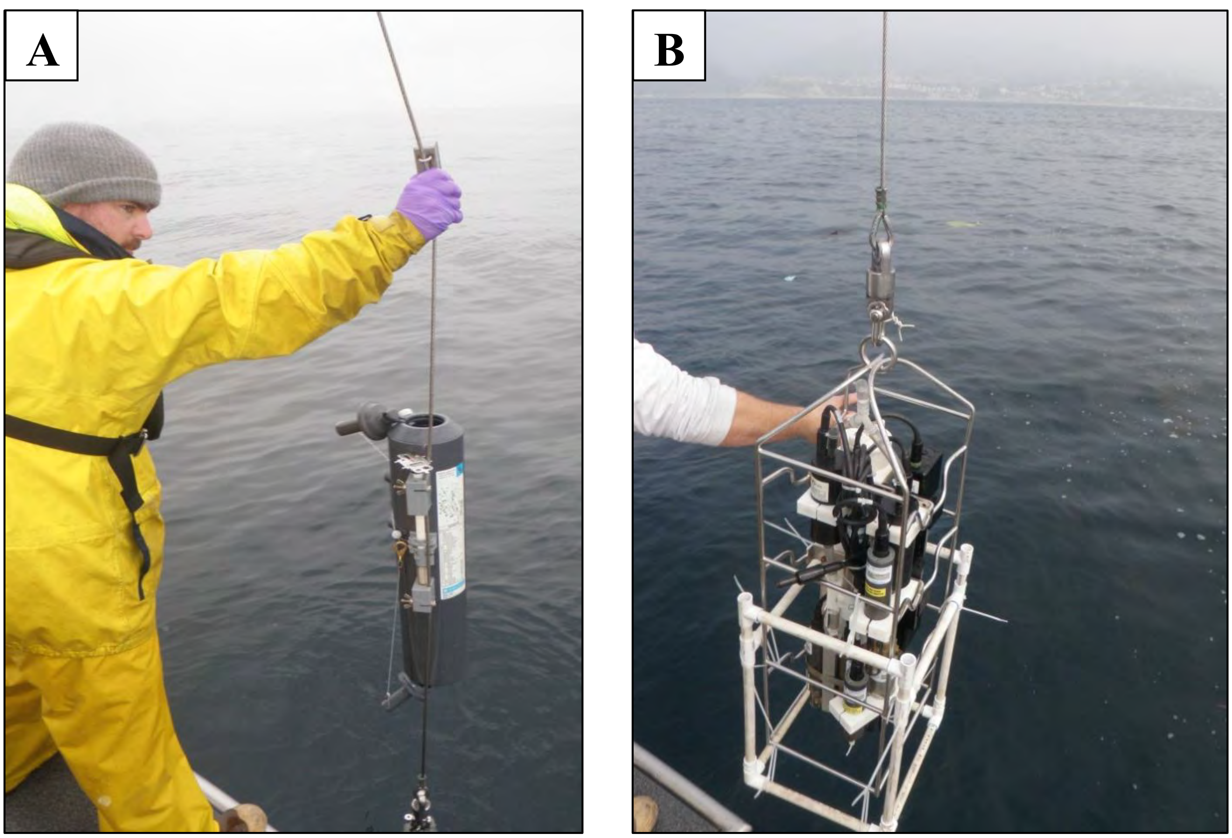


Figure 2-5. Niskin Water Sampler (A) and SeaBird SBE Sealogger (B)

2.1.2 Surveying Equipment

Surveys of the two proposed cable routes and Electrode Array Area were performed using a tethered ROV operated from the deck of the *R/V Early Bird II*. The SeaBotix 300-6 ROV used in the survey is capable of operating at depths down to 304 m (1,000 ft) below the surface and was equipped with six thrusters, external lighting, video and audio recording capabilities, and a subsea navigation component called MicroNav (Figure 2-6). The MicroNav system contains a surface USBL transducer unit with integral magnetic compass and pitch/roll sensors and operating software under control of the onboard laptop computer. The navigation system allowed for computer tracking and omni-directional coverage of the ROV at all times.

A team of SCUBA divers conducted biological surveys of transect areas along the cable routes and in the Electrode Array Area. The *R/V Westerly,* a 14.6-m (48-ft) research vessel equipped for conducting bathymetric and diver surveys (Figure 2-7), was used as the support vessel for all diving operations. Aside from standard dive equipment, the dive team used mixtures of compressed gases, dive computers, dive scooters, meter tapes, video cameras and still cameras to conduct the surveys.

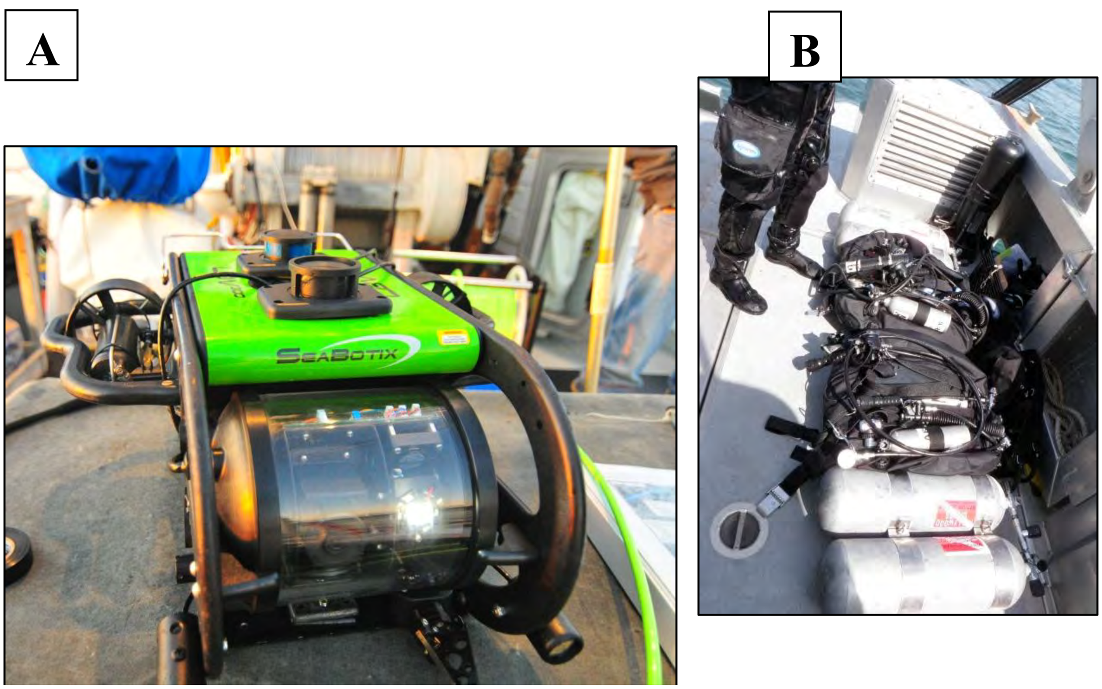


Figure 2-6. SeaBotix ROV (A) and Mixed Gas Dive Tanks, Buoyancy Compensators and Dive Scooters (B)

Figure 2-7. Dive Vessel *R/V Westerly*

2.1.3 Navigation

All sampling locations were pre-plotted (Table 2-1) and were determined using a differential Global Positioning System (dGPS) that is accurate to ± 0.5 m (1.6 ft). For dive surveys, the boat was anchored on one of the corners of the pre-plotted transect areas. For ROV surveys, the boat tracked toward points that had been pre-plotted along the cable routes and within the Electrode Array Area. All final station locations and survey points were recorded in the field using dGPS.

2.2 Sample Collection and Survey Methods

Project-specific methods performed for water and sediment collection, water quality monitoring, and dive and ROV surveys are detailed below. Water and sediment sample collection methods followed the Standard Operating Procedures (SOP) manual (WESTON, 2011) for each constituent. All samples were logged on a Chain of Custody (COC) form as they were collected and were subsequently handled and relinquished under said custody (see section 2.6 below for additional information).

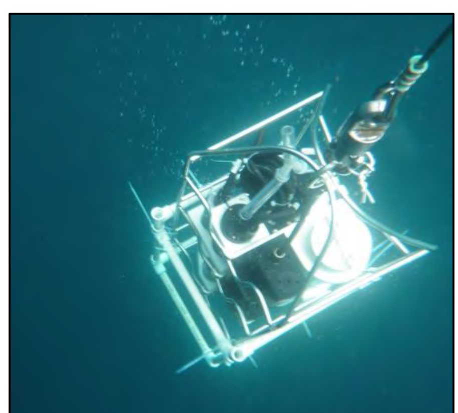
2.2.1 Water Sample Collection and Water Quality Monitoring

Water sampling

Water samples were collected from one Reference Area location and from three sites within the proposed Electrode Array Area using a 10-L acrylic Niskin bottle. The water sampler was slowly lowered to within approximately 2 m (6.6 ft) of the seafloor before being triggered to capture a water sample at depth using a weighted messenger. Care was taken to avoid disturbance of the sediment prior to triggering the sampler. Upon retrieval of the Niskin bottle, the bottle was checked to ensure that the rubber stop-valve had been engaged. Water samples were poured from the Niskin bottle into laboratory-certified, contaminant-free sample bottles and stored on ice in a cooler until delivery to Calscience Environmental Laboratories, Inc. (Calscience). The sample bottles were labeled with the following data: Project Name, Time, Date, Station identification (ID), Water Depth, Preservative, and Analysis to be performed. Water samples were analyzed for trace metals using U.S. Environmental Protection Agency (USEPA) Methods 1640 and 7470 (mercury), total residual chlorine using Standard Method 4500-Cl F, and both volatile and semi-volatile halogenated organic compounds using USEPA Methods 624 and 625. Halogenated organic compounds and chlorine produced oxidants (measured as total residual chlorine) were targeted for analysis based upon literature reviews that revealed the potential for halogenated and chlorinated compounds to form in the vicinity of subsea electrodes during electrode operation. Background levels of metals were targeted for analysis because they are a common sediment contaminant that can be re-suspended by construction activities and have the potential to cause toxicity to marine species.

Water Quality Monitoring

Water quality data were collected using a Seabird SBE 25 Sealogger to measure depth, temperature, hydrogen ion concentration (pH), transmissivity, salinity, density, chlorophyll *a*, and dissolved oxygen (DO) at each of the 16 stations (5 along each of the proposed cable routes, 3 at the proposed Electrode Array Area, and 3 at the Reference Area). These sampling station locations are shown in Figure 2-8 and Figure 2-9 for the Option 1 Cable Route, Electrode Array Area, and Reference Area. Figure 2-10 and Figure 2-11 show the sampling station locations for the Option 2 Cable Route. The Seabird CTD unit scans all sensors at 8 scans per second as the instrument is lowered through the water column. Data collected during each cast were stored in the unit's memory and were also recorded in real time on the deck support computer. The scans were averaged by 0.91-m (3-ft) depth intervals using software provided by Seabird. The unit was lowered at a speed of 0.2–0.4 m/s (0.65-1.3 ft/s) so that each depth interval was sampled several times.


Seabird CTD

At each site the pre-calibrated CTD unit was activated, suspended on a cable, and slowly lowered into the water from the A-frame of the *R/V Early Bird II*. Once in the water, the CTD was lowered approximately 2 m below the surface of the water and allowed to acclimate for 3 minutes. After the 3-minute acclimation period, the unit was brought to the surface and then slowly lowered through the water column at a steady rate of approximately 0.3 m/s (1 ft/s) until it was within approximately one meter of the ocean floor. Upon reaching a depth that was within one meter of the ocean floor, the CTD unit was slowly brought to the surface at the same steady rate of approximately 0.3 m/s. The unit was then brought aboard the sampling vessel and the data were downloaded to determine if the cast was successful. A technician then analyzed and converted the data into 0.91 m (3 ft) depth bins for reporting.

Field observations for CTD casts were recorded on site and entered into a field log for ambient water quality monitoring. This field log included station location information (i.e., site name, station, latitude, and longitude), time and date of sampling, CTD cast number, station depth, tide stage, visual observations (i.e., trash, floatable material, oil and grease, discoloration, or turbidity), odor, current speed, and direction.

Quality Assurance
A pre-cruise equipment checkout and calibration of the CTD was conducted within 24 hours prior to the survey. This checkout included a visual inspection of the equipment, battery status, and computer output tests for CTD sensors. During the survey, routine visual inspections of cast profiles were performed so immediate action could be taken to resample sites with poor data quality. Before beginning a cast, a 3-minute equilibration was performed to bring the CTD sensors to thermal equilibration with the ambient sea water. A post-cruise calibration was performed within 24 hours of the last sampling for the survey.

Prior to deployment of the Niskin bottle water sampler, and between sampling sites, decontamination of the water sampling equipment was performed. The Niskin bottle was scrubbed on the inside with a residue-free biodegradable detergent (e.g., Alconox), rinsed with site water, and rinsed three times with tap water.

To assess the effectiveness of the de-contamination procedure, one field blank sample was collected. For the field blank, approximately 1-L of de-ionized water was poured into the decontaminated 10-L Niskin bottle, circulated throughout, then poured into the appropriate sample jars for constituent analysis in the laboratory. The field blank samples were stored on ice and in a cooler with the other samples until delivery to Calscience.

2.2.2 Sediment Sample Collection

Sediment samples were collected from each of the 16 stations (5 along each of the proposed cable routes, 3 at the proposed Electrode Array Area, and 3 at the Reference Area) using two standard 0.1-m^2 stainless steel Van Veen grab samplers that were coupled together for simultaneous collection of sediment. Sampling station locations are shown in Figure 2-8 and Figure 2-9 for the Option 1 Cable Route, Electrode Array Area, and Reference Area. Figure 2-10 and Figure 2-11 show the sampling station locations for the Option 2 Cable Route. Four sediment grabs per site were collected at sites requiring the following analyses: benthic infauna, chemistry, grain size, and toxicity. Two sediment grabs were collected at sites Trans 1, 3, 5, 6, 8, and 10 since they did not require toxicity testing. A sample grab was determined to be acceptable if the surface of the grab was even, minimal surface disturbance occurred, and the penetration depth was at least 5 centimeters (cm). Rejected grabs were discarded and re-sampled. For a given site, the contents of one sediment grab was used for benthic infaunal analysis, while one and a half grabs were used for chemistry and grain size analysis, and one and a half grabs were used for evaluation of toxicity.

Samples collected for benthic infaunal analysis were rinsed through a 1.0-millimeter (mm) (0.04 in) mesh screen and transferred to a labeled quart jar. A seven percent (%) magnesium sulfate ($MgSO_4$) seawater solution was added for approximately 30 minutes to relax the collected specimens before they were fixed in a 10% buffered formalin solution. Infauna samples were sorted by WESTON and submitted to qualified taxonomists for identification to either species level or to the lowest taxonomic group that could be identified.

Sediment toxicity, chemistry, and grain size samples were collected from the top 5 cm (2 in) of the grab, avoiding sediment within 1 cm (0.4 in) of the sides of the grab. A minimum of 10 L (2.6 gal) of sediment was collected for toxicity and placed into 4 mm (0.16 in) food grade-quality poly open bags. Toxicity samples were kept at 4 °C on ice in coolers until delivery to WESTON. Sediment chemistry samples were placed into laboratory certified clean 8-oz glass jars with Teflon lids, labeled, and placed on ice inside a cooler until delivery to Calscience within 72 hours of collection. Grain size samples, comprised of approximately 150–200 g of sediment, were placed into 1-quart Ziploc™ bags and kept on ice until delivery to WESTON.

Sediment chemistry samples were analyzed for total organic carbon (TOC) using USEPA 9060A protocol, total solids using Standard Method 2540B, trace metals using USEPA 6020, chlorinated pesticides using USEPA 8081A, polychlorinated biphenyl (PCB) congeners using USEPA 8270C with selected ion monitoring (SIM) for PCB congeners, and polycyclic aromatic hydrocarbons (PAHs) using USEPA 8270C SIM for PAHs. The 2008 Southern California Bight Regional Monitoring Program (Bight ’08) used an identical analyte list for identifying sediment contaminant issues throughout Southern California embayments, harbors, and nearshore and offshore ocean environments (Southern California Coastal Water Research Project [SCCWRP], 2008).

2.2.3 Documentation of Chain of Custody

Samples were considered to be in custody if they were: (1) in the custodian’s possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a secured container. The principal documents used to identify samples and to document possession were COC records, field log books, and field tracking forms. COC procedures were used for all samples throughout the collection, transport, and analytical process, and for all data and data documentation, whether in hard copy or electronic format.

COC procedures were initiated during sample collection. A COC record was provided with each sample or sample group. Each person who had custody of the samples signed the form and ensured that the samples were not left unattended unless properly secured. Minimum documentation of sample handling and custody included the following:

- Sample identification
- Sample collection date and time
- Any special notations on sample characteristics
- Initials of the person collecting the sample
- Date the sample was relinquished to the laboratory
- Shipping company and waybill information

The completed COC form was placed in a sealable plastic envelope that travelled with the listed samples and was signed by the person transferring custody of the samples. The condition of the samples was recorded by the receiver. COC records were included in the final analytical report prepared by the laboratory, and are considered an integral part of that report.

2.2.4 Analysis of Sediment Contaminants and Comparison to ER-L and ER-M Values

Results of chemical analyses of project dredged materials were compared to Effects Range-Low (ER-L) and Effects Range-Median (ER-M) values developed by Long et al. (1995). The effects range values are helpful in assessing the potential significance of elevated sediment-associated contaminants of concern, in conjunction with biological analyses. Briefly, these values were developed from a large data set where results of both benthic organism effects (e.g., toxicity tests and benthic assessments) and chemical concentrations were available for individual samples. To derive these guidelines, the chemical values for paired data demonstrating benthic impairment were sorted in ascending chemical concentration. The 10^{th} percentile of this rank order distribution was identified as the ER-L and the 50^{th} percentile as the ER-M. While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. The ER-L and ER-M sediment quality values were used in conjunction with bioassay testing and were included for comparative purposes only.

For certain pesticide compounds (e.g., dieldrin) the ER-L may be below detection levels of standard USEPA-approved analytical procedures; therefore, a non-detect concentration is not considered an ER-L or ER-M exceedance.

Quality Assurance
In addition to the sediment samples collected above, one randomly-selected sediment field duplicate sample was collected throughout the monitoring period in accordance with Surface Water Ambient Monitoring Program (SWAMP) protocols and analyzed for the constituents listed in Sub-section 2.5.2. The results were used to assess the accuracy and precision of the analytical data using the appropriate data quality objectives.

A pre-cruise equipment checkout was performed on the sampling gear to ensure that all surfaces and hinges were free of defects, rust, and missing hardware, and that all connectors, cables, and/or chains were in good condition. The “jaws” of the sampler were inspected to ensure minimal gaps existed when closed. Prior to sampler deployment and between sampling sites, decontamination of the equipment was performed. The sampler was scrubbed on the inside with Alconox and rinsed with site water.

Chemical analyses were performed in a nationally-certified laboratory (Calscience; National Environmental Laboratory Accreditation Program (NELAP) Certificate #03220CA and DoD ELAP Certificate #L10-41). Grain size analyses performed by WESTON were consistent with internal quality control (QC) criteria. Performance was evaluated via the use of standard reference materials or laboratory control samples, method blanks, surrogates, spiked samples, duplicate samples, and internal QC samples. Precision and accuracy objectives were established for method reporting limits (MRLs), spike recoveries, and duplicate analyses.

2.2.5 Benthic Infauna Analysis

Benthic infaunal samples were transported from the field to the laboratory and stored in a formalin solution for a minimum of three days before being transferred from formalin to 70% ethanol for laboratory processing. The organisms were initially sorted into five groups: polychaetes, crustaceans, molluscs, echinoderms, and miscellaneous minor phyla, using a dissecting microscope. While sorting, technicians kept a rough count for quality assurance/quality control (QA/QC) purposes, as described under the *Quality Assurance* paragraph that follows. After initial sorting, qualified taxonomists identified each organism to the lowest possible taxon, and species counts were tabulated. Taxonomists used the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) Edition 5 for nomenclature and orthography (SCAMIT, 2008).

Standard community measures (i.e., total abundance, number of taxa, and diversity indices [Shannon-Wiener, Evenness, and Dominance]) were calculated for each sample. Additionally, the Benthic Response Index (BRI), developed by SCCWRP (Smith et al., 2001) was calculated. This index establishes numerical criteria (i.e., community response levels) correlated with the pollution tolerance of species on an abundance-weighted average that relates to habitat quality. The BRI measure is scaled such that values less than 25 represent reference conditions and characterize a "healthy" community and good habitat quality (Table 2-2). Four levels of community response representing increasing degrees of community change are defined: marginal community deviation (BRI 25-34), loss of biodiversity (BRI 34-<44), loss of community function (BRI 44-72), and defaunation or exclusion of most species (BRI >72). Thus, BRI values greater than 25 represent increasing degrees of poorer habitat quality characterized by increasingly less "healthy" infaunal communities. The BRI as developed is applicable for open coastal waters for the Inner, Middle, and Outer Shelf depth zones (i.e., 10-30 m, 30-120 m and 120-200 m, respectively).

Table 2-2. Benthic Response Index Levels, Characterization, Definition, and Thresholds

Level	Characterization	Definition	BRI Threshold
Reference	Reference		< 25
Response Level 1	Marginal deviation	> 90% tolerance interval for reference index values	25-34

Table 2-2. Benthic Response Index Levels, Characterization, Definition, and Thresholds

Level	Characterization	Definition	BRI Threshold
Response Level 2	Biodiversity loss	> 25% of reference species lost	34-< 44
Response Level 3	Community function loss	> 90% of echinoderm and 75% arthropod species lost	44-72
Response Level 4	Defaunation	> 90% of reference species lost	> 72

Quality Assurance
A QA/QC procedure was performed on each of the sorted samples to ensure a 95% sorting efficiency. A 10% aliquot of a sample was then re-sorted by a senior technician trained in the QA/QC procedure, and the number of organisms found in the aliquot were divided by 10% and added to the total number found in the sample. The original total was then divided by the new total to calculate the percent sorting efficiency. If the sorting efficiency of the sample was below 95%, the remainder of the sample (90%) was re-sorted.

2.2.6 Toxicity Testing

A ten-day solid phase bioassay test using the marine amphipod *Eohaustorius estuarius* was conducted in accordance with procedures outlined in the amphipod testing manual (USEPA, 1994) and American Society for Testing and Materials (ASTM) Method E1367-03 (ASTM, 2010) to establish baseline toxicity levels for sediment collected along the proposed cable routes, Electrode Array Area, and Reference Area. Appropriate laboratory control samples were run concurrently with the amphipod test to ensure the test was run within acceptable control measures.

E. estuarius and laboratory control sediment were supplied by Northwestern Aquatic Sciences of Newport, Oregon. Composited sediment from all test areas and laboratory control sediment were placed in five replicate 1-L glass jars to a thickness of 2 cm (150 mL), to which was added approximately 800 mL of 30 ± 2 parts per thousand (ppt) seawater. Additional surrogate replicates (no animals) for each treatment were used to obtain measurements of pore water ammonia at test initiation and termination. The test was run under continuous light at a temperature of 15 ± 2 degrees Celsius (°C) and under gentle aeration. On Day 0, an initial set of water quality parameter measurements were made including temperature, DO, pH, and salinity for each replicate. Ammonia was measured in the overlying water of a composite of replicates from each test area and the control. In addition, a surrogate replicate from each test treatment was broken down, and sediment pore water was extracted via centrifugation for subsequent analysis of ammonia. At test initiation, 20 organisms were randomly distributed to each test chamber. Animals remaining in the water column and exhibiting abnormal behavior were replaced after 1 hour. The chambers were covered with petri dishes to minimize evaporation.

Daily water quality measurements including DO, temperature, salinity, and pH were taken for one replicate for each treatment and daily observations of obvious mortality, sublethal effects, and abnormal behavior were recorded. At test termination on Day 10, the sediments from the chambers were sieved through a 0.5-mm (0.02 in) screen and the number of survivors was recorded. Test results were compared to test acceptability criterion (i.e., 90 % mean survival in controls at test termination).

The experimental design, bioassay procedures, and water quality measurements for the solid phase test on project sediments using *E. estuarius* are shown in Table 2-3.

Table 2-3. Experimental Design, Bioassay Procedure and Water Quality Measurements for the 10-day Solid Phase Bioassay using *Eohaustorius estuarius*

Toxicity Test Experimental Design 10-Day Solid Phase Bioassay		
Sample Identification		Trans-2, Trans-4, Trans-7, Trans-9, EA-1, EA-2, EA-3, Ref-1, Ref-2, Ref-3
Test Species		***Eohaustorius estuarius***
Acclimation/holding time		2–10 days including holding time required to adjust to test temperature and salinity (adjust by changing <3°C per day, and <5 ppt per day); water quality of DO, pH, salinity, temperature daily while holding; if problem, change water or perform corrective action.
Age/Size class		Mature, 3–5 mm
Test Procedures		**USEPA 1994; ASTM E1367-03 (2010)**
Test Type/Duration		Static - Acute SP/10 days
Sample Storage Conditions		4°C, dark, minimal head space
Control Water Source		Scripps Pier seawater, 3 μm filtered, UV sterilized
Recommended Water Quality Parameters	Temperature	15 ± 2°C
	Salinity	30 ± 2 ppt
	Dissolved Oxygen	≥ 60% saturation; ≥ 6.0 mg/L
	pH	Monitor drift
	Overlying Total Ammonia	No recommended concentration
	Overlying Un-ionized Ammonia	No recommended concentration
	Interstitial Total Ammonia	< 60 mg/L
	Interstitial Un-ionized Ammonia	< 0.8 mg/L
Photoperiod		Continuous light
Test Chamber		1 L glass jars
Replicates/Sample		5
No. of Organisms/Replicate		20
Exposure Volume		2 cm sediment, 800 mL water
Feeding		None
Water Renewal		None
Test Acceptability Criteria		Control survival ≥ 90%

Quality Assurance
A 96-hour reference toxicity test was conducted concurrently with the sediment test to establish sensitivity of the test organisms used in the evaluation of the sediments and to evaluate the potential influence of ammonia toxicity on the test organisms. The reference toxicant test was performed using the reference substance ammonium chloride with measured total ammonia concentrations of 0, 12.5, 25.5, 49.3, 102.0, and 206.0 mg NH_3/L. Un-ionized concentrations of 0, 0.366, 0.592, 0.920, 1.191, and 1.531 mg NH_3/L were calculated. Ten test organisms were added to each of four replicates for each concentration. Subsamples were collected at test initiation and were used to measure actual ammonia concentrations and to calculate un-ionized ammonia concentrations. The concentrations of total ammonia and un-ionized ammonia that caused 50% mortality of the organisms (the median lethal concentration, or LC_{50}) were calculated from the data. The LC_{50} values were then compared to historical laboratory data for the test species with ammonium chloride and the results of this test were used in combination with the control mortality to assess the health of the test organisms.

WESTON's QC staff performs periodic audits to ensure that test conditions, data collection, and test procedures are conducted in accordance with WESTON's SOPs. WESTON's SOPs have been audited and approved by an independent USEPA-approved laboratory and placed in the QA file as well as laboratory files.

2.3 Quality Assurance/Quality Control

The QA objectives for chemical analysis conducted by the participating analytical laboratories are detailed in their Laboratory QA Manual(s). These objectives for accuracy and precision involve all aspects of the testing process, including the following:

- Methods and SOPs
- Calibration methods and frequency
- Data analysis, validation, and reporting
- Internal quality control
- Laboratory controls, matrix replicates, matrix spikes, and method blanks
- Analysis of field duplicates and equipment blanks
- Preventive maintenance
- Procedures to ensure data accuracy and completeness

Results of all laboratory QC analyses were reported with the final data. Any QC samples that failed to meet the specified QC criteria in the methodology were identified, and the corresponding data were appropriately qualified in the final report.

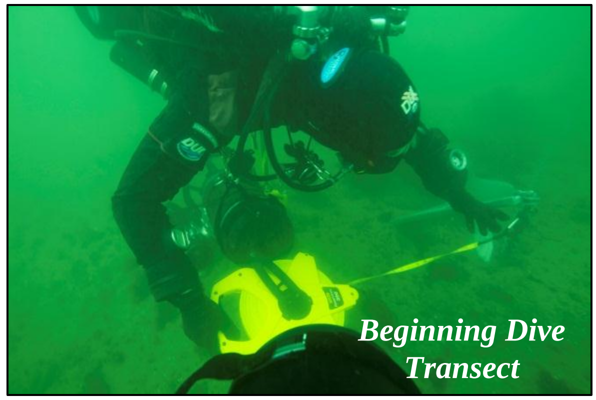
All QA/QC records for the various testing programs were kept on file for review by regulatory agency personnel, if required.

2.4 ROV Survey

A SeaBotix 300-6 ROV was used along each of the proposed cable routes and at the proposed location of the electrode array to document the seafloor habitat and biota in these areas and to supplement diver surveys. The ROV was tethered to the *R/V Early Bird II* by a 91-m (300-ft) fiber optic cable that attached to on-board computers and monitors for live imagery. To prevent the ROV tether from wrapping around the boat's propellers, the majority of the tether was secured to a cable that was anchored in place with a clump weight and lowered off the stern from the boat's A-frame. Approximately 9.1-m (30 ft) of free tether allowed the ROV to move in any direction out from the clump weight. During the survey, the clump weight was adjusted manually to remain approximately 2 m (6.5 ft) above the ocean floor. A steady course was maintained throughout the ROV survey by towing the ROV behind the boat at a speed ranging between 0.5 and 1.5 knots. This was done to minimize the effects of surface winds and currents pushing the boat in one direction while the ROV was pushed in a different direction by bottom currents. A transducer mounted on the side of the vessel communicated with the MicroNav subsea navigation system on the ROV, allowing for navigational tracking of both the ROV and the boat at all times during the survey.

The ROV survey consisted of two passes along the 5-km (3.1 mi) Option 1 and 7-km (4.3 mi) Option 2 cable routes and four passes through the 1-km (0.62 mi) diameter Electrode Array Area to ensure sufficient coverage of the seafloor habitat and to maximize the chance of observing resident organisms. The ROV survey paths are shown in Figure 2-8 and Figure 2-9 for the Option 1 Cable Route (2 passes) and Electrode Array Area (4 passes). Figure 2-10 and Figure 2-11 show the ROV paths (2 passes) for the Option 2 Cable Route. During the survey, a video recording was made of the illuminated seafloor as the ROV moved along the proposed cable routes and over the proposed location of the electrode array. Both the video recording of the seafloor and a computerized map of the navigational route taken by the ROV are provided on a hard drive for future reference by LADWP.

2.5 Dive Surveys



An underwater biological resource and habitat survey was conducted by two marine biologists using SCUBA. The divers were knowledgeable of local marine flora and fauna and were proficient at conducting technical dives at depths greater than 39.6 m (130 ft). Diving was performed from the *R/V Westerly*, a 14.6-m (48-ft) support vessel, that anchored near the divers as they swam a systematic pattern of transects throughout the designated survey areas. In total, 10 transect areas (each measuring 91.4 m x 30.5 m (300 ft x 100 ft)) were surveyed by divers along the two optional cable routes. Additionally, three areas measuring 198 m x 45.7 m (650 ft x 150 ft) were surveyed within the proposed Electrode Array Area. The dive survey transects are shown in Figure 2-8 and Figure 2-9 for the Option 1 Cable Route and the Electrode Array Area. Figure 2-10 and Figure 2-11 show the dive survey transects for the Option 2 Cable Route. Motorized aqua scooters were used by the divers to facilitate greater coverage of the survey areas over a given time period. The dive vessel was equipped with a dGPS unit that was used to accurately mark the location of the survey boundaries. In areas where it was safe to do so, the boat anchored on one corner of the pre-plotted transect area and divers descended along the anchor line and took a compass heading to lay down a meter tape along one side of the rectangular area boundary. The divers then swam four parallel transects that were spaced approximately 7.6 m (25 ft) apart, perpendicular to the baseline meter tape, to visually survey the majority of the transect area. While conducting the survey, divers remained within sight of one another and within site of the bottom substrate at all times while swimming parallel transects across the transect area.

Divers were equipped with low-light cameras capable of taking both still photos and video footage of the survey area. Limited visibility necessitated the use of artificial lighting in some areas, particularly at depths below 30.5 m (100 ft). Visibility along the bottom dictated the maximum spacing of the divers and ultimately determined the percent coverage of a given transect area. While conducting the surveys, divers took notes of the physical and biological conditions within the survey area including substrate type (soft bottom or rocky reef), dominant flora and fauna, and observed species, and recorded information onto data sheets. Where reefs were encountered during the ROV surveys, the nearest diver transect areas were relocated from their pre-plotted position to areas with rocky reef so that biological communities associated with hard substrate along the cable route could be assessed. The observed reef areas are shown in Figure 2-8 and Figure 2-10.

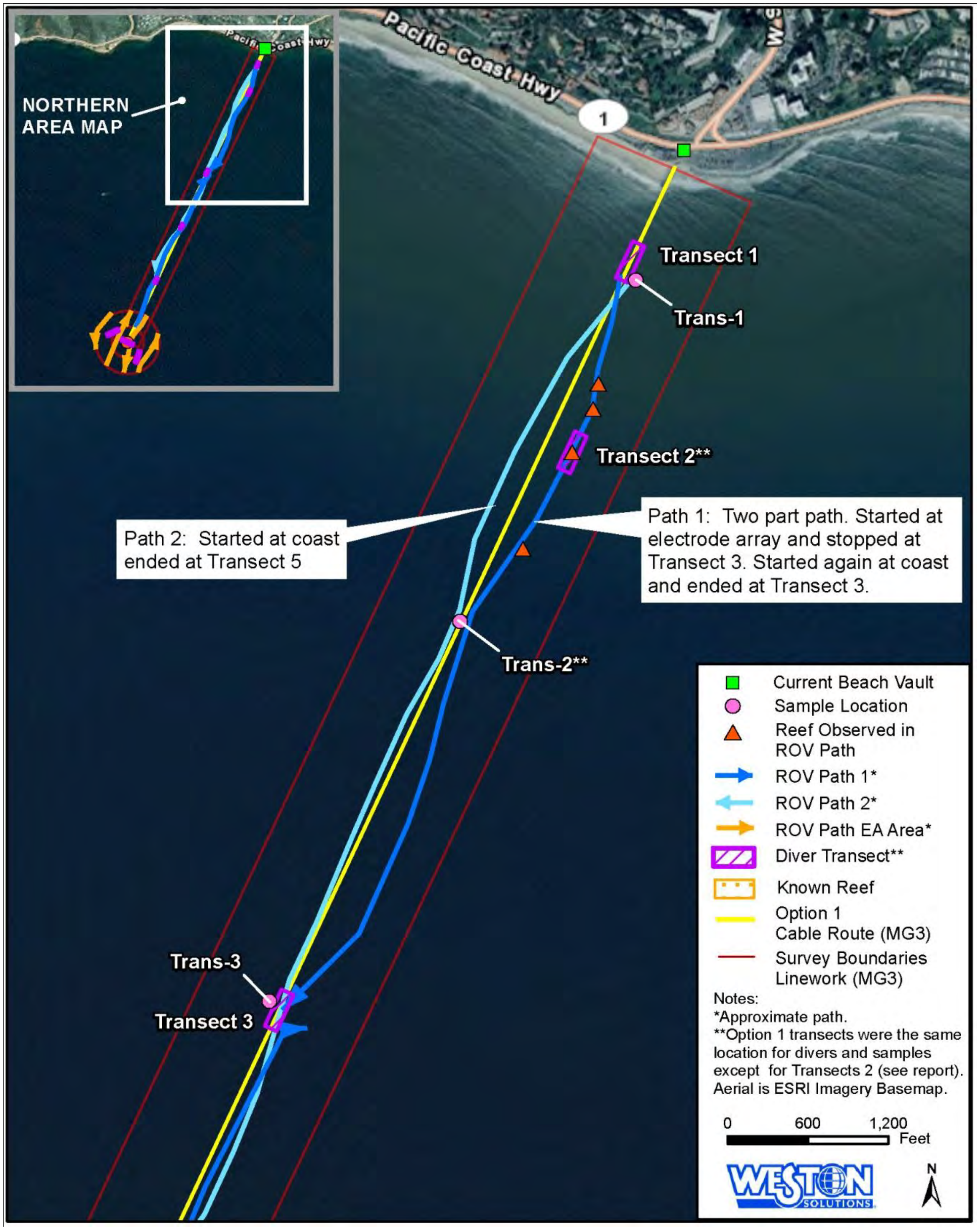


Figure 2-8. Northern Portion of Option 1 Cable Route Showing Water and Sediment Sample Locations, Diver Survey Transects, and ROV Paths (Two Passes), and Reef Areas Observed During ROV Survey

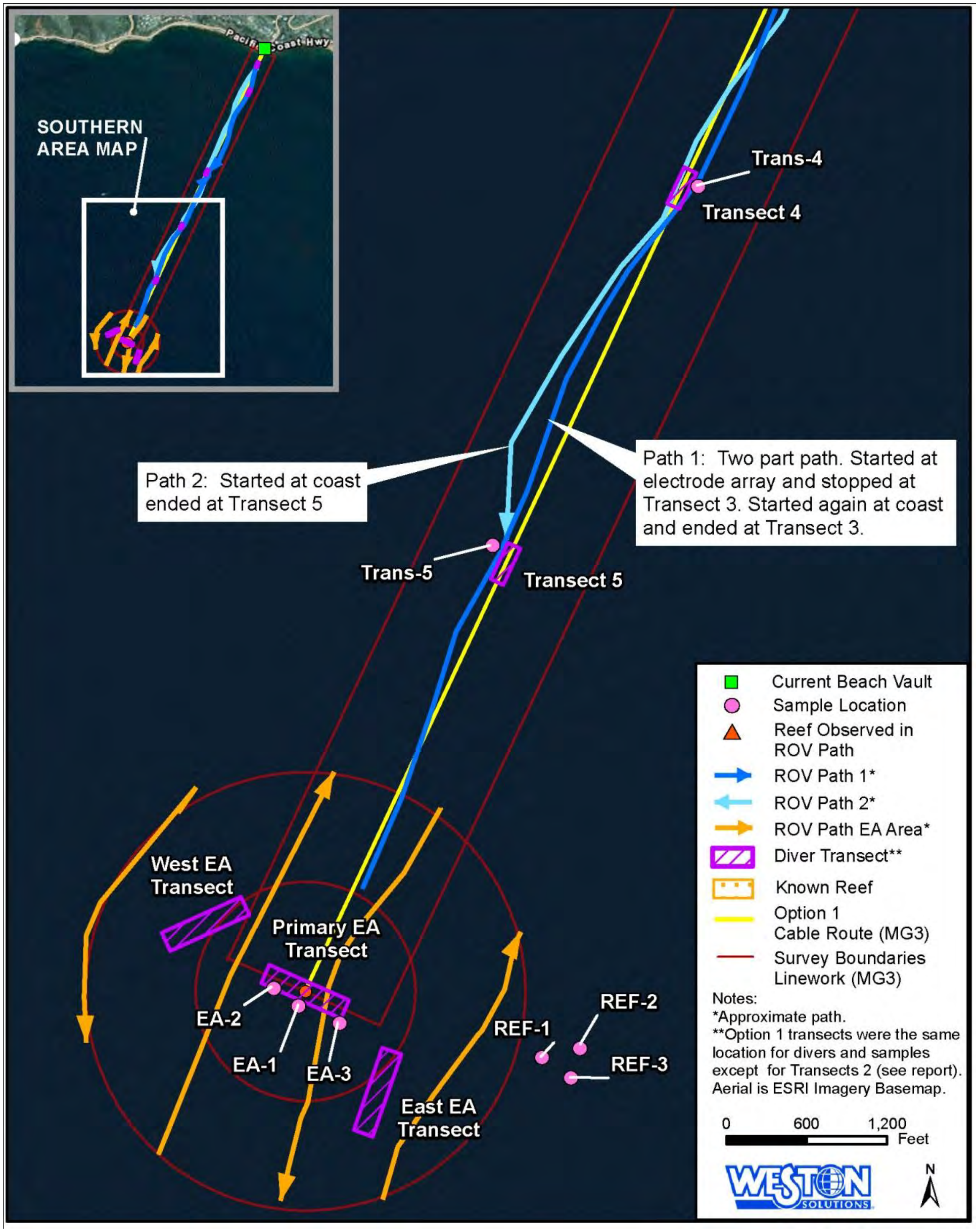


Figure 2-9. Southern Portion of Option 1 Cable Route and Electrode Array (EA) Area Showing Water and Sediment Sample Locations, Diver Survey Transects, ROV Paths (2 Passes in Cable Route and 4 Passes in EA Area), and Reefs Observed in ROV Survey

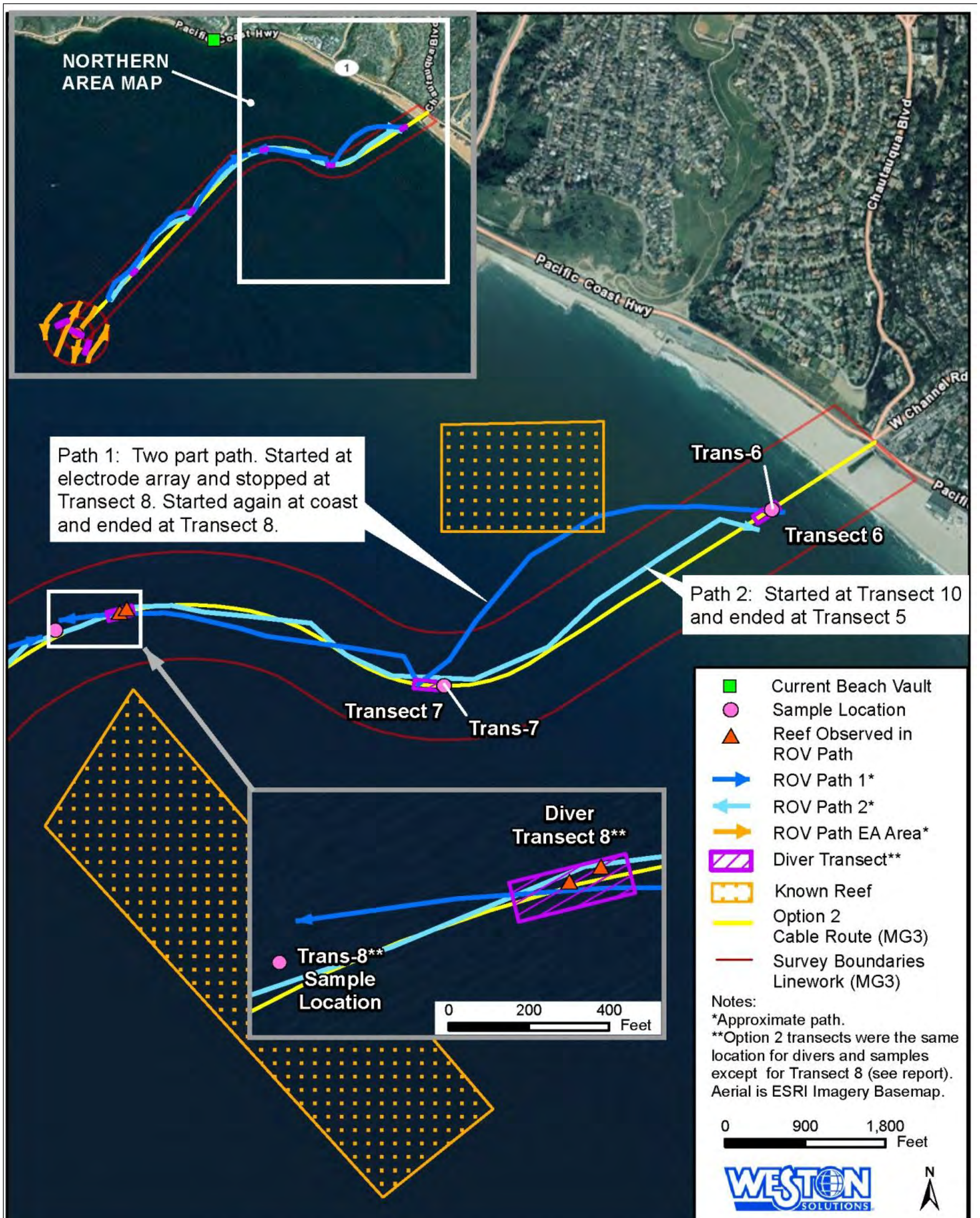


Figure 2-10. Northern Portion of Option 2 Cable Route Showing Water and Sediment Sample Locations, Diver Survey Transects, and ROV Paths (Two Passes), and Reefs Observed During ROV Survey

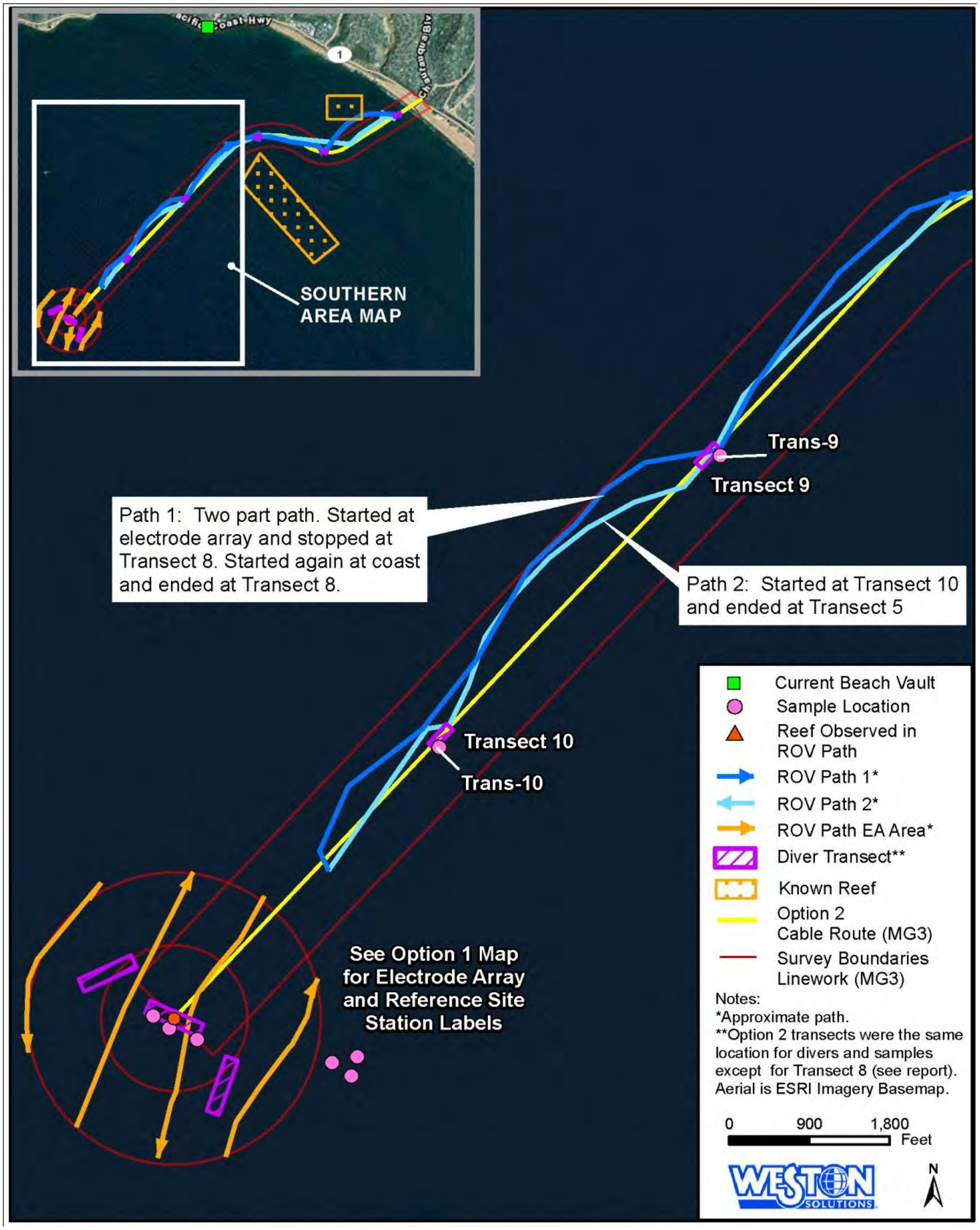


Figure 2-11. Southern Portion of Option 2 Cable Route and Electrode Array (EA) Area Showing Water and Sediment Sample Locations, Diver Survey Transects, and ROV Paths (2 Passes in Cable Route and 4 Passes in Electrode Array Area)

2.6 Data Review, Management and Analysis

2.6.1 Data Review

All data were reviewed and verified by participating team laboratories to determine if data quality objectives had been met and if appropriate corrective actions had been taken, when necessary. Data quality objectives followed the USEPA guidance documents for data review (USEPA, 2002, 2004, 2008). WESTON's QA Officer was responsible for the final review of all data generated.

2.6.2 Data Management

All laboratories supplied analytical results in both hard copy and electronic formats. Laboratories had the responsibility of ensuring that both forms were accurate. After completion of the data review by participating team laboratories, hard copy results were placed in the project file at WESTON and the results in electronic format were imported into WESTON's database system.

2.6.3 Quality Assurance/Quality Control and Laboratory Data Report

Analytical laboratories provided a QA/QC narrative describing the results of the standard QA/QC protocols that accompanied the analysis of field samples. All hard copies of results will be maintained in the project file at WESTON in Carlsbad and are included in the final report. In addition, back-up copies of results generated by each laboratory will be maintained at their respective facilities. At a minimum, the laboratory reports contain results of the laboratory analysis, QA/QC results, all protocols and any deviations from the project SAP, and a case narrative of COC details.

3.0 RESULTS

3.1 Sample Collection and Water Quality Monitoring

Water sampling, sediment sampling, and water quality monitoring was conducted March 29-30, 2012. During sampling, seas were relatively calm with 0.9-1.2 m (3-4 ft) swells out of the southwest and winds were generally light (0-10 mph) coming out of the west southwest. Water depth varied among the stations and was correlated with increased distance from shore. Station ID, field coordinates, date and time of sample collection and water depth are summarized in Table 3-1 for both sampling and water quality monitoring.

Table 3-1. Water Sample and Water Quality Monitoring Station Information

Location	Station ID	Type of Analysis	Date	Time	Latitude	Longitude	Water Depth (m)
Primary Cable Route (Option 1)	Trans-1	Sediment Chemistry, Water Quality	3/30/12	09:30	34°02.1441	118°33.4266	7.1
	Trans-2	Sediment Chemistry, Water Quality	3/30/12	10:00	34°01.7233	118°33.6831	12.2
	Trans-3	Sediment Chemistry, Water Quality	3/30/12	10:45	34°01.2542	118°33.9619	19.0
	Trans-4	Sediment Chemistry, Water Quality	3/30/12	11:15	34°00.7825	118°34.1803	28.0
	Trans-5	Sediment Chemistry, Water Quality	3/31/12	08:55	34°00.3391	118°34.4815	38.1
Secondary Cable Route (Option 2)	Trans-6	Sediment Chemistry, Water Quality	3/30/12	12:55	34°01.5665	118°31.3877	5.8
	Trans-7	Sediment Chemistry, Water Quality	3/30/12	13:25	34°01.2378	118°32.1139	11.8
	Trans-8	Sediment Chemistry, Water Quality	3/30/12	14:00	34°01.3369	118°32.9791	13.5
	Trans-9	Sediment Chemistry, Water Quality	3/30/12	14:45	34°00.8343	118°33.5504	23.5
	Trans-10	Sediment Chemistry, Water Quality	3/30/12	15:30	34°00.2928	118°34.1702	37.4

Table 3-1. Water Sample and Water Quality Monitoring Station Information

Location	Station ID	Type of Analysis	Date	Time	Latitude	Longitude	Water Depth (m)
Electrode Array Area	EA-1	Water and Sediment Chemistry, Water Quality	3/31/12	10:00	33°59.7706	118°34.7650	48.2
	EA-2	Water and Sediment Chemistry, Water Quality	3/31/12	11:25	33°59.7927	118°34.8016	48.5
	EA-3	Water and Sediment Chemistry, Water Quality	3/31/12	12:30	33°59.7498	118°34.7033	48.3
Reference Area	Ref-1	Water and Sediment Chemistry, Water Quality	3/31/12	13:55	33°59.7092	118°34.4038	47.6
	Ref-2	Sediment Chemistry, Water Quality	3/31/12	14:45	33°59.7205	118°34.3481	47.2
	Ref-3	Sediment Chemistry, Water Quality	3/31/12	15:20	33°59.6841	118°34.3609	48.0

3.2 Results of Chemical Analyses of Water Samples

Summary results of chemical analyses of water samples collected from the Electrode Array Area and the Reference Area are presented in Table 3-2. Target detection limits are provided in the SAP (WESTON, 2012). California Ocean Plan (COP) Daily Maximum and Instantaneous Maximum water quality objectives for the protection of marine aquatic life are provided in Table 3-2 for comparison to sample results. Only those compounds which have COP Daily Maximum and Instantaneous Maximum values are shown in Table 3-2. Detection limits and raw data for water sample analyses are provided in Appendix C.

Results of water chemistry analyses at stations EA-1, EA-2, EA-3 and REF-1 determined that there were no detectable concentrations of residual chlorine or halogenated organic compounds (volatile and semi-volatile) in any of the samples. Concentrations of trace metals were detected across all samples; however, all trace metal concentrations were substantially below the most conservative water quality objectives for the protection of marine life listed in the COP.

Table 3-2. Summary of Chemistry Analytical Results for Water Samples Collected from Electrode Array and Reference Areas

Analyte	Units	Methods	*COP Daily Max.	**COP Instant. Max.	EA-1	EA-2	EA-3	REF-1
Trace Metals								
Arsenic	µg/L	USEPA 1640	32	80	1.78	1.7	1.61	1.59
Cadmium	µg/L	USEPA 1640	4	10	0.102	0.111	0.111	0.109
Chromium	µg/L	USEPA 1640	8	20	0.194J	0.159J	0.157J	0.183J
Copper	µg/L	USEPA 1640	12	30	0.327	0.245	0.249	0.22
Lead	µg/L	USEPA 1640	8	20	0.115	0.0896	0.0817	0.104
Mercury	µg/L	USEPA 7470A	16	4	<0.0321	<0.0321	<0.0321	<0.0321
Nickel	µg/L	USEPA 1640	20	50	1.41	1.51	1.73	1.74
Selenium	µg/L	USEPA 1640	60	150	0.0489J	0.0621	0.0479J	0.0453J
Silver	µg/L	USEPA 1640	28	7	0.139	0.143	0.137	0.141
Zinc	µg/L	USEPA 1640	80	200	1.73	1.49	1.87	1.03
Chlorine								
Chlorine, Total Residual	mg/L	SM 4500-Cl F	8	60	<0.042	<0.042	<0.042	<0.042
Halogenated Organic Compounds (volatile and semi-volatile)								
2,4,6-Trichlorophenol	µg/L	USEPA 625	4	10	<2.5	<2.5	<2.5	<2.5
2,4-Dichlorophenol	µg/L	USEPA 625	4	10	<2.5	<2.5	<2.5	<2.5
2-Chlorophenol	µg/L	USEPA 625	4	10	<2.3	<2.3	<2.3	<2.3
4-Chloro-3-Methylphenol	µg/L	USEPA 625	4	10	<2.4	<2.4	<2.4	<2.4
All other halogenated organic compounds were below detection limits								

*California Ocean Plan Daily Maximum concentration
**California Ocean Plan Instantaneous Maximum concentration
J - Results above the method detection limit but below the reporting limit. Result is estimated.
< - Result below method detection limit.

3.3 Results of Water Quality Measurements

A summary of the results of water quality parameters measured by the SeaBird SBE datalogger at the surface, along the bottom, and the range throughout the entire water column for each station are provided in Table 3-3. Measurements included temperature, salinity, pH, DO, chlorophyll *a*, conductivity, density, and transmissivity. A complete record of these data, summarized in 0.91-m (3-ft) data bins, is provided in Appendix B. Profiles of temperature, DO, and pH at a deep water station (EA-1) and a shallow water station (Trans-2) are shown in Figure 3-1 and Figure 3-2 for comparison. Profiles of temperature, DO, and pH for all stations are provided in Appendix B.

Temperature
Water temperatures were consistent across all stations, varying gradually with depth. Surface temperatures ranged from approximately 13^{o}C to 15^{o}C and decreased steadily throughout the water column as depth increased. There were no notable thermoclines observed at shallow or

deep water stations. Temperatures were approximately 12^{o}C at 12.2 m (40 ft) in depth and were approximately 10^{o}C at 48.8 m (160 ft) in depth.

Salinity
Salinity varied little with depth and was nearly uniform across all stations. In general, salinity was slightly higher in deeper waters, but varied by less than 1 ppt throughout the water column at any of the monitored stations. Salinity values ranged from 33.3 to 34.0 ppt across all stations and depths; no significant differences in salinity were observed between the two cable routes.

pH
Values of pH varied slightly throughout the water column. pH ranged from 8.0 to 8.1 pH units at the surface and decreased slightly below depths of 15.2 m (50 ft) or more. Throughout the entire water column pH ranged from 7.6 pH units at 46.9 m (154 ft) in depth to 8.1 pH units at the surface. Along the two cable routes, there were no substantial differences in pH between stations that were similar in depth.

Dissolved Oxygen
DO levels varied significantly with depth across all stations. DO values were generally between 6.5 mg/L and 8.0 mg/L in the upper surface waters, and peaked at approximately 8.5 to 9.0 mg/L between 3 and 9.1 m (10 and 30 ft) of depth. Below approximately 9.1 m (30 ft) in depth, DO values began to gradually decline at most stations as depth increased (Figure 3-1 and Figure 3-2). Across all stations, DO ranged from 3.4 mg/L at 46.9 m (154 ft) of depth to 9.4 mg/L at 4.6 m (15 ft) of depth. In general, the two cable routes had similar DO levels for stations similar in depth.

Transmissivity
Transmissivity of light tended to remain relatively constant throughout the water column for most stations. Stations further offshore had greater transmissivity values than stations located closer to shore. For example, Transect-1, located just offshore, had an average transmissivity value of 78.9% while Transect-2 and Transect-3, located further offshore, had average transmissivity values of 87.7% and 92%. Low light penetration can be attributed to increased turbidity in nearshore waters as a result of wave action. Transmissivity differences between the two cable routes were minimal. Most notably, Transect-6 had substantially lower transmissivity at the surface and along the bottom than Transect-1; however, the range in transmissivity values throughout the water column at Transect-6 encompassed the range in values at Transect-1.

Chlorophyll *a*
Chlorophyll *a* concentrations ranged from 0.9 mg/m^3 to 4.8 mg/m^3 across all stations. With the exception of Station Trans-6, chlorophyll *a* concentrations varied by less than 1.5 mg/m^3 throughout the water column of any station. The close proximity of a freshwater input (small stream) to Station Trans-6 may explain the higher chlorophyll *a* concentrations (range of 3.1 to 4.8 mg/m^3) observed there. Trans-6 also had the lowest transmissivity of any station (average of 61.8%), likely partially due to the increased phytoplankton in the water column. Differences in chlorophyll a concentrations among the two cable routes were relegated to the stations closest to shore (Transects 1 and 6).

Resistivity
Resistivity was measured by converting conductivity measurements in Seimens/cm units to resistivity in ohms/cm. Resistivity was correlated with increasing depth across all stations, and ranged from 24.35 to 25.24 ohms/cm in surface waters to 26.81 to 26.85 ohms/cm at 46.9 m (154 ft) in depth.

Table 3-3. Summary of Water Quality Parameters Measured at the Surface, Bottom, and throughout the Water Column at Each Station

Station	Range of Values	Depth (ft)	Temp (C)	Conductivity (mS/cm)	Resistivity (ohms/cm)	Salinity (ppt)	DO (mg/l)	pH	Trans-missivity	Chlorophyll *a* (mg/m^3)	Density (kg/m^3)
(Option 1) Trans-1	Surface	0	13.4	39.8	25.14	33.5	8.7	8.0	75.9	1.9	1025.2
	Bottom	18	12.9	39.4	25.40	33.6	8.9	8.0	77.0	2.1	1025.3
	Range	0-18	12.9-13.4	39.4-39.8	25.14-25.40	33.5-33.6	8.7-9.4	8.0-8.1	75.9-82.4	1.9-2.1	1025.2-1025.3
(Option 1) Trans-2	Surface	0	13.6	40.0	25.00	33.5	6.7	8.1	81.7	2.0	1025.1
	Bottom	36	12.4	38.9	25.71	33.6	7.1	8.0	87.6	1.9	1025.5
	Range	0-36	12.4-13.6	38.9-40.0	25.00-25.71	33.5-33.6	6.7-9.0	8.0-8.1	81.0-92.7	1.5-2.0	1025.1-1025.5
(Option 1) Trans-3	Surface	0	13.7	40.1	24.96	33.5	7.2	8.1	86.6	1.6	1025.1
	Bottom	57	12.2	38.8	25.79	33.6	7.7	7.9	86.7	1.8	1025.5
	Range	0-57	12.2-13.7	38.8-40.1	24.95-25.79	33.5-33.7	7.2-8.9	7.9-8.1	86.6-96.0	1.2-1.8	1025.1-1025.6
(Option 1) Trans-4	Surface	0	13.8	40.1	24.93	33.5	7.0	8.0	95.2	1.2	1025.1
	Bottom	84	12.1	38.7	25.87	33.6	6.8	7.9	84.7	2.0	1025.6
	Range	0-84	12.1-13.8	38.7-40.1	24.93-25.87	33.5-33.6	6.8-8.4	7.9-8.0	84.7-96.1	1.1-2.0	1025.1-1025.6
(Option 1) Trans-5	Surface	0	13.4	39.8	25.15	33.5	6.5	8.0	95.2	1.6	1025.1
	Bottom	120	10.7	37.5	26.68	33.7	3.7	7.6	85.7	2.5	1026.0
	Range	0-120	10.7-13.4	37.5-39.8	25.11-26.68	33.5-33.8	3.7-8.4	7.6-8.0	85.7-95.6	1.3-2.5	1025.1-1026.0

Table 3-3. Summary of Water Quality Parameters Measured at the Surface, Bottom, and throughout the Water Column at Each Station

Station	Range of Values	Depth (ft)	Temp (C)	Conductivity (mS/cm)	Resistivity (ohms/cm)	Salinity (ppt)	DO (mg/l)	pH	Trans-missivity	Chlorophyll *a* (mg/m^3)	Density (kg/m^3)
(Option 2) Trans-6	Surface	0	14.8	41.1	24.35	33.5	6.8	8.0	57.0	4.8	1024.8
	Bottom	15	14.1	41.0	24.42	34.0	7.8	8.0	61.3	3.1	1025.5
	Range	0-15	12.1-14.8	38.7-41.1	24.35-24.42	33.5-34.0	6.8-8.4	7.9-8.0	57.0-96.1	3.1-4.8	1024.8-1025.6
(Option 2) Trans-7	Surface	0	14.2	40.5	24.66	33.5	7.4	8.0	85.6	1.6	1025.0
	Bottom	36	12.6	39.1	25.56	33.6	7.8	8.0	83.3	2.4	1025.4
	Range	0-36	12.6-14.2	39.1-40.5	24.66-25.56	33.5-33.7	7.2-9.4	8.0	83.3-88.1	1.4-2.4	1025.0-1025.5
(Option 2) Trans-8	Surface	0	14.2	40.5	24.72	33.4	7.4	8.0	86.0	1.4	1024.9
	Bottom	39	12.8	39.3	25.44	33.6	8.9	8.0	89.2	1.7	1025.4
	Range	0-39	12.8-14.2	39.3-40.5	24.69-25.44	33.4-33.7	7.4-9.1	8.0	85.9-91.9	1.4-1.7	1024.9-1025.4
(Option 2) Trans-9	Surface	0	13.7	40.0	24.98	33.5	5.9	8.0	95.3	1.3	1025.0
	Bottom	72	12.5	39.0	25.61	33.6	8.4	8.0	84.3	1.9	1025.5
	Range	0-72	12.5-13.8	39.0-40.1	24.95-25.61	33.5-33.7	5.9-8.8	8.0	84.3-95.4	1.2-1.9	1025.0-1025.5
(Option 2) Trans-10	Surface	0	13.4	39.5	25.34	33.3	6.4	8.0	95.7	2.7	1025.0
	Bottom	117	10.9	37.7	26.52	33.7	4.5	7.6	85.7	2.4	1025.9
	Range	0-117	10.9-13.4	37.7-39.6	25.23-26.54	33.3-33.7	4.5-8.2	7.6-8.0	85.7-95.9	1.6-2.9	1025.0-1026.0

Table 3-3. Summary of Water Quality Parameters Measured at the Surface, Bottom, and throughout the Water Column at Each Station

Station	Range of Values	Depth (ft)	Temp (C)	Conductivity (mS/cm)	Resistivity (ohms/cm)	Salinity (ppt)	DO (mg/l)	pH	Trans-missivity	Chlorophyll *a* (mg/m^3)	Density (kg/m^3)
EA-1	Surface	0	13.2	39.6	25.24	33.5	6.4	8.0	93.3	1.5	1025.2
	Bottom	154	10.4	37.3	26.81	33.8	3.5	7.6	89.6	2.4	1026.2
	Range	0-154	10.4-13.2	37.3-39.6	25.24-26.81	33.5-33.8	3.5-8.4	7.6-8.0	89.0-96.5	1.2-2.4	1025.2-1026.2
EA-2	Surface	0	13.4	39.8	25.14	33.5	8.1	8.0	93.7	1.1	1025.2
	Bottom	154	10.4	37.3	26.82	33.8	3.4	7.6	89.7	2.2	1026.2
	Range	0-154	10.4-13.4	37.3-39.8	25.14-26.83	33.5-33.8	3.4-8.6	7.6-8.0	89.7 -96.5	1.1-2.4	1025.2-1026.2
EA-3	Surface	0	13.4	39.8	25.13	33.5	6.9	8.0	93.5	1.2	1025.2
	Bottom	154	10.3	37.3	26.84	33.8	3.4	7.6	89.0	2.4	1026.2
	Range	0-154	10.3-13.4	37.3-39.8	25.13-26.84	33.5-33.8	3.4-8.5	7.6-8.0	89.0-96.5	1.1-2.4	1025.2-1026.2
REF-1	Surface	0	13.7	40.0	24.99	33.5	8.2	8.0	93.9	1.0	1025.1
	Bottom	151	10.3	37.2	26.85	33.8	3.4	7.6	90.3	2.4	1026.2
	Range	0-151	10.3-13.7	37.2-40.0	24.99-26.85	33.5-33.8	3.4-8.7	7.6-8.0	90.3-96.1	1.0-2.4	1025.1-1026.2
REF-2	Surface	0	14.0	40.4	24.77	33.5	8.3	7.9	94.6	1.0	1025.0
	Bottom	151	10.3	37.3	26.84	33.8	3.4	7.6	90.0	2.3	1026.2
	Range	0-151	10.3-14.0	37.3-40.4	24.77-26.84	33.5-33.8	3.4-8.7	7.6-8.0	87.4-96.1	1.0-2.3	1025.0-1026.2
REF-3	Surface	0	14.8	41.0	24.38	33.5	8.1	8.0	94.5	1.0	1024.9
	Bottom	154	10.3	37.3	26.84	33.8	3.4	7.6	89.9	2.2	1026.2
	Range	0-154	10.3-14.8	37.3-41.0	24.38-26.85	33.5-33.8	3.4-8.7	7.6-8.0	89.9-96.0	0.9-2.5	1024.9-1026.2

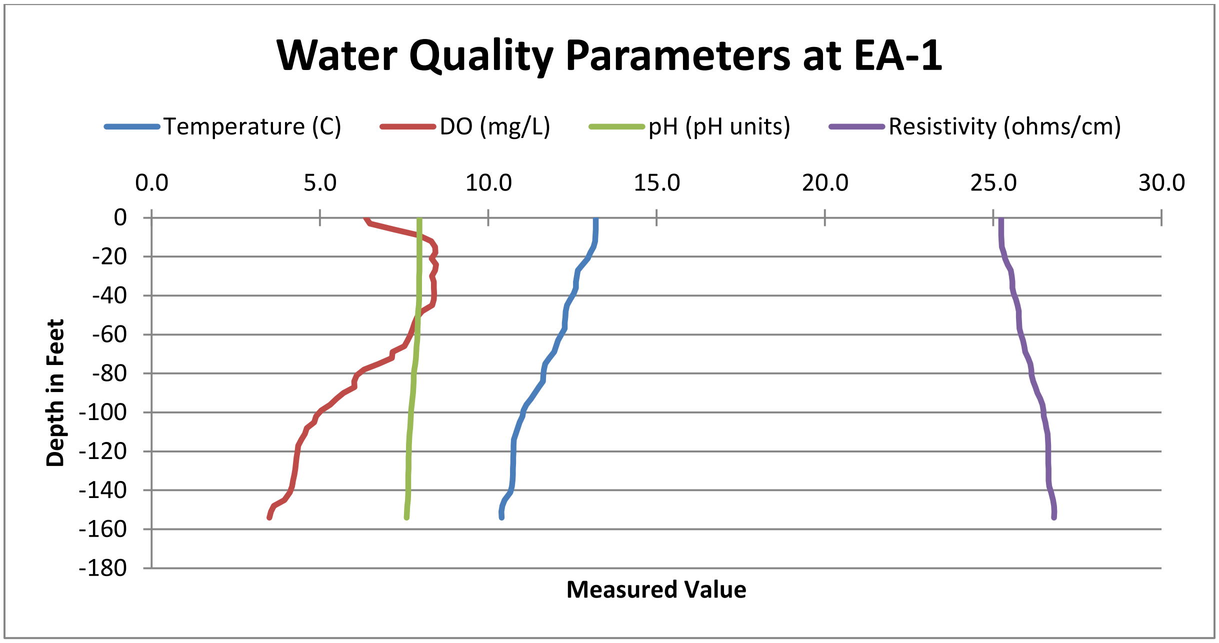


Figure 3-1. Water Column Measurements at a Deep Water Station, EA-1

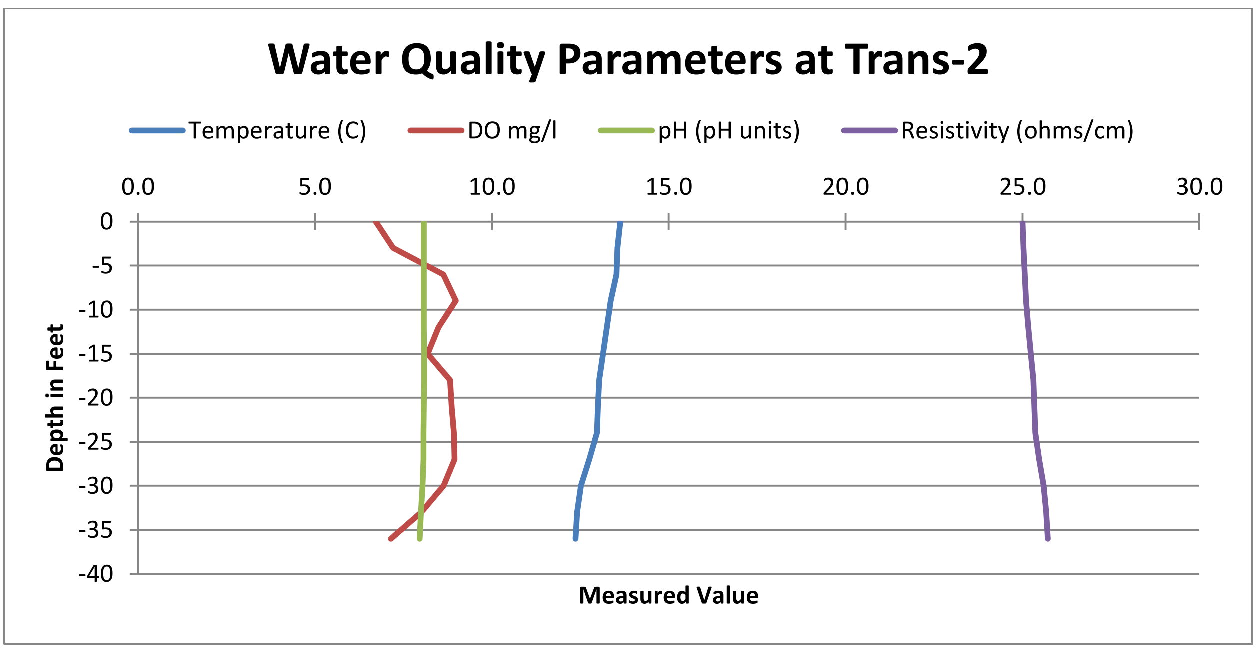


Figure 3-2. Water Column Measurements at a Shallow Water Station, Trans-2

3.4 Sediment Sample Collection

Sediment samples were collected on March 30-31, 2011 from all stations using a double Van Veen grab sampler. Samples for chemical analysis and grain size were collected from the top 5 cm of sediment while benthic infauna was collected from the entire grab (17 cm in depth). Figure 2-8 through Figure 2-11 depict the final station locations as determined in the field.

3.5 Sediment Chemistry Results

Sediment samples were analyzed for the following contaminants of concern: metals, organochlorine pesticides, PAHs, and PCB congeners. Physical measurements for TOC content, percent solids, and grain size were also performed. Results of grain size analysis were strongly correlated with depth. Sediment collected from stations that were less than 18.3 m (60 ft) in depth (Transects 6 1, 7, 2, and 8) were comprised of the greatest percentages of sand (70% or higher) and lowest percentages of silt and clay, while stations that were below 30.5 m (100 ft) in depth, were comprised of mostly silts, less than 40% sand, and higher percentages of clay. Results of grain size analyses, arranged by increasing station depths are shown in Figure 3-3, while raw data are provided in Table 3-4.

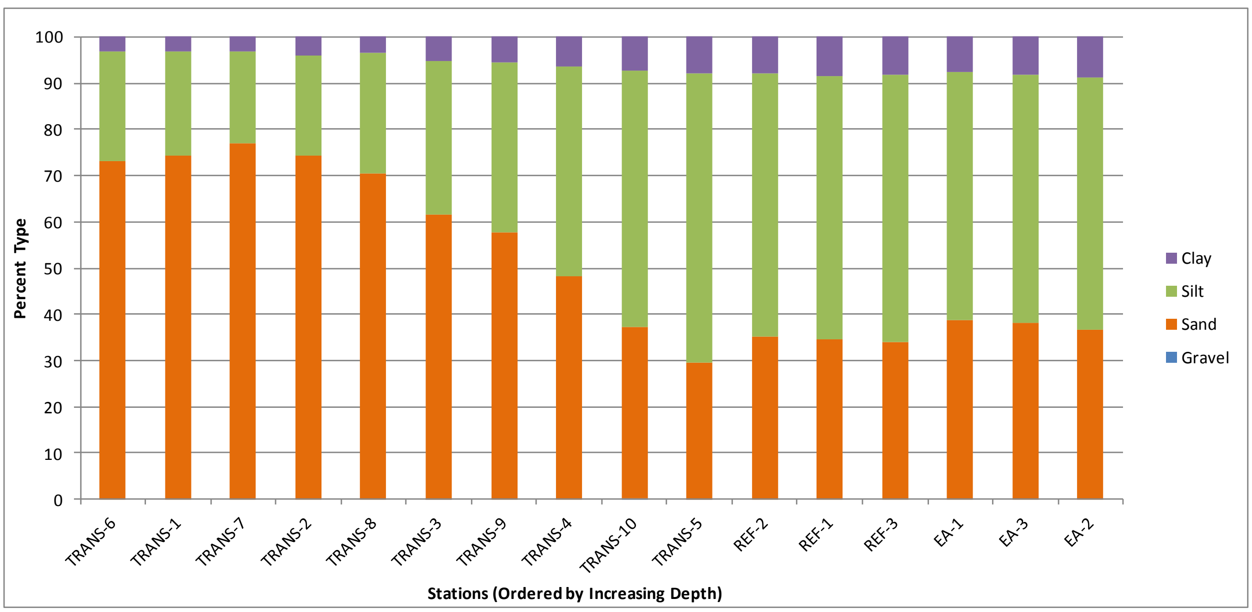


Figure 3-3. Results of Grain Size Analysis

The results of chemical analyses of the sediment samples collected from the two cable route options, the Electrode Array Area, and the Reference Area are presented in Appendix C with the ER-L and ER-M sediment quality values for each analyte. A summary table of the sediment chemistry results is provided below in Table 3-4. Concentrations of all chemicals of concern were below ER-M levels throughout the APE. All trace metals were below ER-L values with the exception of mercury at Trans-1 and Ref-2. Mercury values along the Option 1 cable route ranged from 0.033 to 0.426 mg/kg, while along the Option 2 cable route and Electrode Array Area, mercury concentrations ranged from 0.032 to 0.105 mg/kg, and 0.077 to 0.163 mg/kg, respectively. In general, concentrations of metals were comparable along both cable routes and were correlated with increasing percentages of fine-grained material. The deeper sites (Transects 4, 5, 9, 10 and electrode array and reference areas), located furthest offshore and comprised of the highest percentages of fine sediment (Figure 3-3), contained the highest concentrations of trace metals.

Several chlorinated pesticide compounds, such as dichlorodiphenyltrichloroethanes (DDTs), exceeded ER-L concentrations. As occurred with trace metals, concentrations of chlorinated pesticides were greatest in locations which had the highest percentage of fine-grained materials (silts and clays). While ER-L concentrations for total detectable DDTs were exceeded at all stations other than Trans-1, there were no ER-M exceedances (Table 3-4). Concentrations of the chlorinated pesticide 4-4'-DDD exceeded the ER-L of 2.0 µg/kg at Trans-5, Trans 10, EA-3, REF-2, and REF-3, but were well below the ER-M of 20 µg/kg. In general, chlorinated pesticide concentrations were comparable between both the Option 1 cable route and the Option 2 cable route and increased in concentration as stations increased in both depth and fine-grained sediment composition. Since the Electrode Array and Reference areas consist solely of deep water stations, average chlorinated pesticide concentrations were higher in these areas than along either of the cable routes.

Station EA-3 was the only station with a sediment concentration of total PCBs that was above the ER-L. Since no ER-Ls or ER-Ms have been established for individual PCB congeners, results were compared to ER-Ls and ER-Ms for total PCBs. As with trace metals, and chlorinated pesticides, total PCBs were strongly correlated with increasing depth and decreasing grain size. PCB concentrations between the Option 1 cable route and the Option 2 cable route were generally comparable to one another, with total PCB concentrations at all stations below the ER-L. The average total PCB concentrations in the Electrode Array and Reference Areas were somewhat higher than along either of the cable routes.

The number of ER-L exceedances along the two cable routes and the Electrode Array and Reference areas is shown in Figure 3-4. The Electrode Array and Reference areas sediments had more ER-L exceedances than either of cable routes, likely as a result of containing more fine-grained material. DDT and its breakdown products, DDD and DDE, were found at levels above the ER-L at nearly all stations. These compounds are considered to be legacy contaminants in Santa Monica Bay resulting from pesticide spraying activity on land and dumping activity in nearshore waters prior to DDT being banned in 1972.

Table 3-4. Summary of Sediment Chemistry Results

Analyte	Units	Methods	ER-L	ER-M	Option 1 Cable Route					Option 2 Cable Route					Central Electrode Array			Reference		
					TRANS-1	TRANS-2	TRANS-3	TRANS-4	TRANS-5	TRANS-6	TRANS-7	TRANS-8	TRANS-9	TRANS-10	EA-1	EA-2	EA-3	REF-1	REF-2	REF-3
					3/30/2012	3/30/2012	3/30/2012	3/30/2012	3/31/2012	3/30/2012	3/30/2012	3/30/2012	3/30/2012	3/30/2012	3/31/2012	3/31/2012	3/31/2012	3/31/2012	3/31/2012	3/31/2012
General Chemistry																				
Carbon, Total Organic	%	USEPA 9060A			0.31	0.23	0.39	0.75	0.76	0.27	0.22	0.27	0.67	0.85	0.82	0.84	0.87	0.75	0.77	0.82
Solids, Total	%	SM 2540 B			70	68.1	66.5	64.4	66.1	67.9	66.9	67.4	67.5	63.4	64.7	61.7	62.9	62.9	62.3	61.2
Particle Size																				
Gravel	%	Plumb, 1981			0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Sand	%	Plumb, 1981			74.36	74.40	61.45	48.15	29.63	73.21	77.05	70.58	57.61	37.33	38.83	36.73	38.25	34.73	35.31	33.93
Silt	%	Plumb, 1981			22.38	21.48	33.45	45.35	62.51	23.56	19.83	26.03	36.90	55.35	53.74	54.53	53.58	56.87	56.75	57.77
Clay	%	Plumb, 1981			3.26	4.12	5.08	6.50	7.85	3.24	3.13	3.39	5.49	7.24	7.43	8.74	8.17	8.40	7.93	8.30
Trace Metals																				
Arsenic	mg/kg	USEPA 6020	8.2	70	3.17B	3.71B	3.98B	6.66B	5.71B	4.39B	3.66B	3.87B	5.12B	5.18B	4.93B	4.91B	4.41B	4.08B	5.2B	4.37B
Cadmium	mg/kg	USEPA 6020	1.2	9.6	0.29	0.224	0.248	0.4	0.331	0.274	0.215	0.265	0.401	0.393	0.274	0.337	0.308	0.259	0.376	0.216
Chromium	mg/kg	USEPA 6020	81	370	17.4B	15.8B	17.8B	25.8B	30.6B	19.2B	17.7B	17.7B	26.4B	30.2B	33.1B	34B	32.3B	30.1B	35.9B	31.3B
Copper	mg/kg	USEPA 6020	34	270	5.79B	5.95B	5.61B	9.39B	10.9B	7.45B	4.21B	4.63B	9.27B	10.6B	10.7B	12.1B	11.2B	10.2B	11.8B	11B
Lead	mg/kg	USEPA 6020	46.7	218	5.62	5.58	7.33	10.6	11.7	7.67	7.08	7.48	11.1	11.3	10.8	11.4	10.7	9.29	11.7	10.4
Mercury	mg/kg	USEPA 7471A	0.15	0.71	0.426	0.0328	0.0572	0.0968	0.0999	0.0437	0.0319	0.0443	0.0808	0.105	0.0896	0.126	0.0771	0.0962	0.163	0.116
Nickel	mg/kg	USEPA 6020	20.9	51.6	16	13.3	12.5	16.3	17.8	17.9	13.8	14.1	16.7	17.9	17.5	16.8	16.2	15.8	18.9	15.5
Silver	mg/kg	USEPA 6020	1	3.7	0.0426B,J	0.0653B,J	0.171B	0.447B	0.541B	0.0533B,J	0.0546B,J	0.0742B,J	0.386B	0.527B	0.561B	0.712B	0.621B	0.521B	0.632B	0.609B
Zinc	mg/kg	USEPA 6020	150	410	33.6	29.9	33.4	48.1	52.6	43.7	34	33.4	46.7	53.2	51.8	51.2	48.2	46	55	48.2
Chlorinated Pesticides																				
2,4'-DDD	µg/kg	USEPA 8081A			<0.24	<0.25	<0.25	<0.26	<0.26	<0.25	<0.25	<0.25	<0.25	0.35J	<0.26	0.4J	0.48J	<0.27	0.36J	0.51J
2,4'-DDE	µg/kg	USEPA 8081A			<0.22	0.32J	0.73J	1.3	2.2	0.39J	0.26J	0.39J	1.5	2	3.2	1.6	2.8	1.8	2.9	2.4
2,4'-DDT	µg/kg	USEPA 8081A			<0.21	<0.22	<0.23	<0.23	<0.23	<0.22	<0.22	<0.22	<0.22	<0.24	<0.23	<0.24	<0.24	<0.24	<0.24	<0.25
4,4'-DDD	µg/kg	USEPA 8081A	2	20	0.42J	<0.23	0.65J	1.6	2.3	0.91	<0.24	0.44J	1.6	2.9	<0.24	1.9	3	1.7	3.1	2.6
4,4'-DDE	µg/kg	USEPA 8081A	2.2	27	1.1	1.8	5.5	11	17	3.2	1.6	2.7	10	14	26	15	25	13	21	18
4,4'-DDT	µg/kg	USEPA 8081A	1	7	<0.24	<0.25	<0.25	<0.26	<0.25	<0.25	<0.25	<0.25	<0.25	<0.26	<0.26	<0.27	<0.27	<0.27	<0.27	<0.27
Total Detectable DDTs	µg/kg	USEPA 8081A	1.58	46.1	1.52	2.12	6.88	13.9	21.5	4.5	1.86	3.53	13.1	19.25	29.2	18.9	31.28	16.5	27.36	23.51
Dieldrin	µg/kg	USEPA 8081A	0.02	8	<0.24*	<0.24*	<0.25*	<0.26*	<0.25*	<0.24*	<0.25*	<0.24*	<0.24*	<0.26*	<0.25*	<0.27*	<0.26*	<0.26*	<0.26*	<0.27*
Other Chlorinated Pesticides	µg/kg	USEPA 8081A	-	-	Across all sites, no other chlorinated pesticides were detected above reporting limits.															
PCB Congeners																				
Individual PCB congeners	µg/kg	USEPA 8270C SIM	NA	NA	Across all sites, 14 PCB congeners were detected above reporting limits. Individual PCB congeners do not have established ER-L and ER-M values.															
Total PCBs	µg/kg	Calculation	22.7	180	<0.29	<0.3	3.72	6.82	12.01	<0.3	<0.3	<0.3	3.93	9.21	13.04	13.08	36.32	16.59	8.76	14.05
Polynuclear Aromatic Hydrocarbons																				
Individual PAHs	µg/kg	USEPA 8270C SIM	-	-	Across all sites, 7 PAHs were detected above reporting limits; of these, only fluoranthene, naphthalene and pyrene have established ER-L and ER-M values. No ER-L or ER-M values were exceeded by individual PAH concentrations at any site.															
Total Detectable PAHs	µg/kg	Calculation	4,022	44,792	18.8	3.5	20.1	25.9	89.3	154	1.7	2	35	43.4	33.2	38	50.1	12.8	78.9	22.1

< - results less than the method detection limit.

B - Analyte was detected in the associated method blank.

J - Result above the method detection limit but below the reporting limit. Result is estimated.

* - The method detection limit is greater than the ER-L.

NA- ER-L and ER-M values have not been established

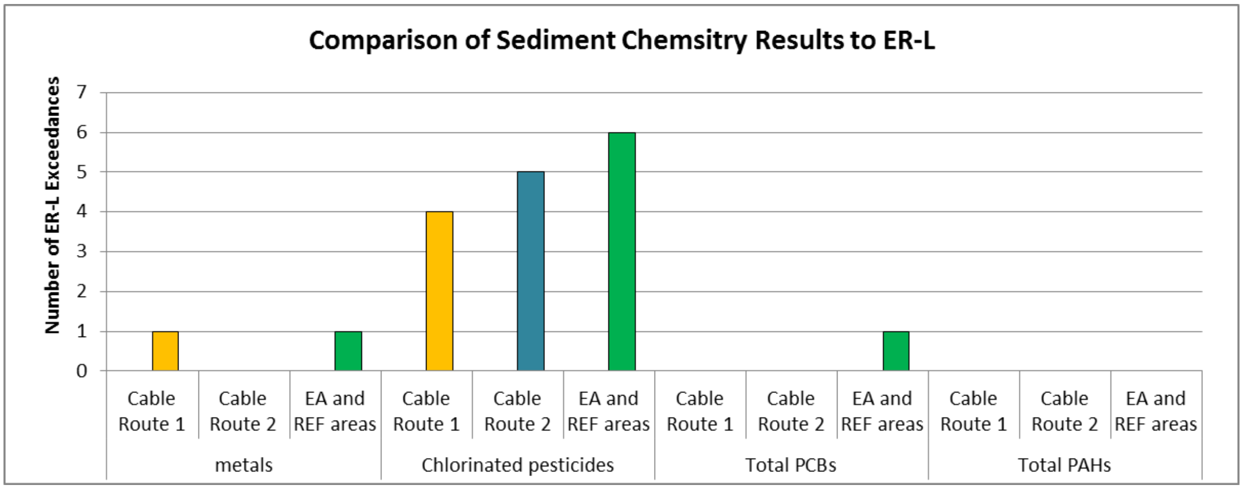


Figure 3-4. Number of ER-L Exceedances by Constituent Groups along Cable Routes and Electrode Array and Reference Areas.

3.6 Benthic Infauna Results

Benthic infauna samples were collected from each of the 16 stations: five along each of the proposed cable routes, three at the proposed electrode array location, and three at the reference location (Figure 2-1 and Figure 2-2). The complete species list and abundance for each station is provided in Appendix D. A summary of the benthic community measures for each station are provided in Table 3-5. Standard benthic community measures include total abundance, number of species, dominance index (number of species comprising 70% of the total number of species at a station), evenness (proportion of abundance of different species), Shannon-Wiener Diversity Index, and BRI. A benthic response condition is also provided for each station (refer to Section 2.2.2.2 for a description of the BRI and how it is measured). The percentage of total abundance and number of species by taxonomic group is shown in Table 3-6.

In addition, to provide perspective for the 2012 benthic infauna results, comparisons were made to Bight ’08 stations that were sampled surrounding the region of the proposed cable routes (Figure 3-5). The complete species list and abundance for each station is provided in Appendix D. A summary of the community measures for the Bight ’08 stations is provided in Table 3-7. The percentage of total abundance and number of species by taxonomic group is shown in Table 3-8.

When the BRI was evaluated for the two stations, Trans-1 and Trans-6, it was determined that the station depths were too shallow for the ranges set in the BRI calculations. Water depths for these two stations were 7.1 m (23 ft) and 5.8 m (19 ft), respectively. The shallow depth range for calculating the BRI extends from 10-35 m (33- 115 ft). For comparative purposes only, these two stations were included in the shallow range in order to calculate a benthic response condition.

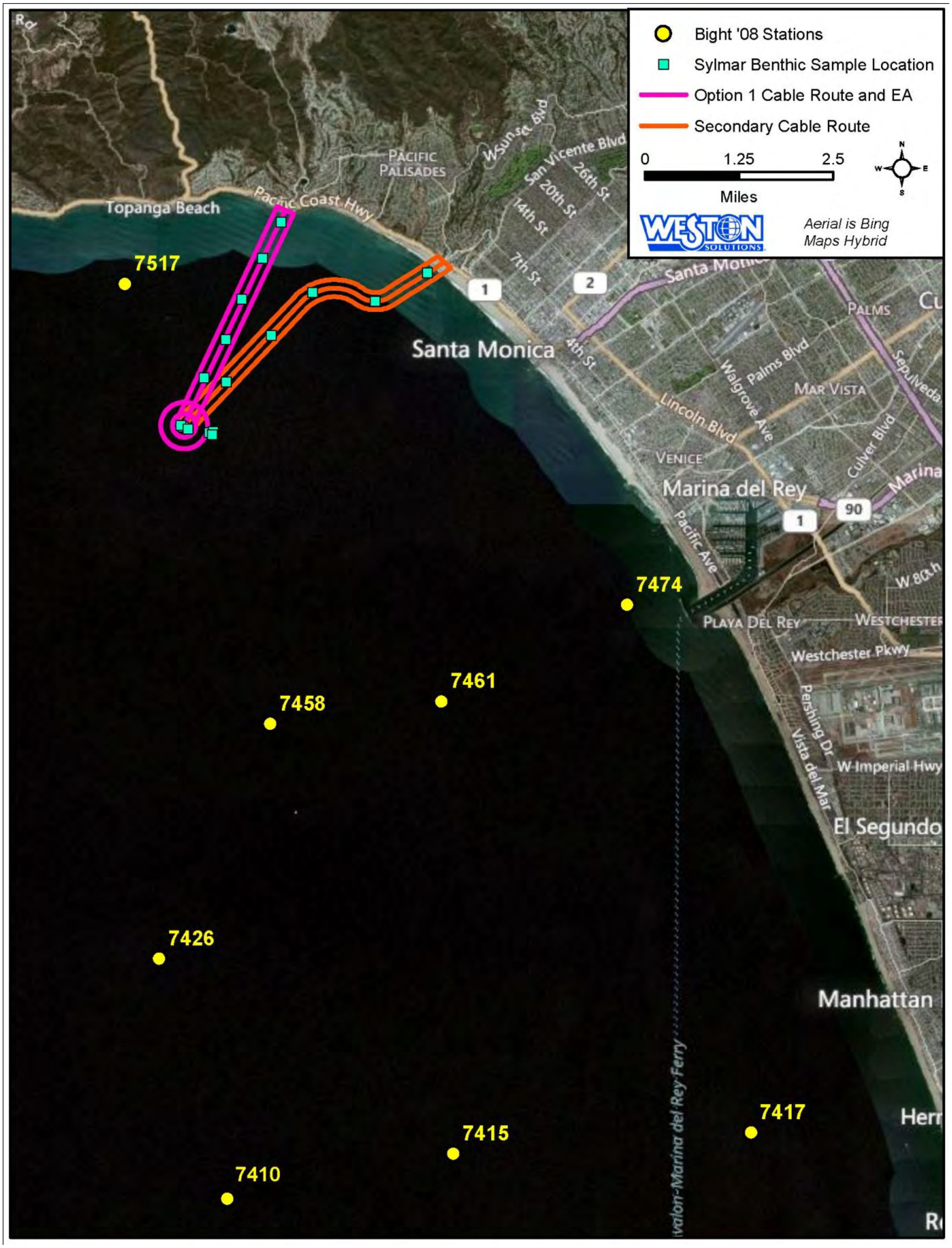


Figure 3-5. Bight '08 Stations in the Vicinity of the Area of Potential Effect

Table 3-5. Benthic Community Measures for Stations Located Within the Proposed Cable Routes, Electrode Array Area, and Reference Area

Location	Station ID	Depth (m)	Total Abundance	Number of Species	Dominance Index	Evenness	Shannon-Wiener Diversity Index	Benthic Response Index	Benthic Response Condition
Option 1 Cable Route	Trans-1	7.1	49	26	14	0.94	3.05	25.34*	Response Level 1
	Trans-2	12.2	76	39	22	0.94	3.44	18.62	Reference
	Trans-3	19.0	164	70	35	0.95	4.04	29.94	Response Level 1
	Trans-4	28.0	298	90	35	0.87	3.93	22.21	Reference
	Trans-5	38.1	414	131	58	0.93	4.55	15.05	Reference
Option 2 Cable Route	Trans-6	5.8	40	23	14	0.96	3.01	4.77*	Reference
	Trans-7	11.8	62	37	24	0.96	3.46	16.21	Reference
	Trans-8	13.5	74	27	13	0.91	3.01	10.19	Reference
	Trans-9	23.5	444	105	32	0.85	3.95	22.83	Reference
	Trans-10	37.4	480	120	47	0.89	4.27	16.57	Reference
Electrode Array Area	EA-1	48.2	208	83	36	0.89	3.92	9.88	Reference
	EA-2	48.5	300	89	37	0.90	4.02	12.21	Reference
	EA-3	48.3	311	101	42	0.91	4.21	14.95	Reference
Reference Area	REF-1	47.6	287	103	42	0.91	4.21	13.95	Reference
	REF-2	47.2	265	95	42	0.91	4.16	11.22	Reference
	REF-3	48.0	319	109	45	0.90	4.24	14.27	Reference

* Stations Trans-1 and Trans-6 were located in water depths of 7.1 m and 5.8 m, respectively. The shallow depth range for calculating the BRI extends from 10-35 m. For comparative purposes only, these two stations were included in the shallow range in order to calculate a benthic response condition.

Table 3-6. Percentage of Total Abundance and Number of Taxa by Taxonomic Group for Proposed Cable Routes, Electrode Array Area, and Reference Area

Location	Station ID	Depth (m)	Taxonomic Group									
			Percentage of Total Abundance					Percentage of Number of Species				
			Polychaetes (%)	Crustaceans (%)	Molluscs (%)	Echinoderms (%)	Minor Phyla (%)	Polychaetes (%)	Crustaceans (%)	Molluscs (%)	Echinoderms (%)	Minor Phyla (%)
Option 1 Cable Route	Trans-1	7.1	24.5	46.9	24.5	0.0	4.1	19.2	46.2	26.9	0.0	7.7
	Trans-2	12.2	52.6	25.0	13.2	0.0	9.2	39.0	34.1	12.2	0.0	14.6
	Trans-3	19.0	38.4	36.6	22.0	2.4	0.6	46.1	25.0	23.7	3.9	1.3
	Trans-4	28.0	43.6	29.2	10.7	10.7	5.7	42.7	31.3	11.5	4.2	10.4
	Trans-5	38.1	34.8	37.4	9.9	10.1	7.7	40.8	31.7	10.6	4.9	12.0
Option 2 Cable Route	Trans-6	5.8	22.5	50.0	25.0	0.0	2.5	25.0	50.0	20.8	0.0	4.2
	Trans-7	11.8	43.5	25.8	17.7	0.0	12.9	30.8	28.2	25.6	0.0	15.4
	Trans-8	13.5	10.8	59.5	21.6	2.7	5.4	17.2	37.9	27.6	6.9	10.3
	Trans-9	23.5	37.2	49.3	8.1	0.9	4.5	40.5	32.4	17.1	2.7	7.2
	Trans-10	37.4	30.2	50.6	9.0	5.2	5.0	38.8	31.3	11.9	6.7	11.2
Electrode Array Area	EA-1	48.2	30.3	26.4	10.6	26.4	6.3	34.1	29.5	17.0	8.0	11.4
	EA-2	48.5	33.3	25.3	12.0	25.0	4.3	36.8	32.6	15.8	6.3	8.4
	EA-3	48.3	36.0	24.4	13.5	19.6	6.4	40.4	27.5	15.6	5.5	11.0
Reference Area	Ref-1	47.6	33.8	28.6	12.9	18.5	6.3	36.2	28.6	16.2	6.7	12.4
	Ref-2	47.2	31.3	32.1	9.4	20.4	6.8	36.7	30.6	15.3	7.1	10.2
	Ref-3	48.0	30.4	24.1	14.1	24.1	7.2	38.7	26.1	18.0	7.2	9.9

Table 3-7. Benthic Community Measures for Stations Sampled During the Bight '08 Program

Station ID	Depth Range (m)	Total Abundance	Number of Taxa	Dominance Index	Evenness	Shannon-Wiener Diversity Index	Benthic Response Index	Benthic Response Condition
7474	5-30	194	66	26	0.87	3.63	26.1	Response Level 1
7517		782	137	35	0.81	4.00	27.2	Response Level 1
7410	31-120	257	95	38	0.90	4.11	11.1	Reference
7415		448	118	37	0.86	4.10	14.5	Reference
7417		277	90	35	0.89	4.00	16.6	Reference
7426		281	105	47	0.93	4.32	8.4	Reference
7458		309	106	42	0.90	4.20	18.4	Reference
7461		508	117	36	0.86	4.09	17.4	Reference

Table 3-8. Percentage of Total Abundance and Number of Taxa by Taxonomic Group for Bight '08 Stations

Bight '08 Station ID	Depth Range (m)	Taxonomic Group									
		Percentage of Total Abundance					Percentage of Number of Species				
		Polychaetes (%)	Crustaceans (%)	Molluscs (%)	Echinoderms (%)	Minor Phyla (%)	Polychaetes (%)	Crustaceans (%)	Molluscs (%)	Echinoderms (%)	Minor Phyla (%)
7474	5-30	65.8	13.6	1.1	16.3	3.3	56.1	18.2	15.2	3.0	7.6
7517		64.5	23.1	1.5	6.7	4.1	55.1	22.5	9.4	4.3	8.7
7410	31-120	58.6	10.8	13.1	13.5	4.1	58.9	17.9	11.6	5.3	6.3
7415		36.5	16.1	13.8	30.5	3.1	43.6	21.4	23.9	5.1	6.0
7417		58.9	15.2	8.5	14.1	3.3	53.3	20.0	16.7	3.3	6.7
7426		49.6	28.1	4.1	13.7	4.4	49.5	24.8	12.4	7.6	5.7
7458		50.3	13.3	1.0	31.7	3.7	53.8	14.2	22.6	2.8	6.6
7461		62.3	23.0	4.9	6.0	4.0	57.3	22.2	6.0	6.0	8.5

Option 1 Cable Route

The total abundance of benthic organisms at stations sampled along the Option 1 cable route ranged from 49 individuals at Trans-1 to 414 individuals at Trans-5 (Table 3-5). The number of species at all five stations ranged from 26 species at Trans-1 to 131 species at Trans-5. Both total abundance values and number of species increased with depth. The dominance index also increased the further the stations were located offshore ranging from 14 to 58. Both the Shannon-Wiener diversity index and evenness showed similar values at all five stations. BRI values were indicative of reference to low disturbance conditions (Response Level 1).

Polychaetes dominated Stations Trans-2, Trans-3, and Trans-4 representing 52.6%, 38.4%, and 43.6%, respectively, of the total abundance. Crustaceans (e.g. amphipods, shrimp, and crabs) dominated Stations Trans-1 and Trans-5 representing 46.9% and 37.4%, respectively, of the total abundance (Table 3-6). Polychaetes had the greatest diversity among all of the stations along the Option 1 cable route ranging from 39.0% to 46.1% of the species, except at Station Trans-1 where crustaceans were the most diverse with 46.2% of the species.

Option 2 Cable Route

The total abundance of benthic organisms at stations sampled along the Option 2 cable route ranged from 40 individuals at Trans-1 to 480 individuals at Trans-5 (Table 3-5). The number of species at all five stations ranged from 23 species at Trans-1 to 120 species at Trans-5. Both total abundance values and number of species generally increased with depth. The dominance index tended to generally increase the further the stations were offshore ranging from 14 to 47. Both the Shannon-Wiener diversity index and evenness showed similar values at all five stations. BRI values were indicative of reference conditions.

Crustaceans dominated Stations Trans-6, Trans-8, Trans-9, and Trans-10 representing 50.0%, 59.5%, 49.3%, and 50.6%, respectively, of the total abundance, whereas, polychaetes dominated Station Trans-7 representing 43.5% of the total abundance (Table 3-6). Polychaetes had the greatest diversity at Stations Trans-7, Trans-9, and Trans-10 representing 30.8%, 40.5%, and 38.8% of the species, respectively. At Stations Trans-6 and Trans-8, crustaceans were the most diverse representing 50.0% and 37.9% of the species, respectively.

Electrode Array and Reference Areas

The Electrode Array and Reference areas had similar benthic community measures (Table 3-5). Total abundance of benthic organisms at the Electrode Array Area ranged from 208 to 311 individuals, while the number of organisms at the reference area ranged from 265 to 319 individuals. The number of species was slightly higher at the Reference Area ranging from 95 to 109 species, whereas the number of species at the Electrode Array Area ranged from 83 to 101 species. The dominance index, evenness values, and Shannon-Wiener diversity index showed similar values among all six stations. BRI values in both areas were indicative of reference conditions.

Polychaetes were the most abundant and diverse at all three stations in the Electrode Array Area representing 30.3% (EA-1) to 36.0% (EA-3) of the total abundance and 34.1% (EA-1) to 40.4% (EA-3) of the species (Table 3-6). Polychaetes were also the most abundant and diverse at Stations Ref-1 and Ref-3 located in the reference area representing 33.8% and 30.4%, respectively, of the total abundance and 36.2% and 38.7%, respectively, of the species. At

Station Ref-2, crustaceans had the highest abundance with 32.1% of the total abundance; however, polychaetes had the greatest diversity with 36.7% of the species.

Comparison to Bight '08 Stations
The BRI values calculated for the benthic infauna samples collected along the proposed cable routes, Electrode Array Area, and Reference Area were compared to samples collected during Bight '08 in the surrounding region to determine if benthic community conditions were similar (Table 3-5 and Table 3-7). Stations Trans-1-4 and Trans 6-9, along both proposed cable routes, were compared to the two Bight '08 stations, 7474 and 7517, since these stations were located within a similar depth range of 5-30 m. Both Bight '08 stations had a benthic response condition indicating a low disturbance (Response Level 1). Two of the stations (Trans-1 and Trans-3) located on the Option 1 cable route were characterized with low disturbance conditions (Response Level 1) and two stations (Trans-2 and Trans-4) were characterized with reference conditions. All four stations located on the Option 2 cable route were indicative of reference conditions.

Both Bight '08 stations, 7474 and 7517, located in the 5-30 m depth range were dominated by polychaetes which represented 65.8% and 64.5%, respectively, of the total abundance and 56.1% and 55.1%, respectively, of the species (Table 3-8). Four of the stations located along the proposed cable routes (Trans-2, Trans-3, Trans-4, and Trans-7) had total abundances dominated by polychaetes and four stations (Trans-1, Trans-6, Trans-8, and Trans-9) had total abundances dominated by crustaceans (Table 3-6). Polychaetes had the highest diversity at all of the stations from Trans-1-4 and Trans-6-9, except at Trans-6 where crustaceans were the most diverse.

Stations Trans-5 and Trans-10, as well as the six stations located in the Electrode Array and Reference areas, were compared to six Bight '08 stations (7410, 7415, 7417, 7426, 7458, and 7477) located in similar depths ranging from 31-120 m. All of the Bight '08 stations were characterized with BRI values indicating reference conditions. Stations located in the Electrode Array and Reference area, as well as Trans-5 and Trans-10, were also characterized as having reference conditions.

All of the Bight '08 stations located within the 31-120 m depth range were dominated by polychaetes which represented 36.5% (Station 7415) to 62.3% (Station 7461) of the total abundance and 43.6% (Station 7415) to 58.9% (Station 7410) of the species (Table 3-8). All of the stations in the Electrode Array Area and two of the stations in the Reference Area (Ref-1 and Ref-3) had total abundances that were dominated by polychaetes (Table 3-6). Total abundances at Stations Trans-5, Trans-10, and Ref-2 were dominated by crustaceans. Polychaetes had the highest diversity at all of the stations located in the Electrode Array and Reference areas, as well as Trans-5 and Trans-10.

3.7 Toxicity Results

Water quality parameters were within the appropriate limits. Mean percent survival of *E. estuarius* was 96.0% in the control, which met the minimum acceptable control survival criterion ($\geq$ 90%). More than 20 amphipods were recovered at test termination from replicate 1 of sample TRANS-7. Since the number of organisms added at test initiation could not be confirmed, this replicate was dropped from statistical analysis. Toxicity was only apparent for sample REF-3, since mean percent survival was not significantly different from the control at all other stations. A summary of test results is provided in Table 3-9. The detailed report and laboratory bench sheets are provided in Appendix E.

In the ammonium chloride reference toxicant test, LC_{50} values of 54.4 mg total NH_3/L and 0.977 mg un-ionized NH_3/L were determined from survivorship at measured concentrations of 0, 12.5, 25.5, 49.3, 102, and 206 mg total NH_3/L and calculated unionized concentrations of 0, 0.366, 0.592, 0.92, 1.19, and 1.53 mg un-ionized NH_3/L. Measured total ammonia and unionized ammonia in tests conducted with project materials were below concurrent reference toxicant effect levels (LC_{50} = 54.4 mg total NH_3/L; no observable effect concentration [NOEC] = 12.5 mg total NH_3/L). Therefore, ammonia is not expected to have contributed to any toxicity found in tests using project materials. Laboratory bench sheets and summary tables of the reference toxicant tests with *E. estuarius* are provided in Appendix E.

Table 3-9. Results of Solid Phase Test Using *Eohaustorius estuarius*

Composite Area ID	Amphipods (*Eohaustorius estuarius*)				
	Overlying Total Ammonia Concentration (mg/L)		Interstitial Total Ammonia Concentration (mg/L)		% Survival
	Initial	Day 10	Initial	Day 10	
Control 1	<0.500	<0.500	<0.500	<0.500	96.0
TRANS-2	<0.500	2.52	8.77	3.45	88.0
TRANS-4	<0.500	1.86	4.82	3.75	88.0
TRANS-7	<0.500	1.11	4.42	2.57	96.3
TRANS-9	<0.500	2.02	10.4	3.99	94.0
EA-1	<0.500	<0.500	4.32	2.41	86.0
EA-2	<0.500	2.15	7.75	4.67	86.0
EA-3	<0.500	<0.500	2.64	2.10	89.0
REF-1	<0.500	1.53	3.96	2.98	93.0
REF-2	<0.500	1.22	4.13	3.12	89.0
REF-3	<0.500	2.67	5.90	6.55	*62.0

	Total NH_3	Un-ionized NH_3	% Survival	Total NH_3		Un-ionized NH_3	
	Actual Concentration (mg/L)	Calculated Concentration (mg/L)		LC_{50} (mg/L)	NOEC (mg/L)	LC_{50} (mg/L)	NOEC (mg/L)
Ammonium Chloride Reference Toxicant	Control	Control	95.0	54.4	12.5	0.977	0.366
	12.5	0.366	95.0				
	25.5	0.592	82.5				
	49.3	0.920	60.0				
	102	1.19	0.00				
	206	1.53	0.00				

*Significantly different from control.

3.8 ROV and Dive Survey Results - Biological Community and Habitat Description

ROV surveys were performed over four days from April 3 to April 6, 2012 while dive surveys were performed over the course of six days between April 9 and April 20, 2012. As a result of the arrival of gale force winds and large swell on April 11, 2012, dive surveys were postponed for safety purposes from April 11 through April 16, 2012 and resumed on April 17, 2012. Both the ROV and dive surveys used video surveillance to visually assess biological resources within the project footprint.

The ROV was used to survey the cable routes and footprint of the Electrode Array Area for biological habitat and to delineate areas warranting further observation during the dive surveys. The dive surveys were performed to assess the presence of species at specific locations evenly spaced along the cable routes and to map the extent of habitat types along those routes. The ROV routes and diver transects over the Option 1 cable route and Electrode Array Area are shown in Figure 2-8 and Figure 2-9, while the ROV routes and diver transects over the Option 2 cable route are shown in Figure 2-10 and Figure 2-11. As previously mentioned, diver transects 2 and 8 were re-located from their original locations following the ROV survey to assess rocky reef habitat. It should be noted that no kelp or eelgrass beds were observed within the project footprint.

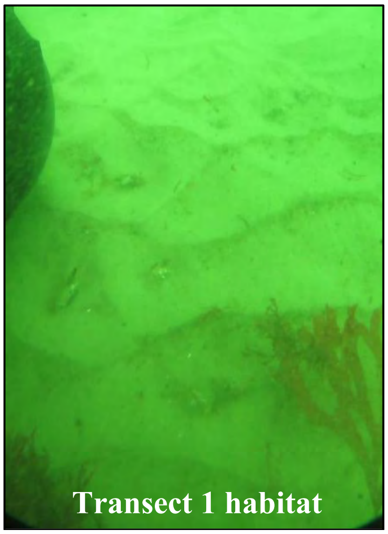
Nearshore Habitat

Nearshore habitat for the purpose of this report will be defined as the habitat within the APE that occurs in less than 18.3 m (60 ft) of water. This would include the area from the shoreline to approximately Transect 3 on the Option 1 cable route and from the shoreline to midway between Transect 8 and Transect 9 on the Option 2 cable route. Both ROV and diver surveys were begun outside of the surf zone in approximately 4.6- 6.1 m (15-20 ft) of water where the boats could be safely operated. Areas shallower than 4.6 m (15 ft) in depth were not surveyed, since directional drilling is planned from the land-side vault to approximately 305 m (1,000 ft) offshore. Areas shallower than 6.1 m (20 ft) of water would not be expected to be impacted by the cable installation.

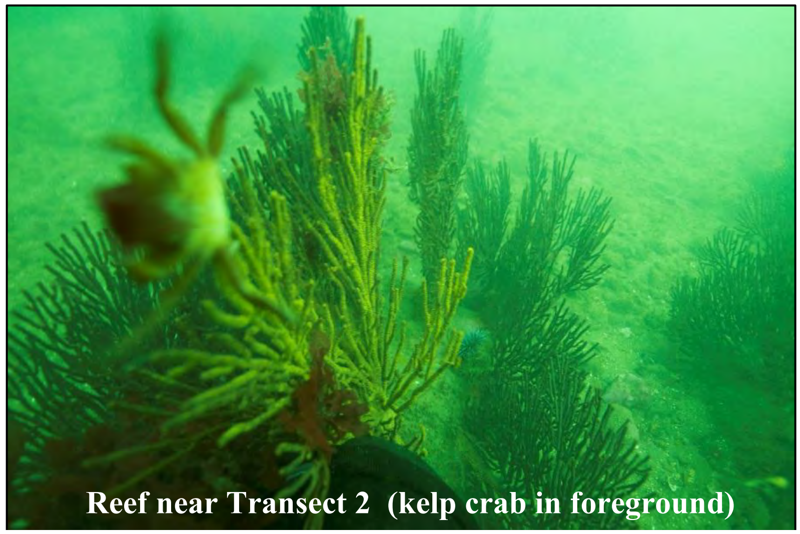
Option 1 Cable Route

Nearshore habitat along the Option 1 cable route was characterized by predominantly soft bottom habitat. Coarse-grained sand that moved with tidal action was observed in the vicinity of Transect 1, creating sand ripples along the sea floor. Moderate surge in this area coupled with its proximity to the surf zone inhibited visibility during field surveys. Depth in this area ranged from approximately 5.5 to 6.7 m (18 to 22 ft) and the substrate was comprised of 100% sand and silt. The ornate tube worm, *Diopatra ornata,* was the only organism observed in the vicinity of Transect 1.

A cobble reef occurred between the Transect 1 and Transect 2 sampling locations, and extended along the cable route approximately 1,000 ft, before ending between the Transect 2 and Transect 3 sampling locations. The reef was approximately 180 to 250 ft wide and occurred at a depth ranging from 7.6 to 10.7 m (25 to 35 ft). In general, the hard substrate of the reef was mostly covered by sand and was low relief, rising no more than 0.7 to 1.2 m (2 to 4 ft) above the seafloor. The following species were observed in the reef area: bat star (*Asterina miniata*) three gorgonian species (*Muricea fruticosa*, *Lophogorgia chilensis*, and *Muricea californicus*), two crab species (*Taliepus nuttalli* and *Loxorhynchus grandis),* ornate tube worm (*Diopatra ornata*), chestnut cowry (*Cypraea spadicea*), red and purple sea urchins, (*Strongylocentrotus franciscanus* and *Strongylocentrotus purpuratus*) palm kelp (*Eisenia arborea*), and the red alga *Acrosorium uncinatum*. The soft-bottom habitat beyond the reef supported the spiny sand star, (*Astropecten armatus*), an unidentified sculpin species, and Kellet's whelk (*Kelletia kelletii*).



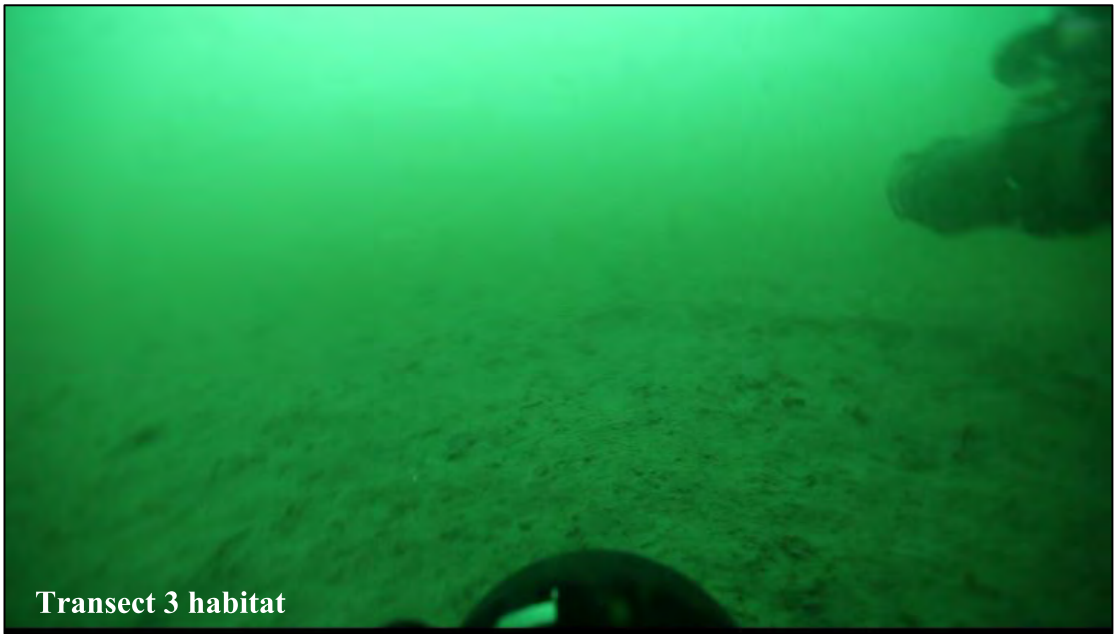
Transect 1 habitat



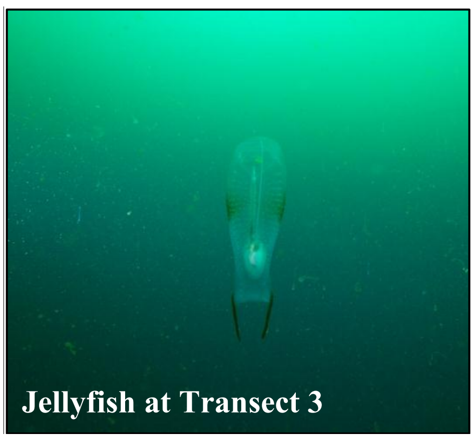
Reef near Transect 2 (kelp crab in foreground)

The habitat along the centerline of the Option 1 cable route was comprised entirely of soft bottom sediments, with the reef occurring approximately 61 m (200 ft) south of the centerline. Moving seaward beyond the reef area, the habitat returned to soft bottom sediment sparsely populated by predominantly sea pens, algal debris, tube anemones, brittle stars, and cancer crabs.

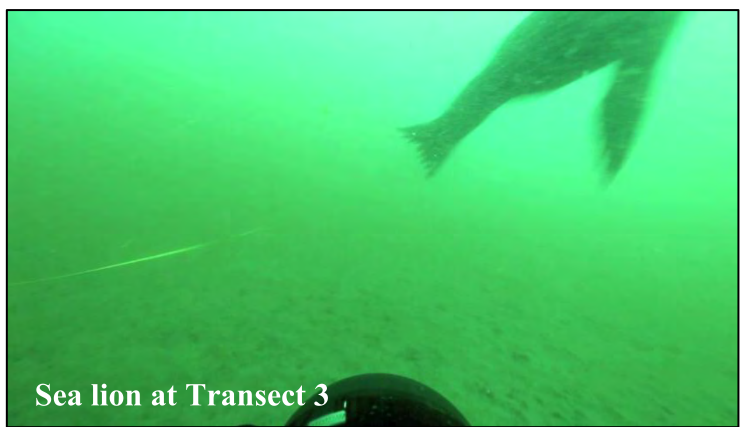
The benthic habitat at Transect 3 was comprised entirely of soft bottom material and was sparsely populated by sea pens (*S. elgongata*), tube anemones (*P. fimbriatus*), spiny sand stars (*A. armatus*), Kellet's whelks (*K. kelletii*), lizardfish (*Synodus lucioceps*), mantis shrimp (*Hemisquilla californiensis*), and cancer crabs (*Cancer sp*.). A California sea lion (*Zalophus californianus*) and a giant bell jellyfish (*Scrippsia pacifica*) were observed within the water column of Transect 3. Water depth in this area was approximately 18.3 m (60 ft).



Transect 3 habitat



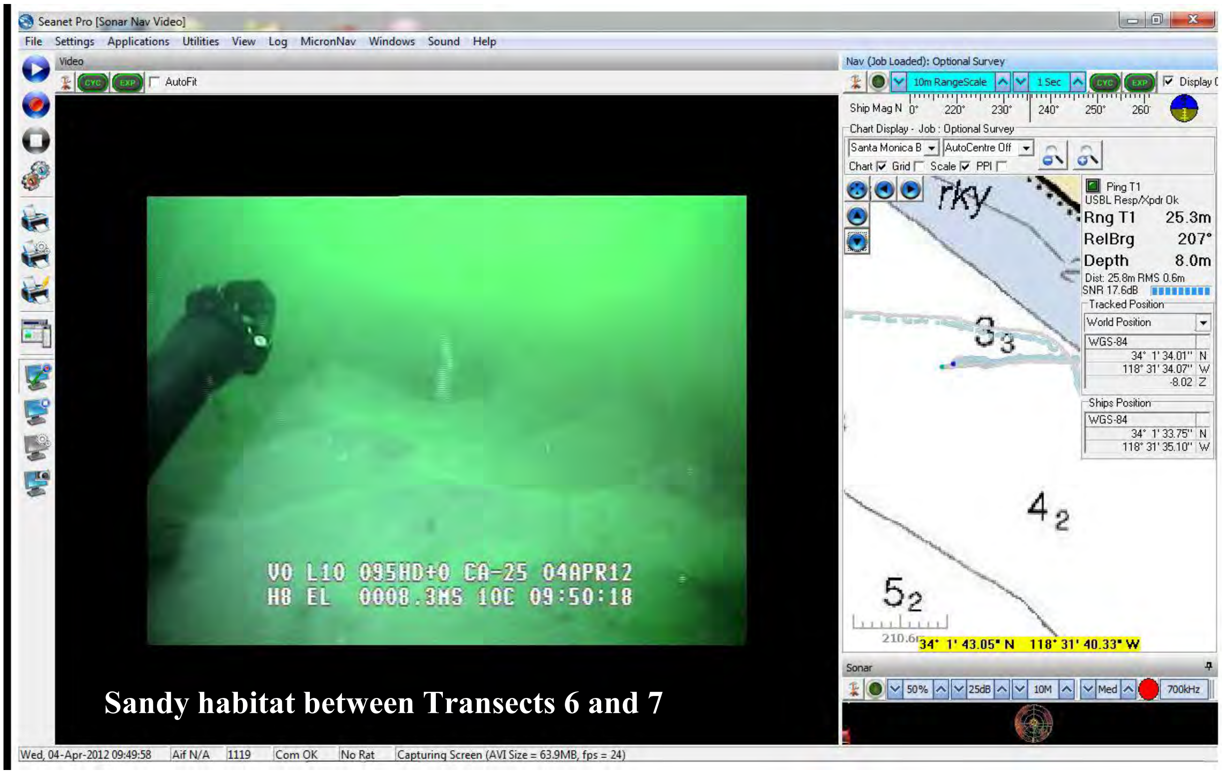
Jellyfish at Transect 3



Sea lion at Transect 3

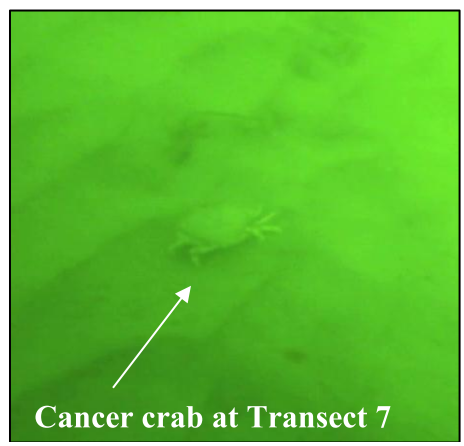
Option 2 Cable Route

The nearshore habitat along the Option 2 cable route was characterized almost entirely by soft bottom habitat. Coarse-grained sand and algal debris that moved with tidal action was observed in the vicinity of Transect 6, creating sand ripples along the sea floor and clouding visibility. Depth in this area ranged from approximately 5.8 to 7.6 m (19 to 25 ft) and the substrate was comprised of 100% sand and silt. Due to the limited visibility, no organisms were observed at Transect 6. The habitat between Transect 6 and Transect 7 is entirely soft bottom, mostly sandy substrate nearly devoid of visible organisms (one unidentified sea star species was observed in the ROV video). Habitat at Transect 7 is comprised of predominantly coarse sand and contained few organisms. Hemphill's kelp crab (*Podochela hemphilli),* Kellet's whelk (*Kelletia kelletii*), *A. armatus* and a cancer crab (*Cancer sp*.) were the only species noted by divers at Transect 7.



Sandy habitat between Transects 6 and 7


Transect 7 habitat


Cancer crab at Transect 7

Habitat at Transect 8 included a small reef that was approximately 15 m (50 ft) in diameter and was located in approximately 7.6 m (25 ft) of water. Sandy, soft bottom habitat comprised the remaining area in Transect 8 outside of the reef. Sea pens and cancer crabs were observed in the sandy habitat.

The reef, which rose approximately 3m (10 ft) from the seafloor, was predominantly covered by gorgonian sea fans (*Lophogorgia chilensis* and *Muicea californica*) with small patches of open rock. Sessile invertebrates such as strawberry anemones (*Corynactis californica*), orange cup coral (*Balanophyllia elegans*), and hydroid species were observed on the reef as well as other more mobile invertebrates such as keyhole limpets (*Megathura crenulata*) and California sea cucumbers (*P. californicus*). Small amounts of various red algas (*Acrosorium uncinatum*, *Chondracanthus corymbiferus*, *Rhodymenia californica*, *Botyglossum farlowianum*, and

Gracilaria sp.) and one species of brown algae (*Dictyota sp*.) were observed growing on the rocky substrate. Additionally, six fish species, including Garibaldi (*Hysypops rubicundus*), rubberlips surfperch (*Rhacochilus toxotes*), kelp bass (*Paralabrax clathratus*), barred sand bass (*Paralabrax nebulifer*), opaleye perch (*Girella nigricans*), and an unidentified perch species, were observed swimming along the reef. The egg case of a swell shark was also observed on the reef.


Reef at Transect 8

Cancer crabs mating in Sandy habitat at Transect 8

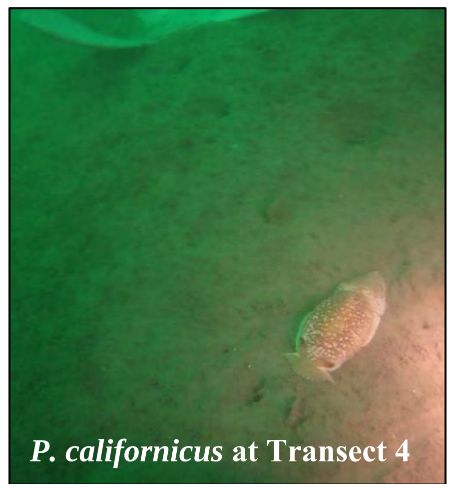
Offshore Habitat

Offshore habitat for the purpose of this report is defined as the habitat within the APE that occurs in greater than 60 feet of water. This would include the area from approximately Transect 3 to Transect 5 on the Option 1 cable route and from midway between Transect 8 and Transect 9 to Transect 10 on the Option 2 cable route. It also includes the Electrode Array and Reference areas.

Option 1 Cable Route

Offshore habitat along the Option 1 cable route was characterized entirely by soft bottom habitat. The deeper offshore sediments contained higher percentages of fine-grained material (silts and clays) than the coarse-grained sands that typified the nearshore environment (Figure 3-3). The seafloor in the vicinity of Transect 4 was sparsely populated by invertebrates such as spiny sea stars (*A. armatus*), sea pens (*S. elongata*), sea slugs (*Pleurobranchia californica*) and tube anemones (*P. fimbriatus*). Holes that were likely made by shrimp and/or polychaete worm species were also prevalent throughout the Transect 4 area and between Transect 4 and Transect 5.

Transect 4 habitat



***P. californicus* at Transect 4**

At Transect 5, the density of sea pens increased substantially while the density of spiny sea stars decreased (*A. armatus*) over what had been observed at Transect 4. A large plastic trash barrel, that appeared to have been in the water for a considerable amount of time, was found in Transect 5. Depths in this area ranged from approximately 28 m (92 ft) at Transect 4 to 38.1 m (125 ft) at Transect 5. Brittle stars (*Amphioda sp*., and *Ophiura sp*.), polychaete worms (unidentified sp.), speckled sandabs (*Citharichthys stigmaeus*), sea cucumbers (*P. californicus*), and white sea urchins (*Lytechinus anamesus*) were also observed at Transect 5.

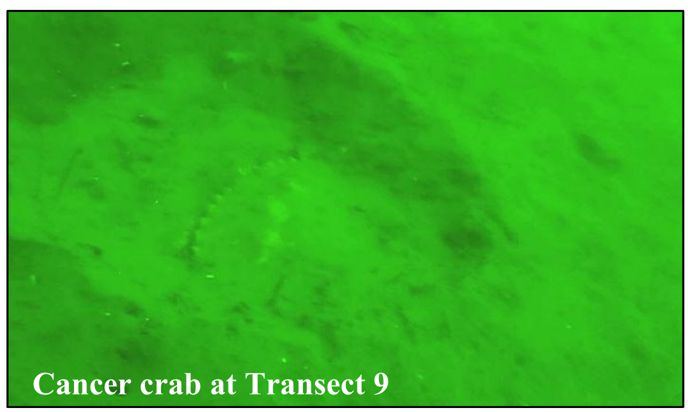
Trash barrel at Transect 5

***S. elongata* at Transect 5**

Option 2 Cable Route

Offshore habitat along the Option 2 cable route was similar to offshore habitat along the Option 1 cable route, and was characterized entirely by soft bottom substrate. The seafloor in this area was comprised of a higher percentage of fine-grained materials than the sandier nearshore environment (Figure 3-3). Transect 9 was sparsely populated by sea pens (*S. elongata*), tube anemones (*P. fimbriatus*), and several species of gastropods, including California cone snails (*Conus californicus*), Kellet's whelks (*K. kelletii*), and unidentified nudibranch species. Holes that were likely made by shrimp and/or polychaete worm species were also prevalent throughout the area from Transect 9 to Transect 10. Water depths from Transect 9 to Transect 10 ranged from 23.4 to 37.5 m (77 to 123 ft).

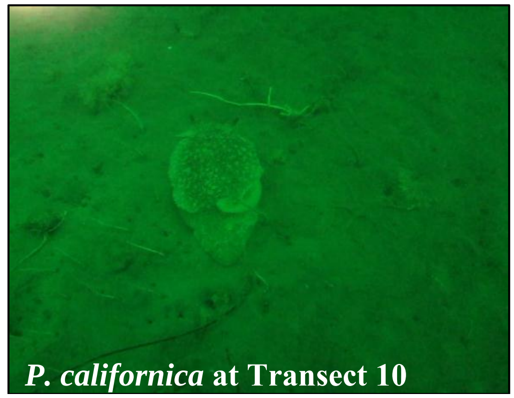
Tube anemone at Transect 9



Cancer crab at Transect 9

At Transect 10, brittle stars (*Amphiodia* sp. and *Ophiura* sp.), polychaete worm species, and sea pens (*S. elongata*) were the dominant fauna observed. Spiny sand stars (*A. armatus*), warty sea cucumbers (*Parastichopus parvimensis*), chestnut cowries (*Cypraea spadicea*), and colonies of bryozoans (*Thalamoporella californica*) were also present. Substrate at Transect 10 consisted of over 60% silts and clays.

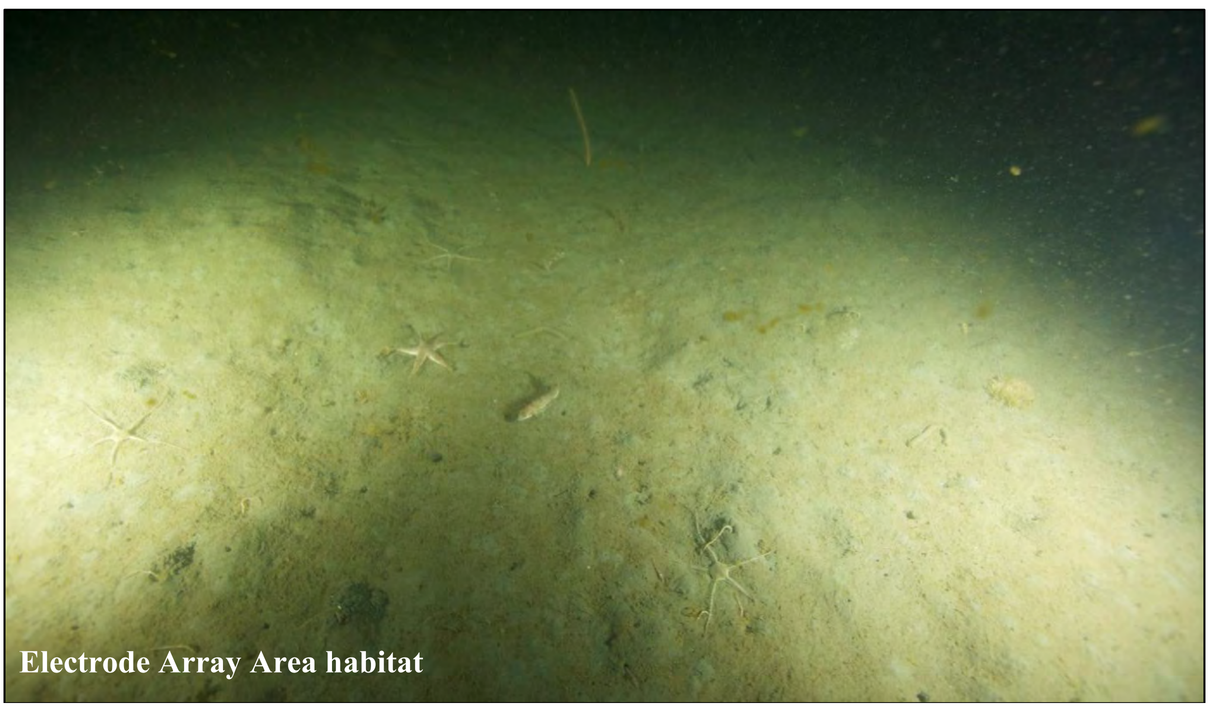
Brittle stars and bryozoan colony at Transect 10



***P. californica* at Transect 10**

Electrode Array Area

The soft bottom substrate in the Electrode Array Area was comprised of greater than 60% silts and clays. Almost no visible light reached the seafloor in this area, which averaged 48.2 m (158 ft) in depth. Observed fauna in this area included sea pens (*S. elongata*), brittle stars (*Amphiodia sp*. and *Ophiura sp*.), polychaete worm species, sea cucumbers (*P. californicus* and *P. parvimensis*), spiny sand stars (*A. armatus*), bryozoans (*Thalamoporella californica*), lizard fish (*Synodus lucioceps*), sea slugs (*Pleurobranchia californica*), cancer crabs (*Cancer sp*.), mantis shrimp (*Hemisquilla californiensis*), and egg casings from a moon snail (*Polinices lewisii*).



Electrode Array Area habitat

Sea slug and sea pens in Electrode Array Area habitat

3.8.1 Observed Species

Lists of species observed along the Option 1 Cable Route, Option 2 Cable Route, and Electrode Array Area are provided in Table 3-10, Table 3-11, and Table 3-12. The species contained in these lists were compiled by divers and through review of ROV and diver videos. Additional species observed in the vicinity of the project area included brown pelicans (*Pelecanus occidentalis*), Brandt's cormorant (*Phalacrocorax penicillatus*), California gulls (*Larus californicus*), western gulls (*Larus occidentalis*), and unidentified tern species.

Table 3-10. Observed Species along Option 1 Cable Route

Common Name	Scientific Name	Habitat Where Observed
Vertebrates		
Lizard fish	*Synodus lucioceps*	Soft bottom
Sculpin	Unidentified sculpin species	Soft bottom
California sea lion	*Zalophus californianus*	In water column over soft bottom
Speckled sanddab	*Citharichthys stigmaeus*	Soft bottom
Invertebrates		
Bat Star	*Asterina miniata*	Reef
Brittle star	*Amphiodia sp*	Soft bottom
Brittle star	*Ophiura sp*	Soft bottom
Brown gorgonian	*Muricea fruticosa*	Reef
California golden gorgonian	*Muricea californica*	Reef
California sea cucumber	*Parastichopus californicus*	Soft bottom and Reef
Cancer crab	*Cancer sp.*	Soft bottom
Chestnut cowry	*Cypraea spadicea*	Reef
Kelp crab	*Podochela hemphilli*	Reef
Jellyfish	*Scrippsia pacifica*	Water column
Kellet's whelk	*Kelletia kelletii*	Soft bottom
Kelp crab	*Taliepus nuttalli*	Reef
Mantis shrimp	*Hemisquilla californiensis*	Soft bottom
Moon snail (egg casing)	*Polinices lewisii*	Soft bottom
Nudibranch	*Hermissenda crassicornis*	Soft bottom
Orange anemone	*Urticina sp*	Soft bottom
Ornate tube worm	*Diopatra ornata*	Soft bottom
Purple sea urchin	*Strongylocentrotus purpuratus*	Reef
Red gorgonian	*Lophogorgia chilensis*	Reef
Red sea urchin	*Strongylocentrotus franciscanus*	Reef
Sea pen	*Stylatula elongata*	Soft bottom
Sea slug	*Pleurobranchia californica*	Soft bottom
Sheep crab	*Loxorhynchus grandis*	Reef
Spiny sand star	*Astropecten armatus*	Soft bottom
Strawberry anemone	*Corynactis californica*	Reef
Tube dwelling anemone	*Pachycerianthus fimbriatus*	Soft bottom

Table 3-10. Observed Species along Option 1 Cable Route

Common Name	Scientific Name	Habitat Where Observed
White sea urchin	*Lytechinus anamesus*	Reef
Algae		
Red algae	*Acrosorium uncinatum*	Reef
Palm kelp	*Eisenia arborea*	reef

Table 3-11. Observed Species along Option 2 Cable Route

Common Name	Scientific Name	Habitat Where Observed
Vertebrates		
Garibaldi (juv)	*Hysypops rubicundus*	Reef
Perch (no id)	Unidentified perch sp.	Reef
Rubberlips surfperch	*Rhacochilus toxotes*	Reef
Swell shark (egg case)	*Cephaloscyllium ventriosum*	Reef
Kelp bass	*Paralabrax clathratus*	Reef
Barred sand bass	*Paralabrax nebulifer*	Reef
Opaleye perch	*Girella nigricans*	Reef
Invertebrates		
Brittle star	*Amphiodia sp*	Soft bottom
Brittle star	*Ophiura sp*	Soft bottom
California Cone Snail	*Conus Californicus*	Soft bottom
California Golden Gorgonian	*Muricea californica*	Reef
California Sea cucumber	*Parastichopus californicus*	Reef and Soft bottom
Cancer Crab	*Cancer sp.*	Soft bottom and near Reef
Chestnut Cowry	*Cypraea spadicea*	Soft bottom
Hemphill's Kelp Crab	*Podochela hemphilli*	Reef and soft bottom near Reef
Hermit crab	*Pagurus sp.*	Soft bottom
Hydroid sp.	*Unidentified hydroid colony*	Reef
Kellet's Whelk	*Kelletia kelletii*	Soft bottom
Keyhole Limpet	*Megathura crenulata*	Reef
Moon Snail (egg casing)	*Polinices lewisii*	Soft bottom
Nudibranch (no id)	Unidentified nudibranch sp.	Soft bottom
Orange cup coral	*Balanophillia elegans*	Reef
Razor Clam	*Siliqua patula*	Soft bottom
Red Gorgonian	*Lophogorgia chilensis*	Reef
Rock Scallop	*Crassadoma gigantea*	Reef
Sea Pen	*Stylatula elongata*	Soft bottom
Sea star	*Unidentified sea star species*	Soft bottom
Sea slug	*Pleurobranchia californica*	Soft bottom
Spiny Sand Star	*Astropecten armatus*	Soft bottom
Tube dwelling Anemone	*Pachycerianthus fimbriatus*	Soft bottom

Table 3-11. Observed Species along Option 2 Cable Route

Common Name	Scientific Name	Habitat Where Observed
Warty sea cucumber	*Parastichopus parvimensis*	Soft bottom
Wavy turban	*Lithopoma undosum*	Soft bottom
Bryozoan	*Thalamoporella californica*	Soft bottom
Algae		
Red algae	*Acrosorium uncinatum*	Reef
Red algae	*Chondracanthus corymbiferus*	Reef
Red algae	*Rhodymenia californica*	Reef
Red algae	*Botyglossum farlowianum*	Reef
Red algae	*Gracilaria sp.*	Reef
Brown algae	*Dictyota spp.*	Reef

Table 3-12. Observed Species along Electrode Array Area

Common Name	Scientific Name	Habitat Where Observed
Invertebrates		
Brittle star	*Amphiodia sp*	Soft bottom
Brittle star	*Ophiura sp*	Soft bottom
California Sea cucumber	*Parastichopus californicus*	Soft bottom
Cancer Crab	*Cancer sp.*	Soft bottom
Mantis shrimp	*Hemisquilla californiensis*	Soft bottom
Moon Snail (egg casing)	*Polinices lewisii*	Soft bottom
Sea Pen	*Stylatula elongata*	Soft bottom
Sea slug	*Pleurobranchia californica*	Soft bottom
Spiny Sand Star	*Astropecten armatus*	Soft bottom
Tube dwelling Anemone	*Pachycerianthus fimbriatus*	Soft bottom
Warty sea cucumber	*Parastichopus parvimensis*	Soft bottom
Bryozoan	*Thalamoporella californica*	Soft bottom

3.8.2 Special Status Species

Four special status species were observed within the vicinity of the study area, all were species of marine mammals: California sea lion (*Zalophus californianus)*, minke whale (*Balaenoptera acutorostrata)*, grey whale (*Eschrichtius robustus*), and common dolphin (*Delphinus delphis*). Terns were also observed within the vicinity of the study area; however, the observer could not determine from a distance the species.

Additional special status species that are known to occur within Santa Monica Bay, but were not observed during field activities, are listed in the literature review document (Appendix A). This list includes state and federally endangered, threatened, or otherwise protected birds, cetaceans, pinnipeds, fish, sea turtles, and invertebrates.

3.8.3 Benthic Habitat Characterization

The approximate overall percentages of soft bottom and hard bottom (reef) habitat for each of the project areas are shown in Table 3-13. It should be noted that these percentages are based upon direct observation only from ROV and dive surveys. Due to the large size of the APE and reduced visibility during the surveys, only a portion of the cable routes and electrode array were assessed.

The Option 1 cable route contained a low-relief cobble reef that was approximately 305 m (1,000 ft) in length and occurred south of the centerline of the proposed cable route in approximately 7.6- 10.7 m (25-35 ft) of water. Aside from this reef, the rest of the benthic habitat along the Option 1 cable route was soft bottom, comprised of sand, silt and clay. The Option 2 cable route contained a small reef that was approximately 15.3 m (50 ft) in diameter, rising approximately 3 m (10 ft) above the seafloor. This small reef was the only hard substrate along the Option 2 cable route and comprised less than 1 percent of the cable route's total length. The entire Electrode Array Area was comprised solely of soft-bottom substrate.

Table 3-13. Type of Benthic Habitat Observed along Cable Routes and Electrode Array Area

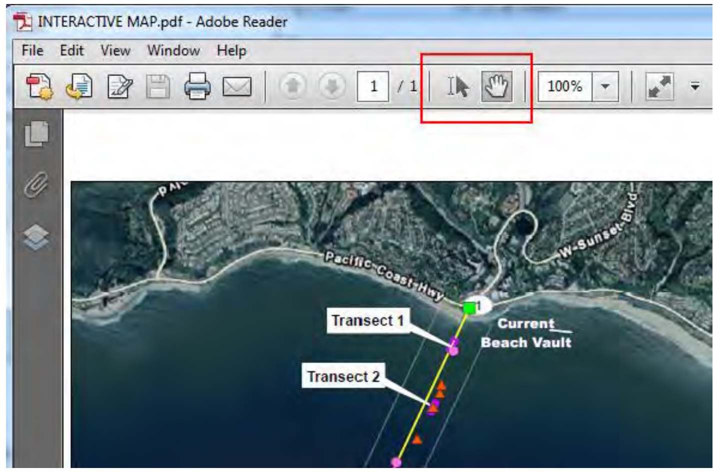
Project Area	Nearshore (depth 0- 60 ft)		Offshore (depth >60 ft)	
	Soft Bottom Substrate (%)	Hard Bottom Substrate (%)	Soft Bottom Substrate (%)	Hard Bottom Substrate (%)
Option 1 Cable Route	90	10	100	0
Option 2 Cable Route	99	1	100	0
Electrode Array Area	NA	NA	100	0

3.9 Observed Human Uses within the Area of Potential Effect

During the field sampling and surveys, human activities that were observed within close proximity to the APE included recreational fishing, surfing, sailing, motor boating, and parasailing. Surfing and parasailing activities occurred in the nearshore area within approximately 305 m (1,000 ft) of the shoreline, whereas recreational fishing, sailing and boating occurred in both nearshore and offshore waters of the APE. No submerged pipes, cables, or other types of human infrastructure were observed during the ROV and dive surveys.

3.10 Summary of Results - Interactive Map

An interactive map that is linked to a summary page with habitat descriptions, site photos, data from water quality, water chemistry, sediment chemistry and benthic infauna is provided in Figure 3-6. To access the interactive map links, use the Select (arrow) or Pan (hand) tool in Adobe Reader, as shown in the red box of the screen shot to right, to click on a transect area within the map. This action will open the appropriate summary page describing the transect area.



PLEASE USE PDF VERSION FOR INTERACTIVE MAP FUNCTIONALITY

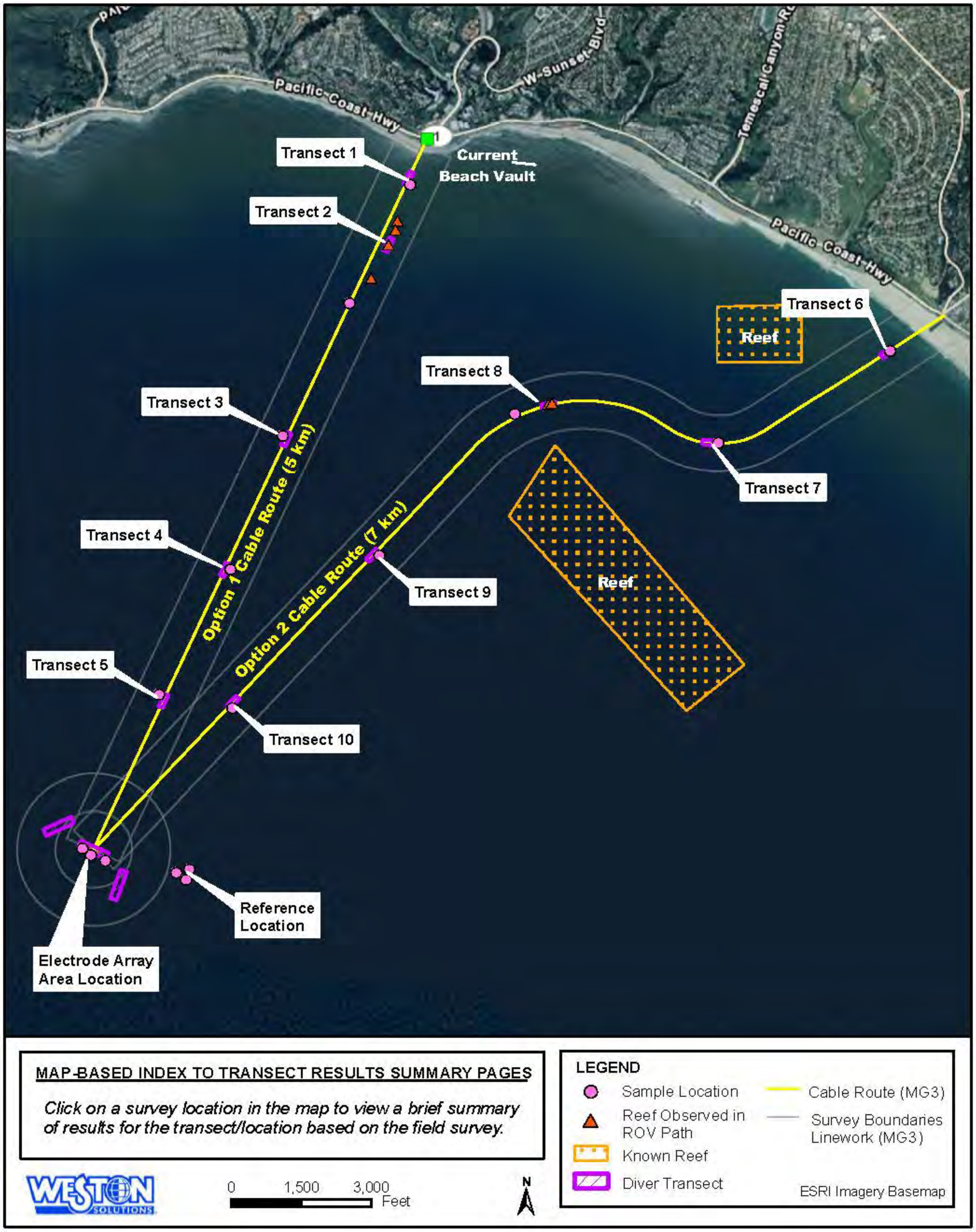


Figure 3-6. Interactive Map with Links to One-Page Summaries of Study Transects/Locations

4.0 DISCUSSION

The discussion compares the marine biological resources and habitat quality between the two optional cable routes, compares the biological resources within the APE to those of Santa Monica Bay, and determines potential short-term and long-term impacts of the project on the local marine environment. Measures to avoid, minimize, and mitigate potential impacts to biological resources and human uses are also discussed.

4.1 Comparison of Biological Resources between Optional Cable Routes

Field surveys showed that physical and chemical water quality parameters, concentrations of chemicals of concern in sediments, toxicity, and benthic infaunal community condition did not differ between optional cable routes. Option 1 cable route contained a 61 m by 305 m (200 ft by 1,000 ft) rocky reef, while Option 2 cable route included a much smaller 15 m by 15 m (50 ft by 50 ft) reef. In both cases, the optional cable routes were otherwise comprised of sandy soft bottom habitat within the APE. Additionally, the Electrode Array Area solely contained soft bottom habitat. For both cable routes, rocky reef areas could be avoided by routing the cables around the outcroppings. The results of bathymetric surveys, including sub-bottom profiling, will provide detailed maps of the bottom that can be used to route cables. There is one primary difference between the optional cable routes – Option 2 cable route is approximately 2,000 m (1.24 mi) longer than that of Option 1 because Option 2 was routed to avoid two artificial reefs. Therefore, the Option 2 route would require the installation of more cable, which would involve disturbance of a greater area of soft bottom habitat than Option 1. As described in greater detail in the impact analysis, placement of cables are projected to only result in a temporary disturbance to habitat because cables will be buried approximately 1 m below the seafloor. This would allow the recolonization of the area by the benthic community.

4.2 Comparison of Biological Resources between Area of Potential Effect and Santa Monica Bay

The vast majority of Santa Monica Bay is comprised of soft bottom sandy habitat, with the largest areas of rocky reefs occurring at the southern and northern ends of the bay in addition to localized patch reefs. Accordingly, the bay supports a benthic and demersal community that is largely characteristic of sandy bottom habitats throughout the majority of the area. Similarly, the APE was found to contain predominantly soft bottom habitat with a minor amount of rocky reef habitat. Habitat within the APE was observed to support a benthic and demersal community that was consistent with soft bottom habitats within the larger bay. Additionally, the rocky reef habitats of the APE supported distinct biological communities, with gorgonians being one of the most prevalent taxa observed. The water column and surface waters within the APE provides similar foraging, migratory, and overall habitat characteristics as that of the majority of Santa Monica Bay, therefore, it is reasonable to assume that similar marine and avian species will have the potential to occur within the APE.

Given that Santa Monica Bay is located at the terminus of a highly urbanized watershed, the Bay has been subjected to point and non-point inputs of pollutants, resulting in detectable levels of contaminants of concern within the sediments. It has been estimated that 90% of the surface sediments of the bay are contaminated (Schiff, 2000); however, observed sediment toxicity is far less common. Similarly, sediments sampled within the APE had detectable levels of contaminants of concern; however, the concentrations of these chemicals were largely below levels expected to cause adverse biological effects. Accordingly, sediment toxicity was only observed in one sample, which was located within the Reference Area, and benthic infaunal community condition was indicative of reference or at most low levels of disturbance, similar to what has been found throughout other areas of the bay.

The multiple lines of evidence assessed showed that the overall habitat and sediment and water quality conditions within the APE are consistent with the conditions of the majority of Santa Monica Bay. The most recent regional surveys conducted in the Southern California Bight (Bight '08) indicate that conditions in Santa Monica bay are broadly similar to those in the APE for a given depth strata. In comparison to the Bight '08 Survey results, samples collected in the APE were of comparable grain size and TOC for those stations collected from the Inner Shelf sites in Santa Monica Bay. Bight '08 samples consisted of primarily silt and sand with the proportion of fine-grain sediments increasing with depth. These regional conditions were similar to those observed in the APE.

Grain size and TOC concentration can have a dramatic influence on concentrations of a number of constituents, particularly organics and metals. Although concentrations of some constituents increased with depth, in general they were lower than those reported in the Bight '08 Survey for a given depth. Several Bight '08 stations in Santa Monica Bay had constituent concentrations above the ER-L, but no concentrations were above the ER-M. All samples collected from the Inner Shelf, which are more comparable to the APE, had metals detected below the ER-L.

Toxicity and concentrations of chlorinated pesticides, PCBs, and PAHs in the Santa Monica Bay Bight '08 samples were also low and generally similar to those observed in the APE. In addition, there were no marine biological resources that were found to be unique or distinct to the APE as compared to the larger bay or the Southern California Bight as a whole. These similarities between sediments within the APE and those found region-wide suggest that impacts within the APE would be expected to have population-level impacts in proportion to the relative size of the APE to the overall bay.

4.3 Impact Analysis

This section evaluates short- and long-term impacts to sediment and water quality, the biological community, and human uses that could result from project construction and ongoing operation within the APE. Mitigation measures (MM) are suggested to avoid, minimize, and mitigate potential project impacts.

4.3.1 Short-term Project Impacts

Short-term potential project impacts within the marine environment are considered to be those impacts associated with the construction of the electrode array and placement of the submarine cables. Construction activities are anticipated to involve the use of vessels and heavy equipment and disturbance of the sea floor, which could impact benthic organisms and water quality due to the suspension of sediments and potential release of contaminants. Additionally, increased vessel operations and use and lowering of equipment through the water column could have the potential to temporarily impact swimming biota, as well as birds, that transit, forage, or reside in the region. These potential impacts are anticipated to be highly localized to the APE, temporary as they will only extend throughout the period of construction, and less than significant with mitigation.

4.3.1.1 Sediment and Water Quality (SWQ)

As defined in Section 13030 of the California Water Code, water quality inputs of concern include discharges that create pollution, contamination, or nuisance or that release toxic substances deleterious to humans, fish, bird, or plant life. The use of vessels during construction operations can increase the potential for localized accidental spills of hazardous chemicals, such as oil; however, this risk is no greater than ongoing recreational and commercial vessel operations within the region. Additionally, small spills would be unlikely to cause a significant adverse effect to water or sediment quality because wave action and current dynamics within Santa Monica Bay would disperse and dilute potential inputs, reducing concentrations below levels expected to have toxic effects on biota (California State Lands Commission, 2010).

MM SWQ-1: To reduce potential for accidental spills and discharges that could impact water and sediment quality during construction, the following best management practices (BMPs) are recommended:

- Discharge of hazardous materials during construction activities into the study area shall be prohibited.
- A comprehensive spill prevention plan shall be developed that documents that management practices that vessels will enact to limit the potential for accidental spills.
- An environmental protection plan shall be developed that addresses issues related to storage and handling of fuel, waste disposal, vessel operation, and field policies.
- All debris and trash shall be disposed in appropriate trash containers on land or on construction barges by the end of each construction day.

Construction activities, including the placement of electrodes and laying of cables, also have the potential to result in the suspension of sediments within the APE. Sediment suspension could increase turbidity and contaminant concentrations within the water column. Increases in turbidity would only last for the duration of immediate construction activities, reducing light penetration to the seafloor. Reductions in light penetration are most relevant to photosynthetic organisms, such as algae; however, observations of the biological habitat and community showed that the benthos is predominantly comprised of soft bottom habitat with very low levels of algal cover. Additionally, reduced light levels could also impact species that rely on visual cues for foraging, such as motile invertebrates, fish, and mammals. It is unlikely that construction activities would increase turbidity beyond levels commonly encountered during high wave events and storms; therefore, the impact of construction on turbidity would be both short term and within the natural level of variability. Sediment resuspension also has the potential to increase the concentrations of contaminants in the water column; however, this potential impact is likely to be minimal since concentrations of contaminants of concern measured within the APE were below the thresholds for likely toxicity (i.e., ER-Ms) for all analytes. There were a limited number of analytes, such as DDT, mercury, and total PCBs, that were between the ER-L and ER-M (i.e., concentrations that have some potential for biological effects); however, bioassay tests of the sediments did not show evidence of toxicity within the APE. These contaminants occurred at concentrations that are typically found in Santa Monica Bay, largely due to legacy inputs of pollutants, and, therefore, resuspension would not be expected to result in an increase in the distribution of contaminants of concern above baywide background levels. Additionally, sediment suspension would not necessarily result in increased bioavailability of contaminants in the water column since contaminants are often bound to sediments and quickly settle following disturbance events and may not substantially increase contaminant concentrations in the overlying water (Chadwick et al., 1999). By using mitigation measures that minimize sediment suspension, short term impacts on sediment and water quality would be less than significant.

MM SWQ-2: Utilize cable installation methodologies that minimize suspension of sediments into the water column, to the extent practicable, including:

- Performing tunneling from the shoreline to 300 m offshore to install cables in order to limit disturbance of the seafloor in the nearshore environment.
- Use plowing and immediate back filling of trenches once the cables have been laid for the APE extending from 300 m offshore to the electrode array.

4.3.1.2 Biological Community

Placement of the concrete electrode vaults and cables on the seabed will be confined to areas with soft bottom habitat, and, therefore, are not expected to adversely affect sensitive habitats or essential fish habitat, such as kelp forests and rocky reefs. Additionally, installation of the cables in the nearshore environment (i.e., within 305 m (1,000 ft) of the shoreline) will be accomplished using directional drilling, avoiding impacts to the intertidal and shallow subtidal environment and associated biota. Within deeper portions of the APE, cables will be installed using trenching and burial. Both electrode and cable installation would result in impacts to nonmotile or slow moving benthic species, including epifauna and infauna. Installation of the electrode vaults would result in a permanent loss of soft bottom habitat and replacement with hard bottom habitat, while cable installation would only result in a temporary disturbance to the habitat and associated community. Since the benthic community is highly disturbance adapted and can re-colonize the soft bottom habitat following cable burial, placement of the cables will only result in a temporary impact to slow moving and non-motile benthic species.

MM BIO-1: Use the results of detailed bathymetric surveys to ensure that electrode array placement and cable routing avoids sensitive habitats and essential fish habitat, such as kelp forests and rocky reefs.

MM BIO-2: Perform pre-construction surveys, as required by resource and regulatory agencies, to determine if final project construction plans will impact sensitive and protected marine resources.

MM BIO-3: Utilize cable installation methodologies that minimize disturbance and permanent habitat alteration of benthic habitat, to the extent practicable, including:

- Performing tunneling from the shoreline to 305 m (1,000 ft) offshore to install cables in order to limit disturbance of the intertidal zone and rocky reefs in the nearshore environment.
- Use plowing and immediate back filling of trenches once the cables have been laid for the APE extending from 305 m (1,000 ft) offshore to the electrode array to restore soft bottom habitat.
- Bury cables to a depth of 1 m (3.3 ft), to the extent practicable, to limit potential for biological interaction during burrowing and foraging.

Project construction is not anticipated to result in adverse population-level impacts to the biological community since the benthic species observed within the APE consists of common species found throughout Santa Monica Bay and the Southern California Bight. Special status species observed, or that have the potential to occur, within the APE included highly motile species that can avoid construction activities, such as pinnipeds, cetaceans, and birds. Given the small footprint of the project relative to Santa Monica Bay, the project is not likely to interfere substantially with the movement or foraging of any native or migratory marine or avian species. However, vessels could collide with marine mammals or sea turtles, resulting in a potential "take" of special status species, which would be a significant impact. Therefore, it is recommended that vessels transporting equipment and supplies to the site and performing construction activities follow mitigation measures to minimize this potential impact.

MM BIO-4: Implement standard marine mammal and sea turtle avoidance mitigation measures, including:

- Requiring vessels involved in construction activities maintain a steady course and speed.
- Avoidance of the immediate areas with marine mammals or sea turtles whenever possible.
- Requiring the presence of a biological monitor on vessels during construction activities.
- Training construction and vessel crews to recognize and avoid marine mammals and sea turtles prior to initiation of project construction activities.
- Reporting of collisions with marine wildlife promptly to federal and state resource agencies.

Construction activities may result in additional noise in the marine environment. Many marine mammals depend on acoustics to communicate and understand their environment and excessive underwater noise could impact their ability to feed and interact. In extreme cases, high levels of noise could result in impairment or injury. Heightened noise levels may be caused by operation of vessels in the APE, trenching, and installation of vaults. Noise levels are likely to be within the range of those caused by other human uses frequently occurring within the area, such as the transit of large power boats; therefore, this impact is anticipated to be less than significant.

4.3.1.3 Human Uses

Impacts to human activities, such as diving, commercial and recreational fishing, surfing, and recreational boating, due to construction activities are expected to be temporary and constrained to immediate areas where work is being performed. Human uses, such as surfing, swimming, and shorefishing, are most pronounced in the nearshore area. Since directional drilling will be used to avoid these areas, project construction should not result in a significant impact to these human activities. Offshore construction activities may limit the use of the APE by divers, fisherman, and boaters, but only in the immediate vicinity of ongoing activities. Additionally, existing data reviews and field surveys did not detect human infrastructure that could be damaged or impacted within the APE. Therefore, by limiting the duration of construction to the extent practicable and implementing best management practices that ensure public safety, construction-related impacts to human uses of the marine environment are anticipated to be less than significant.

4.3.2 Long-term Project Impacts

Long-term potential project impacts could result from the generation of electromagnetic fields, production of chlorine gas, habitat modification, and entanglement of fishing gear with vaults and exposed cables. Potential impacts to sediment and water quality, the biological community, and human uses are discussed as follows.

4.3.2.1 Sediment and Water Quality

Once the electrode system construction has been completed, the system is unlikely to result in resuspension of sediments that could impact water quality. Routine maintenance activities would not require excavation or disturbance of sediments. In the event that one or more of the cables required repair or replacement, excavation could result in sediment resuspension and potential short term impacts to water quality as previously discussed.

MM SWQ-2: Utilize cable installation methodologies that minimize suspension of sediments into the water column, to the extent practicable, as previously described.

Operation of the existing electrode system has been reported to generate chlorine gas as a byproduct of the electrolysis process, and the proposed conceptual electrode array has been modeled to produce up to 140 kg (309 lbs.) of chlorine per year. Chlorine is an oxidizing biocide that is non-selective in terms of the organisms that it has the potential to affect. Free chlorine (chlorine gas dissolved in water) is toxic to fish and aquatic organisms at concentrations greater than 0.01 mg/L. However, its dangers are relatively short-lived because it reacts quickly with other substances in water or dissipates as a gas into the atmosphere. When chlorine gas is dissolved in water, it hydrolyses rapidly to yield hypochlorous acid, which is also an effective biocide. If water contains large amounts of decaying materials, free chlorine can combine with organics to form compounds called trihalomethanes (THMs). Some THMs in high concentrations are carcinogenic to people, and unlike free chlorine, THMs are persistent and have the potential to impact biota for longer durations. While chlorine gas and its bi-products have the potential to adversely impact biota, there have been no reports of higher levels of marine biota mortality in the vicinity of the existing electrode as compared to other areas of Santa Monica Bay. Additionally, the existing electrode vaults support fish and invertebrate communities that are consistent with hard bottom substrates within Santa Monica Bay.

MM SWQ 3 – Utilize electrode materials and design elements that limit the production of chlorine gas to the maximum extent practicable.

4.3.2.2 Biological Community

The electrode system would not emit noise, and therefore would not disturb biological resources. Additionally, the submarine electrode system facilities would not impede the movement of native or migratory species, since the submarine cables and vaults or others structures would be laid on or beneath the ocean floor; therefore the primary potential impact resulting from the operation of the electrode system is the generation of EMFs that could impede foraging and navigation of marine species.

Electromagnetic Fields

Operation of the electrode array is anticipated to be limited to approximately 50 hours per year (0.57% of the year), with discrete operation events lasting for durations of generally less than 120 minutes. During grounding events, the electrode array has been modeled to produce EMFs that are below human health and safety standards, but are at levels that have been reported to be detectable by marine organisms.

Navigation and prey detection are the two most commonly reported uses of EMFs by marine organisms. Of the majority of literature reviewed, detection thresholds for steady DC electric fields ranged from 10^{-6} to 10^{-3} V/m (Gradient Corporation, 2006). These fields primarily affect fish and mainly the elasomobranchs (skates, rays, and sharks). Elasmobranchs are reported to have a higher potential for sensitivity to EMFs resulting in either attraction or avoidance within near proximity to the source of the EMF. Evidence of shark bites on submarine optical telecommunications cables was associated with electrice fields between 1 and 6.3 µV/m (Gill, 2005). Additionally, Gill described studies demonstrating attraction by European eels (*Anguilla anguilla*) and the prawn (*Crangon crangon*). Additional evidence of shark attacks on undersea cables was reported for dogfish (*Mustelus canis*), stingray (*Urolophus halleri*), blue shark (*Prionace glauca*), and bonnet head sharks (*Sphyrna tiburo*) (Fischer and Slater, 2010). Gill (2005) suggested that electric fields emanating from undersea cables have the potential to be detected by electrosensitive species. At levels that approximate the bioelectric fields of natural prey there is the potential for these species to be attracted to them; however, Gill further stated that whether the species would be attracted or repelled is unknown at this time.

The electric field generated by the proposed 88-vault electrode array is predicted to be 1.077 V/m at a position of 1 cm above the vault gravel surface, at maximum in a worst case scenario when only six of eight electrode sections are functioning. Even at this worst case scenario, the strength of the field is below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) pre-standard International Electrotechnical Commission (IEC) 62344 of 1.25 V/m to protect biota. The strength of the field decreases exponentially with distance from the electrode array, and was modeled by CESI to be 1.2 e^{-2} V/m (0.0012 V/m) at a distance of 6 m (19.6 ft) from the electrode vault surface (i.e., at a depth of 40 m (131 ft)). At these levels, species with electrical sensory abilities, such as elasmobranchs, would be able to detect the field, since these species have been reported to detect electric fields as weak as 1 nV/m (Fisher and Slater, 2010). While predicted strength of the electric field is within the detection limits of select marine species, the strength is below reported thresholds for clearly harmful effects on fish, including electronarcosis and paralysis, which were detected at fields greater than 15 V/m (Balayev, 1980; Balayev and Fursa, 1980).

The magnetic field generated by the proposed 88-vault electrode array is predicted to be 10 microTesla (µT), which is far below the IEC limit of 500 µT (5 gauss [G]). The most sensitive organisms to magnetic fields include eels, which have sensitivities as low as a few µT (1×10^{-6} tesla). Other organisms that are sensitive to magnetic fields and use them for navigation include sea turtles, salmonids, elasmobranchs, whales, and dolphins (reviewed by Fisher and Slater, 2010). Sensitive species included the common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), finwhale (*Balaenoptera physalus*), and the long-finned pilot whale (*Globicephala malaena*) (Kischvink et al., 1986). While infrastructure-induced magnetic fields have been reported to be detectable by a number of marine species, evidence is less clear that the fields are adversely affecting navigation.

Magnetic fields have been shown to delay embryonic development in sea urchins and fish (Cameron et al., 1993; Zimmerman et al., 1990; Levin and Ernst, 1997), and alter the development of cells, influence circulation, gas exchange, development of embryos, and orientation (reviewed by Fisher and Slater, 2010). Static magnetic fields, ranging from 10 µT to 0.1 T, can cause a delay in sea urchin embryo development (Levin and Ernst, 1997). Magnetic fields have also been shown to affect development of salmonid embryos and elicit orientation responses in embryos. While there have been detectable effects, experiments using lobster, the blue mussel, prawns, crab, and flounder showed no effects on survival).

The electric and magnetic fields generated by the proposed 88-vault electrode array operating at 3,650 A, while detectable by marine organism, are modeled to be far less than the fields modeled for the existing electrode array at current operating levels. Therefore, the operation of the proposed electrode array would be anticipated to have a diminished potential to impact the surrounding biota as compared to the existing system that has been in operation for more than 40 years.

MM BIO-5: Incorporate design elements and operating procedures that minimize the generation of electric fields so that field strengths are less than the ICNIRP pre-standard of 1.25 V/m.

MM BIO-6: Incorporate design elements and operating procedures that minimize the generation of magnetic fields so that field strengths are less than the IEC limit of 500 µT.

Habitat Loss

Placement of the concrete electrode vaults on the seabed will be confined to areas with soft bottom habitat, and, therefore, are not expected to adversely affect sensitive habitats or essential fish habitat, such as kelp forests and rocky reefs. The placement of the 7.5-m (24.6 ft) diameter by 1.95-m (6.4 ft) tall vaults will result in the loss of soft-bottom habitat that supports benthic infaunal, epifaunal, and demersal species. Cables connecting the electrode arrays within the Electrode Array Area are anticipated to be exposed, further altering the soft bottom habitat in this area. The vaults will replace the soft bottom habitat with hard bottom structure that will provide increased habitat heterogeneity and hard substrate that can aggregate and support a more diverse assemblage of marine algae, invertebrates, and fish than sandy bottom habitat alone.

MM BIO-1: Use the results of detailed bathymetric surveys to ensure that electrode array placement and cable routing avoids sensitive habitats and essential fish habitat, such as kelp forests and rocky reefs.

MM BIO-2: Perform pre-construction surveys, as required by resource and regulatory agencies, to determine if final project construction plans will impact sensitive and protected marine resources.

4.3.2.3 Human Uses

The proposed placement of the electrode array approximately 5 km (3.1 mi) offshore and at a depth of 45.7 m (150 ft) greatly reduces the potential for direct human interactions, primarily through diving. The current electrode system is located only 1.8 km (1.1 mi) from shore and at a depth of 15 m (50 ft), which is well within the ranges of depths and distances from shore where SCUBA and free diving activities are most common. In the electrode array's current location, there have been no reports of adverse impacts of the system on human health while diving. Moving the electrode array further offshore will decrease the potential for direct human interaction as well as health and safety concerns. Furthermore, the burial of subsea cables, achieved through a combination of horizontal drilling and trenching and filling, will reduce the potential for direct human interactions during swimming, surfing, diving, or fishing. Therefore, implementation of MM BIO-3 would also reduce potential human health and safety risks.

The concrete vaults and exposed cables of the electrode array have the potential to adversely affect commercial fishing due to the potential for entanglement of trawl nets during bottom fishing. However, the electrode array is anticipated to confined to an area of approximately 196,000 m^2, assuming an approximately 500 m (1,640 ft) diameter for the electrode array, which would result a minor reduction in the trawlable area of Santa Monica Bay, and would not be expected to impact recreational hook and line fishing. The use of surface buoys and inclusion of the electrode array location on navigational charts, as has been done for the existing electrode array, would greatly reduce the potential for impacts to commercial and recreational fishing, since the immediate area could be avoided during trawling.

MM HU-1: Mark the position of the electrode array using surface buoys and notify the U.S. Coast Guard and other responsible entities of the position and as-built characteristics of the electrode array and any other related infrastructure that could entangle fishing gear.

The generation of an EMF during electrode operation has the potential to increase corrosion of marine and onshore human infrastructure. The potential for corrosion is affected by the strength of the electric field, the duration in which the electrode is operating, and the proximity of metallic and potentially corrodible infrastructure to the electric field. In CESI's study that assessed the "Impact of the Electrodes on Other Facilities", it was noted that metallic infrastructure within in a 5-km (3.1 mi) radius of the electrode array would be the most likely to be affected by corrosion. While there have been no reports of increased corrosion for metallic objects within the vicinity of the existing electrode array, the proposed electrode system is being designed to have a maximum design value of 3,650 A, which is greater than the existing electrode system operational current of 3,100 A. Positioning the proposed electrode array at an approximate distance of 5 km (3.1 mi) offshore would reduce the potential for increased corrosion since metallic infrastructure in the project vicinity is would be exposed to leakage currents below 0.02 A/m^2 in all areas except in the immediate vicinity of the shoreline near Topanga State Park.

MM HU-2: Monitor metallic infrastructure in immediate coastal areas that have the potential to be exposed to leakage currents greater than 0.02 A/m^2, and use corrosion minimization measures to reduce corrosion risk.

4.4 Conclusion

The biological resources encountered within the APE were consistent with those reported to occur within sandy and rocky bottom areas of Santa Monica Bay. While the habitat of the APE was not unique, it does have the potential to support special status species, as evidenced by the observation of four marine mammals as well as a tern species during biological reconnaissance surveys. Therefore, mitigation measures are recommended that limit the potential for "take" of protected species during project construction. These measures would be incorporated regardless of the alternative cable route selected, since habitat and sediment and water quality conditions were equivalent between routes.

Construction activities would be expected to have temporary impacts on marine resources and human uses, since impacts on water quality, potential increased noise levels, vessel operation, and human uses, such as fishing and boating, would only occur over a limited time period of several months within the APE. These potential impacts are anticipated to be highly localized to the APE, temporary as they will only extend throughout the period of construction, and less than significant with mitigation.

Long-term potential project impacts could result from the generation of EMFs, production of chlorine gas, habitat modification, and entanglement of fishing gear with vaults and exposed cables. By positioning the electrode approximately 5 km (3.1 mi) offshore and incorporating design elements that limit the strength of EMFs, impacts on human infrastructure, such as corrosion, and direct human interactions during diving, will be reduced to levels that are less than significant. Additionally, by limiting the use of exposed cables, there will be less potential for direct interaction with biota with electrosensory capabilities and entanglement of fishing gear. Habitat modification due to the placement of concrete vaults on soft-bottom habitat cannot be avoided; however, these structures have the potential to provide hard substrate that has been shown to support marine biota based on assessments of the existing marine electrodes. The production and release of chlorine gas may be a potential environmental concern; however, the use of design elements that limit its production in conjunction with further studies that model the potential for elevated concentrations would be helpful in better assessing this potential risk.

In conclusion, the construction and operation of the proposed electrode would be anticipated to reduce potential impacts to marine resources relative to the current operating electrode system. Since there have been no long-term impacts reported for the current operating subsea system, it is reasonable to assume that the new system, with its upgraded design elements, would have minimal effects on the marine environment.

5.0 REFERENCES

American Society for Testing and Materials (ASTM). 2007. E1367-03 Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Invertebrates. *Annual Book of Standards, Water and Environmental Technology, Vol. 11.06*, West Conshohocken, PA.

Balayev, L.A. 1980. The Behavior of Ecologically Different Fish in Electric Fields II – Threshold of Anode Reaction and Tetanus. Journal of Ichthyology 21(1):134-143.

Balayev, L.A. and N.N. Fursa. 1980. The Behavior of Ecologically Different Fish in Electric Fields I. Threshold of First Reaction in Fish. Journal of Ichthyology 20(4):147-152.

Cameron, I. L., W. E. Hardman, W. D. Winters, S. Zimmerman, and A. M. Zimmerman. 1993. Environmental magnetic-fields - influences on early embryogenesis. Journal of Cellular Biochemistry 51:417-425.

Chadwick, D.B., Leather, J. Richter, S., Apitz, S., Lapota, D., Duckworth, D., Katz, C. and others. 1999. Sediment Quality Characterization – Naval Station San Diego. SPAWAR Systems Center San Diego Technical Report 1777.

CSLC, 2010 (California State Lands Commision): Public Draft Environmental Impact Report for the Chevron El Segundo Marine Terminal Lease Renewal Project. State Clearinghouse No. 2006031091 CSLC EIR No. 735. August, 2010. Accessed at: http://www.slc.ca.gov/division_pages/DEPM/DEPM_Programs_and_Reports/Chevron%20Long%20Wharf/Chevron_El_Segundo/Chevron_El_Segundo.html

Fisher, C. and M. Slater. 2010. Effects of electromagnetic fields on marine species: A literature review. Prepared on behalf of the Oregon Wave Energy Trust. Report 0905-00-001. September 2010.

Gill, A. B. and A. A. Kimber. 2005. The potential for cooperative management of elasmobranchs and offshore renewable energy development in UK waters. Journal of the Marine Biological Association of the United Kingdom 85:1075-1081.

Gradient Corporation. 2006. Report: Cape Wind Energy Project Nantucket Sound, Apendix 3.7-C: *Sensitivity of Marine Organisms to Undersea Electric and Magnetic Fields*. Report No. 5.3.2-3. November.

Kirschvink, J. L., A. E. Dizon, and J. A. Westphal. 1986. Evidence from strandings for geomagnetic sensitivity in cetaceans. Journal of Experimental Biology 120:1-24.

Levin, M. and S. G. Ernst. 1997. Applied DC magnetic fields cause alterations in the time of cell divisions and developmental abnormalities in early sea urchin embryos. 18:8.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management*, 19:81-97.

Plumb, R. H., Jr. 1981. *Procedure for handling and chemical analysis of sediment and water samples. Technical Report EPA/CE-81-1*. U.S. Environmental Protection Agency/U.S. Army Corps of Engineers Technical Committee on criteria for dredged and fill material, U.S. Army Waterways Experimental Station. Vicksburg, MS.

Schiff, K. 2000. Sediment chemistry on the mainland shelf of the Southern California Bight. *Marine Pollution Bulletin* 40: 267-276

Smith, R.W., M. Bergen, S.B. Weisberg, D. Cadien, A. Dalkey, D. Montagne, J.K. Stull and R.G. Velarde. 2001. Benthic response index for assessing infaunal communities of the mainland shelf of Southern California. *Ecological Applications* 11:1073-1087.

Southern California Marine Invertebrate Taxonomists (SCAMIT). 2008. A taxonomic listing of Macro- and Mega-invertebrates from Infaunal & Epibenthic Monitoring Programs in the Southern California Bight. Prepared by The Southern California Association of Marine Invertebrate Taxonomists and the Natural History Museum of Los Angeles County Research & Collections, Los Angeles, CA. Edition 5. July 2008.

Southern California Coastal Water Research Project (SCCWRP). 2008. Southern California Bight 2008 Regional Marine Monitoring Survey, Coastal Ecology Field Operations Manual. Prepared by the Bight '08 Field Sampling & Logistics Committee. Prepared for the Commission of Southern California Coastal Water Research Project, Costa Mesa, CA. July 2008

United States Environmental Protection Agency (USEPA). 1994. Methods for Assessing Toxicity of Sediment-Associated Contaminants With Estuarine and Marine Amphipods. EPA/600/R-94/025. EPA Office of Research and Development, Narragansett, Rhode Island. June.

U.S. Environmental Protection Agency (USEPA). 2002. Guidance on Environmental Data Verification and Data Validation. EPA/240/R-02/004. November 2002.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA-540-R-04-004. October 2005.

USEPA. 2008. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). USEPA-540-R-08-01. June 2008.

Zimmerman, S., Zimmerman, A.M., Winters, W.D., & Cameron, I.L. (1990). Influence of 60 Hz magnetic fields on sea urchin development. *Bioelectromagnetics,* **11**, 37-45.

THIS PAGE INTENTIONALLY LEFT BLANK

D3: LITERATURE REVIEW

THIS PAGE INTENTIONALLY LEFT BLANK

Assessment of Marine Resources in the Vicinity of the Sylmar Ground Return System Undersea Electrode

Literature and Existing Data Review of Human Activities and Infrastructure, Marine Biota, and the Surrounding Environment

Final Report

Prepared for:

Los Angeles Department of Water and Power

Prepared by:

Weston Solutions, Inc.
2433 Impala Dr.
Carlsbad, CA 92010

June 2012

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

A	amps
ASBS	Areas of Special Biological Significance
ºC	degrees Celsius
CDFG	California Department of Fish and Game
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CWA	Clean Water Act
DDT	dichlorodiphenyltrichloroethane
DO	dissolved oxygen
DPR	Department of Parks and Recreation
EFH	Essential Fish Habitat
ESA	Endangered Species Act
EIR	Environmental Impact Report
ºF	degrees Fahrenheit
ft	feet
km	kilometer
km^2	square kilometers
LADWP	Los Angeles Department of Water and Power
LARWQCB	Los Angeles Regional Water Quality Control Board
m	meter
MBTA	Migratory Bird Treaty Act
MGD	millions of gallons per day
MLPA	Marine Life Protection Act
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MW	megawatts
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDCI	Pacific Direct Current Intertie
pH	hydrogen ion concentration
SCCWRP	Southern California Coastal Water Research Project
SMAR	Santa Monica Artificial Reef
SMBAR	Santa Monica Bay Artificial Reef
SMBRC	Santa Monica Bay Restoration Coallition
SMCA	State Marine Conservation Area
SMP	State Marine Park
SMR	State Marine Reserve
SWRCB	State Water Resources Control Board
TAR	Topanga Artificial Reef
TSS	Total suspended solids
US	United States

USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USGS	United States Geological Service
WPCP	Water Pollution Control Plant
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

The Los Angeles Department of Water and Power (LADWP) is engaged in studies to support the proposed upgrading of its Pacific Direct Current Intertie (PDCI) by approximately 600 megawatts (MW) to accommodate the transfer of wind and hydroelectric power. This upgrade will require enhancements to the PDCI ocean electrode system located off the coast of Santa Monica, California. The enhancement includes replacement of two subsea electrical cables, which currently extend from the Gladstone Vault, located at Sunset Blvd and Pacific Coast Highway, to approximately 6,000 feet (ft) offshore to an electrode array. The existing electrode array, which consists of 24 electrode elements placed within concrete vaults that are spaced at intervals 10 to 23 feet and extend to a total length of 543 feet, will also require retrofitting or replacement and potential relocation.

An Initial Study prepared by LADWP determined that the Sylmar Ground Return System Replacement Project (Project) will require an Environmental Impact Report (EIR) based on identification of site-specific impacts and evaluations of potential significance under the California Environmental Quality Act (CEQA). The Initial Study determined that replacement or rehabilitation of the cables and electrode array has the potential to significantly impact marine resources due to construction-related impacts. The Sylmar Electrode System is projected to be operated approximately 50 hours per year at a maximum amperage of 3,650 amps (A), as compared to the maximum amperage of the existing system of 3,100 A. During periods of use, the subsea system has the potential to produce electromagnetic fields and electrochemical reactions that may impact marine organisms and the surrounding environment.

This report details the marine conditions and resources that are reported to occur within the vicinity of the existing electrode in Santa Monica Bay, California. The purpose of the report is to provide a review of historical oceanographic conditions, marine habitats and species in the Bay, and human uses and infrastructure within the vicinity of the Project.

1.1 Project Objectives and Description

The objective of the Project is to replace and upgrade the existing electrode system that extends from the Sylmar Converter Station to an offshore location in the Pacific Ocean. This Project will involve replacing up to 23 miles of overhead transmission cables, including 31 in-ground vaults located on streets, and 1.1 miles of submarine cable running from the Gladstone Vault to an offshore location in Santa Monica Bay. The marine portion of the Project will involve directional boring beginning at the Gladstone Vault to a distance of approximately 1,000 feet (ft) offshore at a depth of 15 to 25 ft (Figure 1-1). Copper submarine cables will then be pushed through the bored conduit from the vault and exit from below the seafloor at a distance of approximately 1,000 ft. Beyond 1,000 ft from shore, the submarine cables will then travel along the seafloor and terminate at an electrode array, which is anticipated to be consist of a series of concrete vaults, as described below. The final location of the new system has yet to be determined but will likely reside between 6,000 and 15,000 ft (1.1 to 2.8 miles) offshore in 60 to 180 ft of water. The nearshore portion (i.e., within 1,000 ft of shore) of the existing electrode cables is targeted for removal, while the remaining cables and electrode array are expected to be abandoned in place.

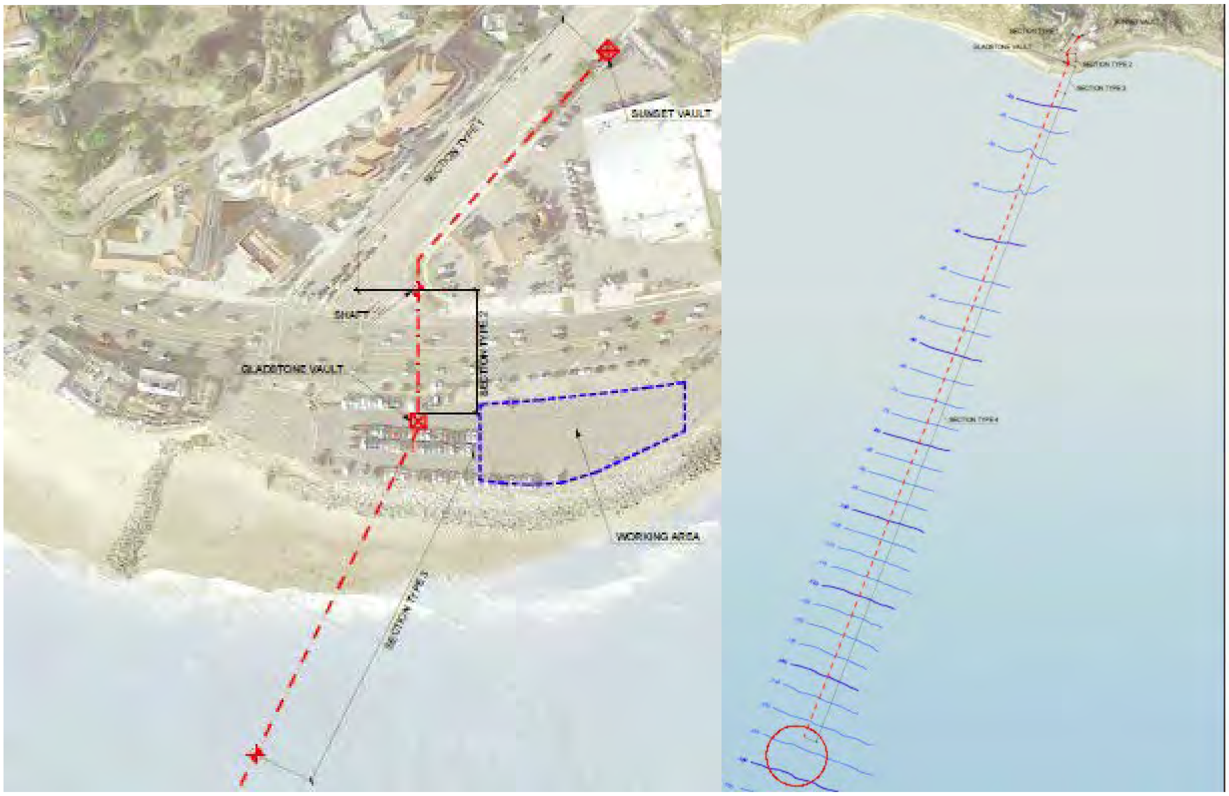


Figure 1-1. General Location of Cable Route from the Gladstone Vault to the Offshore Electrode (Taken from Burns and McDonnell, 2012a)

The new system will be capable of operating at a maximum amperage of 3,650 A even under the condition when up to two of the eight sections of the array (25%) are not available for operation due to failure or maintenance (Burns and McDonnell, 2012a). This choice increases the overall rated current value to 4,867A (3,650A*8/6). The duty cycle of the system is expected to have a total cycle time of 120 minutes and a total time expected in operation of less than 50 hours per year (Burns and McDonnell, 2012a).

1.1.1 Electrode Array

A description of the electrode array is provided in two reports: Task 2 “Electrode Cables Evaluation and Design” – FINAL REPORT (Burns and McDonnell, 2012a), and Submarine Electrode Technical Specification – Annex to Task 1 & 11 Final Report (Burns and McDonnell, 2012b). The basic characteristics of the electrode array described in the two documents are summarized below.

The perimeter of the electrode will be formed by using 88 concrete cylindrical boxes, regularly spaced and laid on the seabed in a circle with a diameter of approximately 1,380 ft. The distance between the centers of two adjacent boxes will be approximately 50 ft. The electrode will be electrically subdivided into 8 sections of 11 boxes (i.e., sub-electrodes) each (Figure 1-2, from Burns and McDonnell, 2012a).

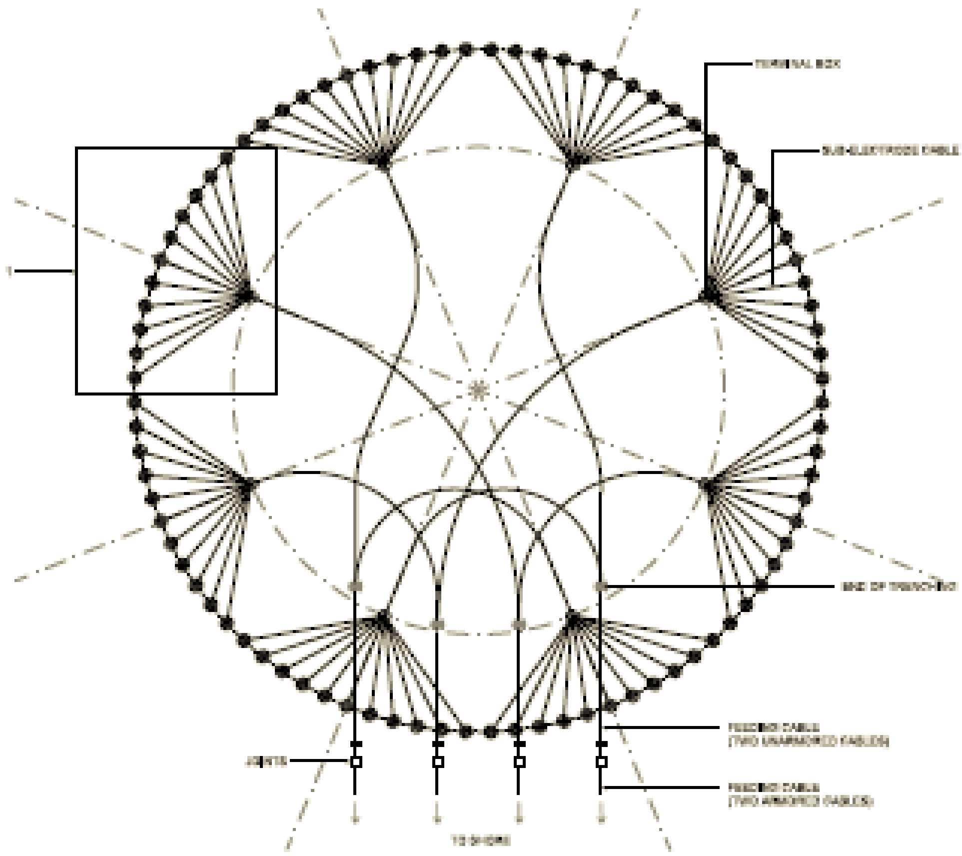
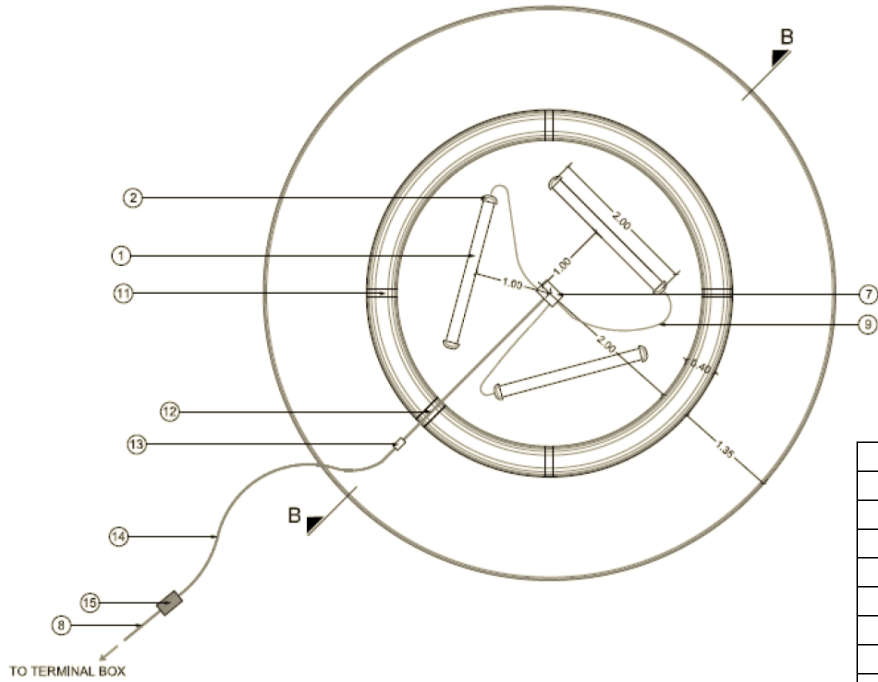


Figure 1-2. Schematic of the Electrode System Proposed for the Sylmar Ground Return System Undersea Electrode (Taken from Burns and McDonnell, 2012a)

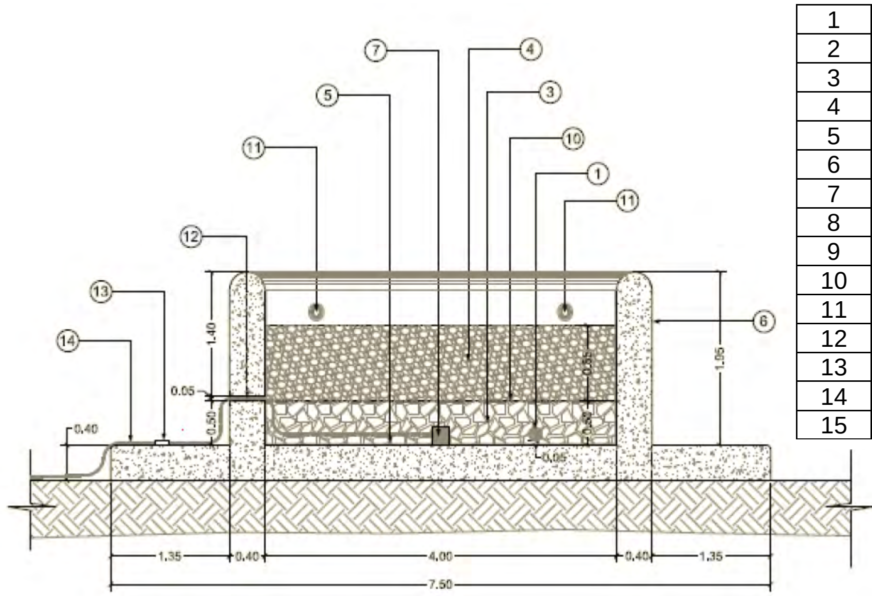
Each box has an internal cylindrical cavity with a diameter of 13 ft. Each cavity will contain three 5-ft long graphite bars with a diameter of approximately 6 inches tangentially disposed to form an “unclosed triangle” (Figure 1-3). The midpoint of each bar will be located approximately 3 ft from the center of the box. The bars will be laid on a 2-inch thick layer of metallurgical coke within the box (which is lined with high density polyethylene (HDPE)) as shown in Figure 1-4 (taken from Burns and McDonnell, 2012b). The graphite bars will be connected to copper cables sealed in flexible plastic conduits. Each of the three cables will be wired to a single sub-electrode pigtail, which will exit the box and be connected to the rest of the array as shown in Figure 1-2.

After the graphite bars have been wired inside each box, they will be covered with a 1.5 ft thick layer of metallurgical coke followed by a final top layer of gravel (approximately 3 ft thick) (Burns and McDonnell, 2012b). If, for any reason, it is necessary to prevent the diffusion of coke particles inside the gravel or to prevent coke contamination coming through the gravel, a sheet of porous/woven polyester fabric or other suitable material can be optionally inserted on the top of the coke, before the final covering with gravel.



1	Graphite bar
2	Waterproof cap
7	Resin-casted junction box
8	Sub-electrode cable
11	Lifting hole
12	Cable inlet HDPE pipe
13	Cable clamp
14	Sub-electrode pig tail
15	"Plug-in" connector

Figure 1-3. Plan View Schematic of Cylindrical Concrete Box Used to House Electrode Terminus (88 Boxes will be used in the Final Electrode Array) (Taken from Burns and McDonnell, 2012b)

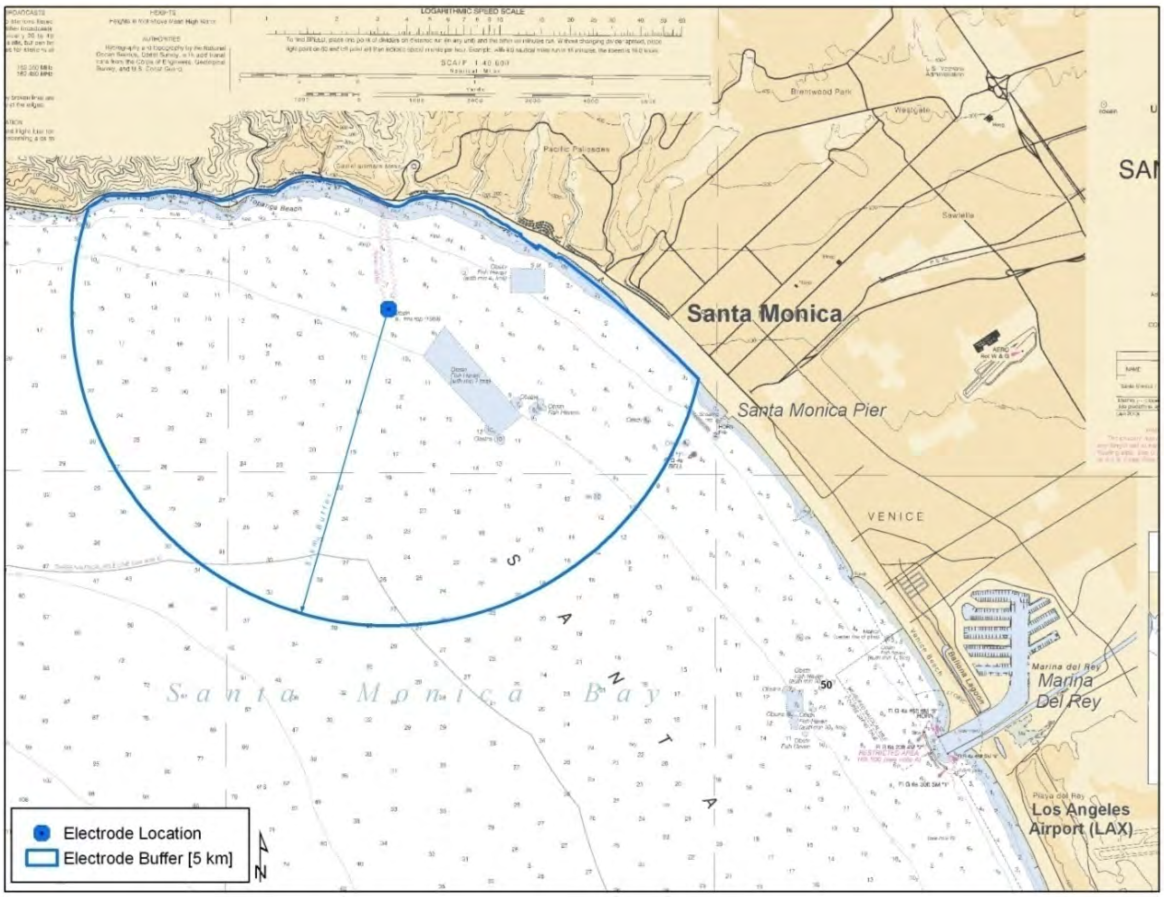


1	Graphite bar
2	Waterproof cap
3	Coke
4	Gravel
5	HDPE liner
6	Epoxy paint
7	Resin-casted junction box
8	Sub-electrode cable
9	Graphite bar cable
10	Porous woven sheet
11	Lifting hole
12	Cable inlet HDPE pipe
13	Cable clamp
14	Sub-electrode pig tail
15	"Plug-in" connector

Figure 1-4. Cross Section Schematic of Cylindrical Concrete Box Used to House Electrode Terminus (Taken from Burns and McDonnell, 2012b)

1.2 Study Area

The study area for the existing marine portion of the electrode system encompasses a 3-mile (5 kilometer) radius extending offshore from the existing electrode array (Figure 1-5). The study area comprises the marine environment located offshore of the cities of Los Angeles and Malibu, California in Santa Monica Bay within the Southern California Bight (Bight). It is located within the U.S. Geological Survey (USGS) 7.5-Minute Series Topanga, California Quadrangle.



Source: http://www.charts.noaa.gov

Figure 1-5. Study Area in Santa Monica Bay

Santa Monica Bay is a large, open-water embayment of the Pacific Ocean that is bordered on the north by rocky headlands at Point Dume and is bordered on the south by the headlands on the Palos Verdes Peninsula. Santa Monica Bay extends seaward a distance of approximately 11 miles from the Santa Monica shoreline. Water depths within the Bay range from approximately 0 to 300 ft along the nearshore continental shelf that extends from the shoreline to an offshore distance of approximately 4 miles. As the continental shelf ends and becomes the continental slope and eventually the Santa Monica Basin, water depths within the Bay increase to over 2,500 ft.

Nearshore habitats within the study area range from sandy beach and rocky intertidal areas along the shoreline to soft bottom habitat interspersed with seagrass beds and small rocky reefs in the nearshore subtidal zone. Further offshore, soft bottom and open ocean habitats predominate, with only a small percentage of rocky reef. Kelp forest habitat within Santa Monica Bay is primarily located in the shallow subtidal zone around Malibu and Palos Verdes. Based on a review of kelp maps, large kelp beds are not indicated in the study area, although small kelp stands are likely to be present. Small kelp stands or individual plants attach to hard substrates such as reefs or debris that are located up to 60 feet in depth. The pelagic habitat, which is the largest habitat within the Bay, is a highly productive offshore region of open ocean that supports nearly all of the Bay's marine life. The vast majority of the phytoplankton, which is the basis for the Bay's marine food web, is primarily grown in the pelagic habitat.

1.3 Literature and Existing Data Review Approach

The objective of this literature and existing data review is to characterize baseline conditions of marine resources within a 3-mile (5-kilometer) radius of the existing electrode in Santa Monica Bay. The review describes historical oceanographic conditions, water and sediment quality, marine organisms and habitats, and human activities and infrastructure that have the potential to be affected by the construction, operation, and maintenance of the undersea electrode system.

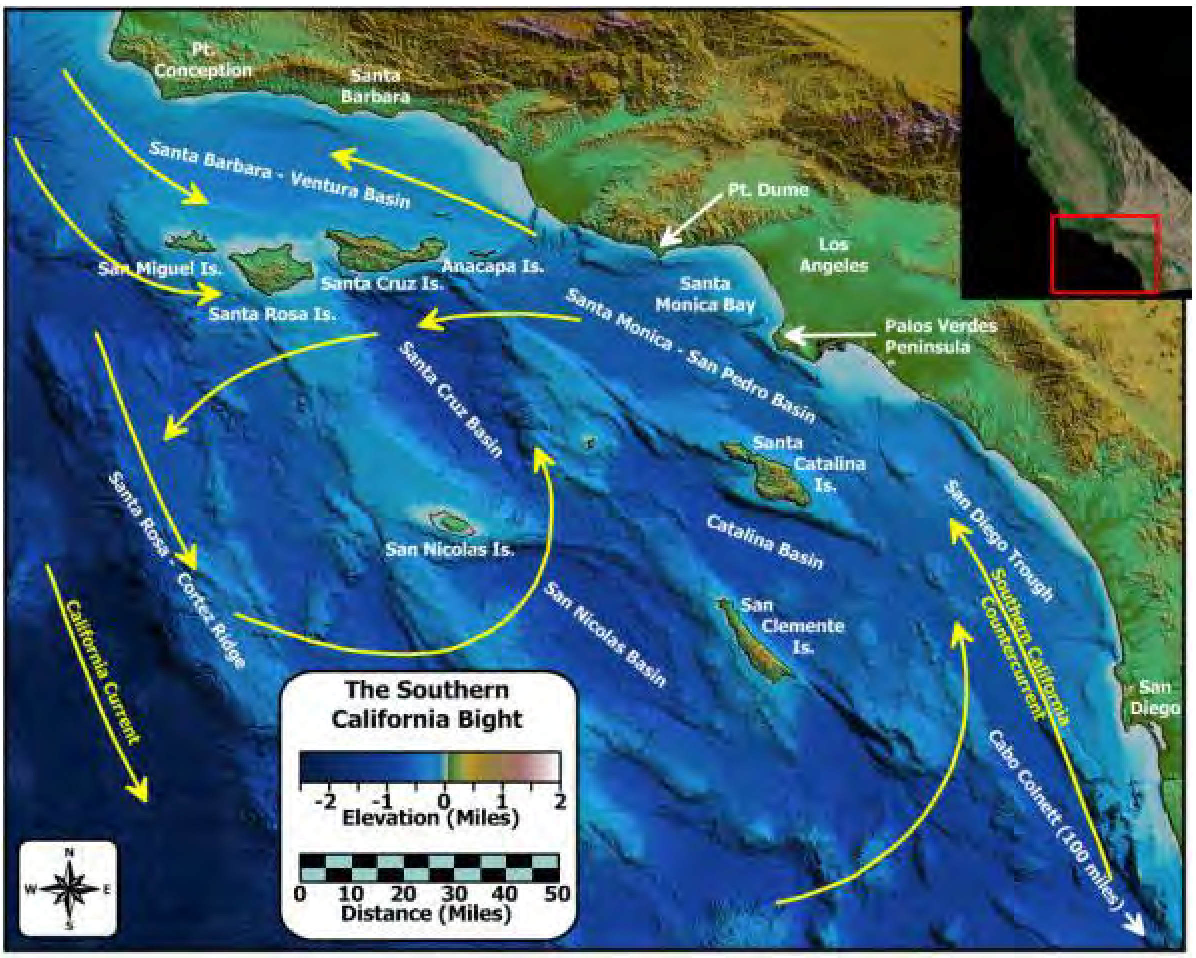
The results of the literature and existing data review will be combined with the findings of field studies to accomplish the following specific objectives:

- Determine potential impacts on humans, marine life, plants, and surroundings from electric and magnetic fields generated by the new electrode array and submarine cables and propose recommendations to mitigate such impacts;
- Analyze the potential short-term effects on marine biota in the vicinity of the electrode array and submarine cables from construction of the new or upgraded electrode array and submarine cables; and
- Address possible chemical effects on nearby surroundings and marine organisms due to electrochemical reactions that occur on the surface of the electrodes, such as chlorine production and other electrolysis products formed at the electrode elements.

A review of natural resource databases, National Marine Fisheries Service (NMFS) lists of threatened and endangered species, EIRs in the Project vicinity, local resource management plans, scientific articles, and regional monitoring reports for the Bight were used to determine the locations and types of natural resources that have the potential to exist in the vicinity of the proposed Project. Additionally, the review highlights the regulatory agencies, policies, and laws that must be engaged and adhered to in order to protect environmental resources.

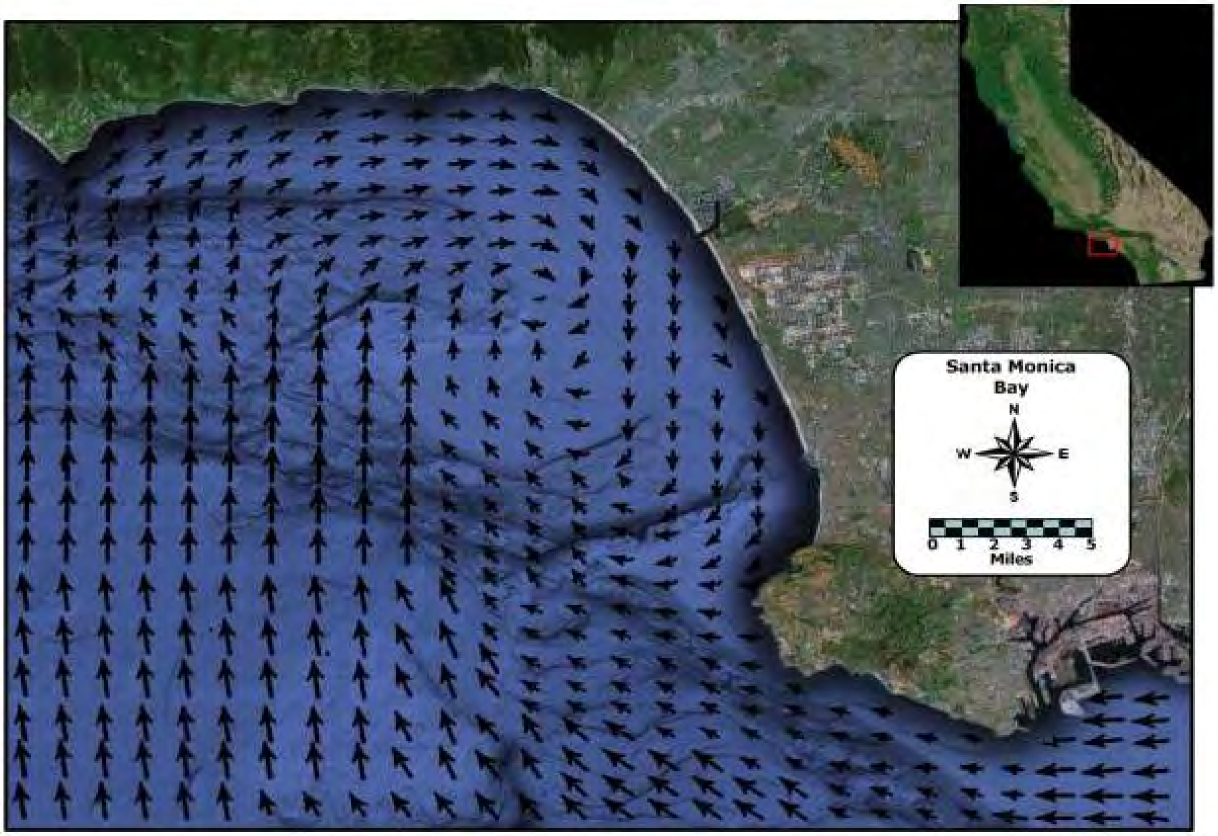
2.0 OCEANOGRAPHY

The large-scale oceanic flow within the Southern California Bight is dominated by the California Current System, which includes the southward-flowing California Current and the northward-flowing Southern California Countercurrent, as shown in Figure 2-1 (Hickey, 1979; 1992; 1998). The California Current is the dominant oceanic current along the Pacific Coast, which is characterized by seasonably stable low salinities, low temperatures, and high nutrient concentrations. The Southern California Countercurrent is the predominant current that affects Santa Monica Bay, transporting warmer, saltier, subtropical water northward along the coast. For most of the year, strong currents flow mainly toward the northwest, and occasionally the northward-flowing coastal current forms a diffuse clockwise-rotating eddy within the Bay (Figure 2-2).



Source: California State Lands Commission (CSLC), 2010

Figure 2-1. Oceanic Currents in the Southern California Bight Region

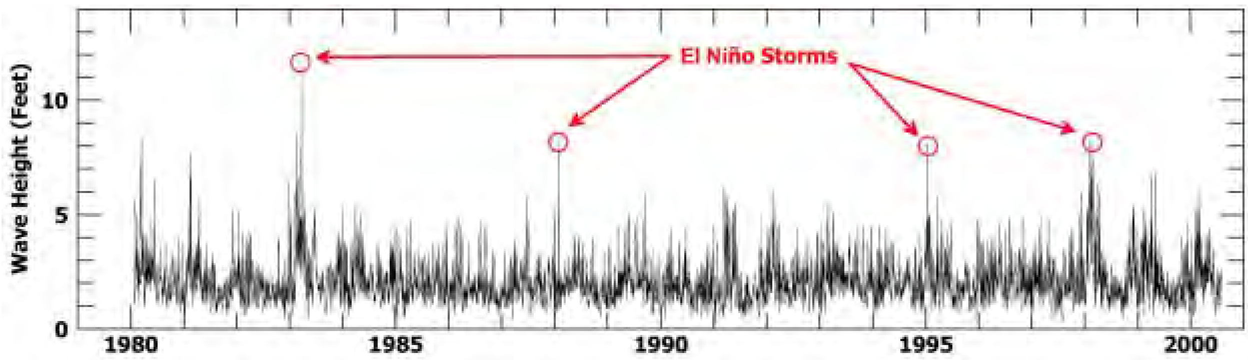


Source: CSLC, 2010

Figure 2-2. Dominant Northwest Flowing Santa Monica Bay Currents

Seasonal surface-circulation patterns within the Bight and Santa Monica Bay respond to a combination of large-scale changes in coastal surface winds (Di Lorenzo, 2003) and fluctuations in the large-scale, long-shore oceanic pressure gradient (Hickey et al., 2003). Thus, currents can flow in a uniform direction throughout the Bay, or they can flow in a clockwise or counterclockwise gyre within the Bay. The mean circulation pattern within the Bay during spring and summer can form a double gyre, with a southeastward nearshore flow along the coastline in the lower half of the Bay and a northwestward coastal flow in the northern reaches (California State Lands Commission [CSLC], 2010). Additionally, upwelling events that usually occur between March and June affect circulation within the Bay, causing surface water to be replaced by deep, cool, nutrient rich seawater. The nutrients brought to the surface during upwelling drive primary production, including planktonic blooms, which support the productive fishery along the southern California coast (CSLC, 2010).

Wave patterns in the Santa Monica Bay are a mixture of remotely generated ocean swell and local winds. Two meteorological sources generate significant swell energy offshore California—winter storms that impinge on the California coastline from the northwest and storm swells generated from the south during summer months. The interactions that steer and focus deep-water swell are sensitive to the direction of the arriving swell. Swells arriving from slightly different directions can result in significantly enhanced wave heights entering Santa Monica Bay. Additionally, nearshore bathymetry can locally amplify swell height as the waves approach the Bay's coastline (CSLC, 2010). Due to the position within the Bight, Santa Monica Bay is comparatively sheltered from swells. Figure 2-3 depicts record wave heights during El Niño storm events.



Source: Jenkins and Wasyl, 2005. Note: Swell generated by the El Niño storm on January 13, 1993, with 7.4-foot (2.3-m), 15-second waves entering Santa Monica Bay from 265°.

Figure 2-3. Wave Height during El Niño Events

Winds within Santa Monica Bay are usually light and exhibit a diurnal variation throughout most of the year (Morris, 2006). Meteorological data recorded from the Santa Monica Pier from August, 2004 through October, 2011 showed an average wind speed of two miles per hour (mph). In addition, the average water temperature recorded was 57.3 °F (14.1 °C) and the average precipitation was approximately 10 inches per year (Weather Underground, 2011).

To further summarize the localized Santa Monica Bay ocean conditions, data collected from Scripps Institute of Oceanography Buoy # 46221, located in the center of Santa Monica Bay (Figure 2-4), were analyzed from 2004 through 2010. A summary of these data is presented in Table 2-1 to Table 2-4 below. Mean monthly water temperature during this time period ranged from 14.23 ºC in March to 19.55 ºC in August (Table 2-1). Wave directions were predominantly from the southwest, ranging from a monthly mean of 211 degrees in July to 256 degrees in February (Table 2-2). Average monthly wave heights were greatest during the winter months of January and February (1.2 meters), while the monthly average wave height was lowest in August (0.82 meters) (Table 2-3). The average monthly wave period ranged from 6.1 seconds in May to 7.5 seconds in January (Table 2-4).

Figure 2-4. Locations of Scripps Ocean Buoy 46221 and Santa Monica Weather Station

Table 2-1. Mean Water Temperature in Santa Monica Bay

	Mean Water Temperature (°C)							Mean Water Temperature (°C)
Month	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2004-2010**
January	NC	15.42	14.31	14.72	13.63	14.29	15.15	14.59
February	NC	15.45	14.59	14.77	13.63	14.20	15.28	14.65
March	NC	16.03	13.05	14.01	13.76	13.92	14.64	14.23
April	NC	14.21	14.80	14.11	13.92	14.30	14.53	14.31
May	NC	15.97	16.57	14.88	16.14	16.78	14.70	15.84
June	NC	16.66	18.58	17.87	18.40	17.76	17.56	17.81
July	NC	18.86	21.08	19.95	19.48	19.27	17.20	19.31
August	NC	19.59	20.84	20.19	20.75	19.29	16.66	19.55
September	21.02	17.25	19.39	20.21	19.72	21.03	17.13	19.39
October	18.61	17.81	18.46	16.42	18.37	19.32	18.32	18.19
November	17.19	17.24	17.90	16.73	17.16	17.06	16.41	17.10
December	15.68	15.33	15.81	14.52	15.49	15.36	14.26	15.21

NC = Not Collected
Source: Santa Monica Bay Buoy #46221 (2004 – 2010) (NOAA National Buoy Data Center at NOAA.gov)

Table 2-2. Mean Wave Direction in Santa Monica Bay

Month	Mean Monthly Wave Direction by Year (Degrees)							Mean Wave Direction (Degrees) (2008-2010)
	2004	2005	2006	2007	2008	2009	2010	
January	NC	NC	NC	NC	247.05	251.09	257.17	251.77
February	NC	NC	NC	NC	257.52	250.89	260.03	256.15
March	NC	NC	NC	NC	236.33	236.46	248.50	240.43
April	NC	NC	NC	NC	232.19	233.59	237.03	234.27
May	NC	NC	NC	NC	229.46	230.81	229.60	229.96
June	NC	NC	NC	NC	224.40	206.55	228.44	219.80
July	NC	NC	NC	NC	213.25	207.01	211.46	210.57
August	NC	NC	NC	NC	208.22	211.91	209.60	209.91
September	NC	NC	NC	NC	213.62	230.84	225.46	223.30
October	NC	NC	NC	NC	216.17	231.47	222.80	223.48
November	NC	NC	NC	NC	242.36	252.76	250.81	248.64
December	NC	NC	NC	NC	251.07	258.80	244.00	251.29

NC = Not Collected
Source: Santa Monica Bay Buoy #46221 (2004 – 2010) (NOAA National Buoy Data Center at NOAA.gov)

Table 2-3. Mean Wave Height in Santa Monica Bay

Month/Year	Mean Monthly Wave Height by Year (m)							Mean Wave Height (m) 2004-2010
	2004	2005	2006	2007	2008	2009	2010	
January	NC	1.21	1.31	1.03	1.23	0.85	1.58	1.20
February	NC	1.07	1.04	1.31	1.24	1.14	1.41	1.20
March	NC	1.27	1.23	0.99	1.23	0.96	1.27	1.16
April	NC	1.16	1.01	1.23	1.06	1.10	1.35	1.15
May	NC	1.00	1.00	0.88	1.05	0.95	1.20	1.01
June	NC	1.02	1.02	0.88	1.05	0.87	1.03	0.98
July	NC	0.86	0.93	0.92	0.91	0.93	0.90	0.91
August	NC	0.69	0.88	0.82	0.81	0.85	0.89	0.82
September	0.97	0.88	0.96	0.94	0.94	0.89	0.85	0.92
October	0.91	0.87	0.87	0.93	0.94	1.02	0.93	0.92
November	0.86	0.87	1.02	0.82	1.03	0.99	1.01	0.94
December	1.07	1.26	1.16	1.23	1.02	1.23	1.15	1.16

NC = Not Collected
Source: Santa Monica Bay Buoy #46221 (2004 – 2010) (NOAA National Buoy Data Center at NOAA.gov)

Table 2-4. Mean Wave Period in Santa Monica Bay

Month	Mean Monthly Wave Period by Year (sec)							Mean Wave Period (sec) 2008-2010
	2004	2005	2006	2007	2008	2009	2010	Total Average
January	NC				5.86	7.57	9.06	7.50
February					7.21	6.87	7.97	7.35
March					6.89	6.68	7.54	7.04
April					6.13	6.60	7.24	6.66
May					5.97	5.96	6.48	6.14
June					6.93	6.53	6.86	6.77
July					6.73	6.32	7.39	6.81
August					6.33	6.19	6.58	6.37
September					6.30	6.38	6.68	6.45
October					7.06	6.45	7.85	7.12
November					7.21	6.89	6.92	7.01
December					6.40	7.95	6.71	7.02

NC = Not Collected
Source: Santa Monica Bay Buoy #46221 (2004 – 2010) (NOAA National Buoy Data Center at NOAA.gov)

3.0 WATER & SEDIMENT QUALITY

Water and sediment quality within Santa Monica Bay has been studied extensively in recent years, particularly near the Hyperion Wastewater Treatment Plant's 5- mile outfall pipe and as part of the Southern California Bight Regional Monitoring Program. Research suggests that there are multiple pollutants of immediate concern in Santa Monica Bay, including metals, organics, and bacterial contaminants (Santa Monica Bay Restoration Commission [SMBRC], 2010). Sources and pathways of contaminants include industrial discharges, urban runoff into creeks and storm drains, municipal wastewater treatment plants (WWTPs), boating and shipping activities, dredging, and advection of pollutants from other areas (Martin et al., 1996). Approximately 645 million gallons of treated wastewater are discharged to Santa Monica Bay each day via seven major point-source facilities and more than 160 permitted smaller commercial and industrial facilities (SMBRC, 2010). As a result of the nearly 30 billion gallons of wastewater effluent that flows into Santa Monica Bay on a yearly basis, impacts to sediment quality are more apparent than those to water quality. SMBRC (2010) rated the water quality "good" overall in Santa Monica Bay, sediment quality was given a rating of "poor" at 59% of sites for sediment contaminants, and at 21% of sites for sediment toxicity.

3.1 Background & Pollutant Sources

Santa Monica Bay is located adjacent to a highly urbanized area, with approximately 12 million people residing along the coastal corridor. Approximately 400 square miles of varied landscape drains into the Bay, including the highly urbanized and channelized Ballona Creek Watershed, and the less developed, Malibu Creek Watershed. The State Water Resources Control Board (SWRCB) has listed Santa Monica Bay as an impaired waterbody under Section 303(d) of the Clean Water Act (CWA).

Historically, the pollutant pathway of most concern for Santa Monica Bay was point source discharges from industrial outfalls and large wastewater treatment facilities, including the Hyperion WWTP and the Joint Water Pollution Control Plant (JWPCP). Over the past few decades pollutants discharged from these treatment facilities have been greatly reduced as secondary treatment has been implemented. Currently, non-point sources constitute a larger source of contaminants to Santa Monica Bay than point sources (Schiff et al., 2000).

Table 3-1 lists the major point source dischargers to the Bay. As of 2007, 193 facilities operated under National Pollutant Discharge Elimination System (NPDES) permits in the area surrounding the Bay, with the majority of them discharging to Ballona Creek (Los Angeles Regional Water Quality Control Board [LARWQCB], 2007a). Less than two percent of contaminants discharged to Santa Monica Bay are from minor point source discharges (LARWQCB, 2007b).

Currently, the primary pathway for pollutants entering the Bay is through non-point discharge from storm drains throughout the surrounding watersheds (Dojiri et al., 2003). The primary pollutants of concern for Santa Monica Bay are nutrients, bacteria, trash and metals, along with historical pesticides. The LARWQCB has implemented nine total maximum daily loads (TMDLs) to address the pollutant issues in the Bay (Table 3-2). These TMDLS are mainly being implemented through incorporation of controls into existing NPDES permits. Over the next five years, at least seven more TMDLs are expected to be in development (SMBRC, 2010).

Table 3-1. Mass Emissions from Major Point Sources through Discharges to Santa Monica

Analyte	Wastewater Plants		Electrical Power Stations			Chevron Refinery
	Hyperion WWTP	Joint WPCP	Redondo	El Segundo	Scattergood	
Flow (MGD)	315	322	661	412	254	6.7
Biological Oxygen Demand (5-day)	8,300	2,800	—	—	—	—
Total Suspended Solids	8,900	6,900	—	—	—	ND
Residual Chlorine	—	—	67	48	—	—
Ammonia Nitrogen	16,000	14,000	ND	ND	—	21
Oil and grease	200	ND	—	—	—	ND
Organic Nitrogen	1,686	2,541	—	—	—	—
Nitrate Nitrogen	9.6	2.9	93	ND	—	—
Total Phosphorus	1,282	352	—	—	—	—
Phenol	—	2.6	—	—	—	ND
Zinc	9.7	2.1	—	14	5.6	ND
Copper	9.2	2.7	ND	1.2	ND	0.019
Nickel	3.7	8.5	ND	ND	ND	0.013
Lead	1.8	ND	ND	ND	ND	ND
Chromium	0.65	ND	ND	3	—	ND
Cyanide	0.7	1.8	—	—	—	ND
Silver	0.62	ND	ND	ND	ND	ND
Arsenic	1.2	0.61	ND	ND	ND	0.217
Cadmium	0.08	ND	ND	ND	1.2	ND
Selenium	0.46	3.1	ND	ND	ND	0.93
Mercury	0.003	ND	ND	ND	ND	ND
Total DDT	0.13	ND	—	—	—	ND
PCB	ND	ND	—	—	—	ND
PAH	0.023	0.0089	—	—	—	ND

Constituents reported in Metric Tons

— Not reported, BOD = Biochemical Oxygen Demand, O&G = Oil and Grease
MGD = Million Gallons per Day
ND = Below detectable limits or no detectable difference between inlet and outlet samples
Sources: Steinberger and Schiff, 2003; Steinberger and Stein, 2004; Lyon et al., 2006

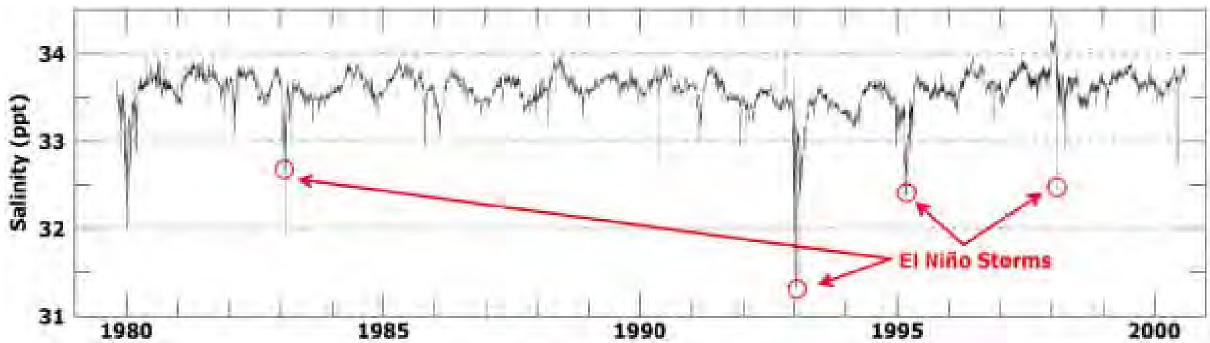
Table 3-2. Total Maximum Daily Loads for Santa Monica Bay Watershed

Pollutant	Water Body	Date of TMDL Adoption
Bacteria	Santa Monica Bay dry weather	2003
	Santa Monica Bay wet weather	2003
	Marina del Rey Harbor, Mother's Beach, and Back Basin	2004
	Malibu Creek	2006
	Ballona Creek, Estuary, Sepulveda Channel	2007
Metals and Toxics	Ballona Creek, Ballona Creek Estuary	2006
	Marina del Rey	2006
	Malibu Creek	Planned
	Malibu Creek	Planned
Nutrients	Malibu Creek	Planned
Historical Pesticides, Chlordane	Santa Monica Bay	Planned
Habitat Alteration, Hydromodification, Exotic Vegetation	Ballona Wetlands	Planned
Benthic Community Effects	Malibu Lagoon	Planned
Marine Debris	Santa Monica Bay	Planned
Trash	Ballona Creek and Wetland	2002
	Malibu Creek	2008

Source: Santa Monica Bay Restoration Commission, 2010.

3.1.1 Water Quality

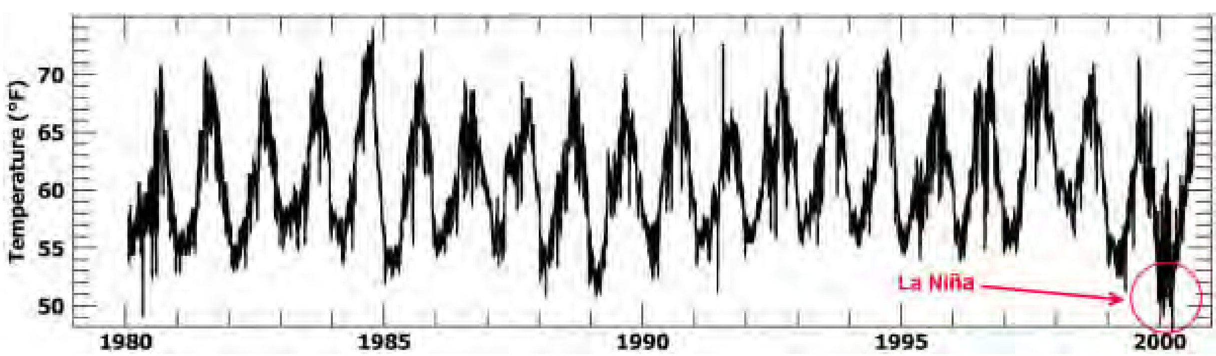
Marine water quality is evaluated using both chemical and physical properties. Various monitoring programs across the Bight and inside Santa Monica Bay monitor and measure salinity, temperature, hydrogen-ion concentration (pH), turbidity, dissolved oxygen (DO), trace-metals, and bacteria concentrations. Within Santa Monica Bay, spatial and temporal variations of physicochemical properties occur from interactions of topography, vertical mixing, biological processes, and freshwater influx (Nezlin et al., 2004; CSLC, 2010). Across most of the Bay, the annual mean salinity is close to 33.40 practical salinity units (psu), while offshore areas adjacent to mouths of creeks, such as Ballona and Malibu creeks, often have sustained lower salinities. Data collected near the Chevron Marine Terminal show seasonal variation in salinity due to the large influx of winter storm runoff (Figure 3-1). Larger fluctuations are also seen based upon weather patterns such as the El Niño (CSLC, 2010).



Source: Jenkins and Wasyl, 2005

Figure 3-1. Daily Mean Seawater Salinity near the Chevron Marine Terminal in Santa Monica Bay

Across the Bight, typical surface water temperatures range from 52-73 ºF (11-23 ºC). Figure 3-2 illustrates the seasonal pattern of temperatures with data collected near the Chevron Marine Terminal (CSLC, 2010). Major weather patterns also impact the mean temperatures, as is illustrated by the La Niña event in 1999-2000.



Source: Jenkins and Wasyl, 2005

Figure 3-2. Daily Mean Sea Surface Temperature near the Chevron Marine Terminal in Santa Monica Bay

Bacterial decomposition of organic pollutants can deplete DO levels below the necessary level needed to maintain a healthy marine environment. The California Ocean Plan prohibits discharge of pollutants that will decrease DO concentrations more than 10% from the natural state (SWRCB, 2005a).

The pH of water in the Bay is slightly alkaline, ranging from 7.5-8.5. This is consistent with pH measurements in the world's oceans. Within the Bay, the highest pH levels occur during spring upwelling when photosynthesis increases, thus releasing higher levels of oxygen near the surface. (CSLC, 2010) Certain types of caustic or acidic pollutants can alter the pH of seawater. These effects are temporary and are moderated quickly by the well buffered ocean. pH altering pollutants are restricted by the California Ocean Plan and may not alter the pH of the receiving water by more than 0.2 pH units from naturally occurring levels.

Water clarity, light transmissivity, turbidity, and total suspended solids (TSS) concentrations are all measures that indicate how well light penetrates seawater. High turbidity can limit the ability of ambient light to penetrate into the upper levels of the water column, thus limiting the depth of the euphotic zone. Decreased light penetration can impact kelp and phytoplankton growth by lowering the rate of photosynthesis and decreasing the primary productivity of the impacted area (Gowen, 1978). Factors that can increase turbidity include ocean outfall wastewater discharges, storm water runoff, and sediment resuspension through construction or dredging activities.

The annual average light transmissivity in Santa Monica Bay indicates a relatively high level of water clarity. Surface waters in the middle of the Bay transmit 85% of ambient light (CSLC, 2010). Nearshore light transmittance, however, is generally lower near creek discharges (e.g., 66% of ambient light is transmitted at the mouth of Ballona Creek) and in other areas where sediment resuspension occurs as a result of wave action (Southern California Coastal Water Research Project [SCCWRP], 2004). Additionally, variability in light transmissivity occurs in nearshore waters as a result of the intermittent nature and variability of wave action (Nezlin et al., 2004).

3.1.2 Sediment Quality

Seafloor sediments are a frequent area of interest when conducting marine environmental quality assessments. Many pollutants accumulate within sediments and/or bind to particles that settle to the ocean floor. Some contaminants degrade over time with exposure to microorganisms, ultraviolet radiation, and/or geochemical processes; however, many pollutants do not naturally degrade and may exhibit persistent toxicity to the marine environment. Biological organisms can interact with the contaminated sediments (foraging, burrowing, etc.) and accumulate as well as transport these contaminants into the food chain and the greater environment.

For three and a half decades the Montrose Chemical Company manufactured the pesticide dichlorodiphenyltrichloroethane (DDT) at its plant near Torrance, CA and released 640 pounds of DDT compounds each day to the Los Angeles County sewer system that was discharged through the Joint WPCP ocean outfall at Whites Point onto the Palos Verdes Shelf and into the San Pedro Channel (MBC, 2008). Prevailing currents distributed the discharged DDT throughout the Bay and the Bight. While the most heavily DDT-contaminated area in the Southern California Bight is the Palos Verdes Shelf, in 2003 regional monitoring found measurable concentrations of DDT in 71% of samples collected in the SCB (Schiff et al., 2006). It is estimated that over 90% of surface sediment in the Bay is contaminated, often at levels considered high enough for potential concern (Schiff, 2000).

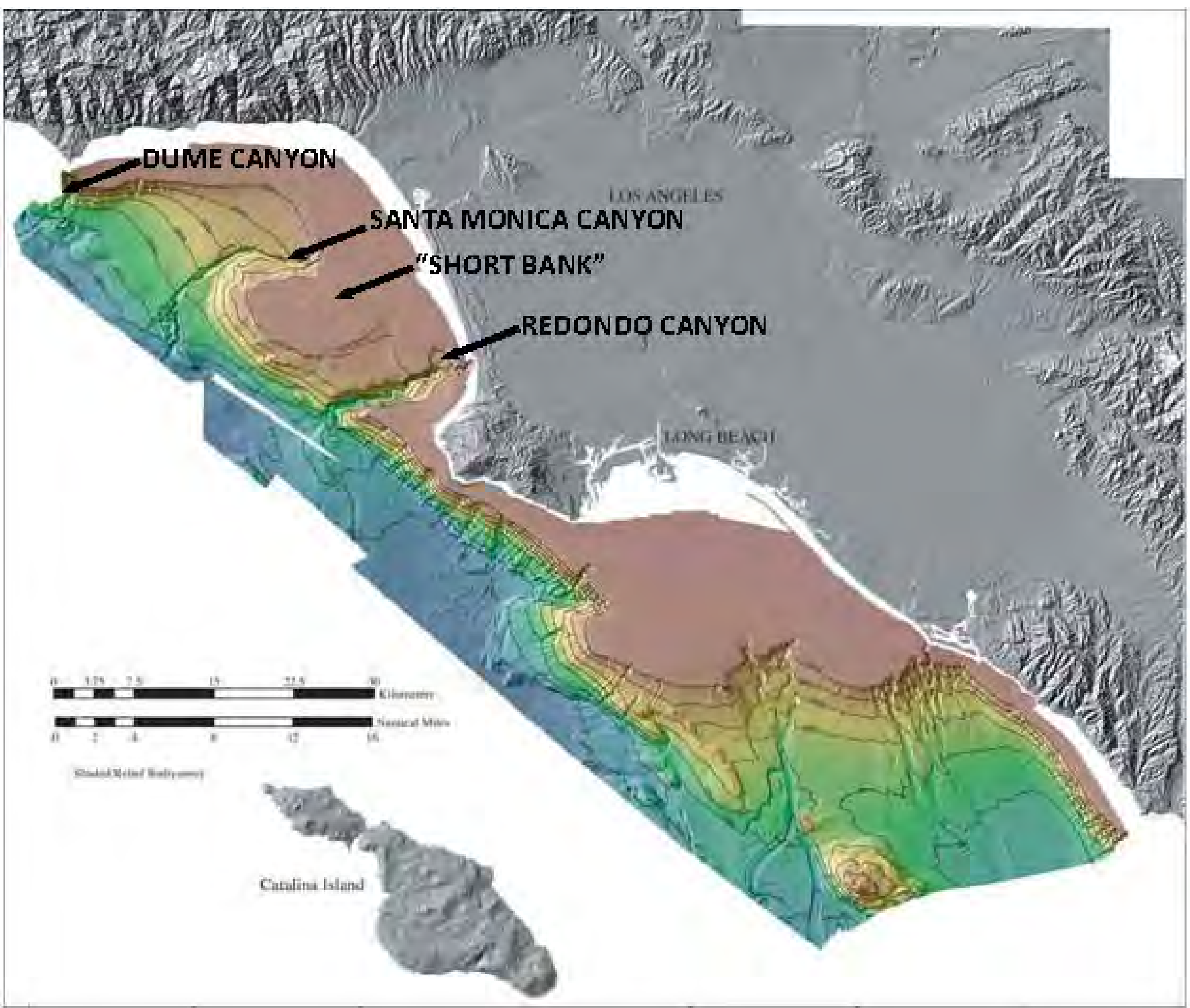
In 1998, studies showed elevated DDT, polychlorinated biphenyl (PCB), and chlordane levels near the Hyperion Plant five mile outfall (LARWCB and USEPA, 2005). These studies also revealed that DDT and PCB contaminated sediments are a major source of fish tissue contamination, particular amongst bottom-dwelling species. This contamination continues to be of concern as organic chemicals such as DDT and PCBs are released through resuspension and biological processes, impacting marine life. Although these contaminants may have been initially deposited near the original outfall location, they are prone to resuspension by waves, currents or other disturbance and can be transported far from the original location (Noble and Xu, 2003).

In January of 2006 the TMDL for metals and organics in sediments in Ballona Creek and adjacent estuary became effective. Elevated levels of organic pollutants and metals were found to be present in seafloor sediments offshore from Ballona Creek (Schiff and Bay, 2003). The TMDL established targets for cadmium, copper, lead, zinc, silver, total PAHs, Total PCBs, chlordane, and total DDT. Primary sources of contaminants in these sediments were found to be unrelated to the Hyperion WWTP but rather due to dry weather and stormwater runoff, NPDES permitted discharges, and atmospheric deposition.

Construction activities associated with the extension of the Sylmar Ground Return System will result in disturbance to the sea floor, which is likely to result in an increase in suspension of fine grain particles in the water column and an increase in turbidity. In addition to the impact on light transmittance, an increase in suspended particles may also have an adverse impact on fish and invertebrate habitat (Arruda et al., 1983), which could potentially result in sublethal and/or lethal impacts to some organisms (Newcombe and MacDonald, 1991; Newcombe and Jensen, 1996).

4.0 BIOLOGICAL RESOURCES

Santa Monica Bay contains a diversity of marine habitats and species. The offshore portion of the existing Sylmar Ground Return System is located in the nearshore waters of the central part of Santa Monica Bay between the metropolitan areas of Santa Monica and Malibu, California. Santa Monica Bay is a large, open-water embayment of the Pacific Ocean that is bordered on the north by rocky headlands at Point Dume and is bordered on the south by the headlands on the Palos Verdes Peninsula. Santa Monica Bay extends seaward a distance of approximately 11 miles from the Santa Monica shoreline. Water depths within the Bay range from approximately 0 to 300 ft along the nearshore continental shelf that extends from the shoreline to an offshore distance of approximately 4 miles. As the continental shelf ends and becomes the continental slope and eventually the Santa Monica Basin, water depths within the Bay increase to over 2,500 ft (Figure 4-1). As a result of the Bay's diverse bathymetry, abundant nutrients, and wide range of habitats, it is considered to be a highly productive biological environment used by both migratory and resident species of marine mammals, fish, birds, and invertebrates.



Source: http://www.charts.noaa.gov

Figure 4-1. Bathymetry of Santa Monica Bay

4.1 Marine Habitats

Seafloor habitat within Santa Monica Bay and within the study area is primarily comprised of mixtures of silt, sand, and clay, or "soft" sediment that slopes gradually away from the surrounding beaches. Soft-bottom habitat in nearshore areas typically consists of a high percentage of coarse-grained sediment such as sand, while soft-bottom habitat further offshore typically consists of fine-grained sediment (silts and clays). As previously stated, exposed rocky and sandstone reefs occur throughout the Bay in nearshore areas around Malibu, Point Dume, and the Palos Verdes Peninsula. It is in these areas that the majority of the kelp forest in the Bay is found (Figure 4-2).

Figure 4-2. Locations of Kelp Beds Occurring within Santa Monica Bay

A gently sloping continental shelf extends to the shelf break at a water depth of approximately 265 ft. In general, the shelf in Santa Monica Bay is very flat and narrow with shelf widths varying from 3 miles off the Malibu margin to 6 miles where the shelf grades into the northern side of the marginal plateau province. Shelf gradients generally are less than 0.5 degrees, although there are several localized zones of rock outcrops adjacent to Palos Verdes Peninsula that produce gradients of more than 85 degrees (Gardner et al., 2003). At the shelf break, the seafloor becomes steep along the slope before flattening out into the deep Santa Monica Basin at a depth of approximately 2,600 ft of water. Santa Monica Bay contains three submarine canyons: Dume Canyon near Malibu, Santa Monica Canyon bisecting the center of the bay, and Redondo Canyon near the Palos Verdes Peninsula (Figure 4-1). A shallow shelf, known as "Short Bank," exists between the Santa Monica and Redondo Canyons along the 50-m bathymetric contour and is characterized by patchy areas of exposed rock, gravel, and mixed sediments (Terry et al., 1956).

4.1.1 Subtidal Hard-Bottom Habitat

Natural hard substrate in Santa Monica Bay occurs primarily along the Bay's periphery near the headlands of Point Dume and Palos Verdes, along the edges of the three submarine canyons, and on the rocky plateau known as the Short Bank that lies between the Santa Monica Canyon and the Redondo Canyon (Terry et al., 1956). Although no large subtidal reef areas are known to occur within the study area, shifting sediments and sand may periodically expose small patches of hard substrate or uncover marine debris.

Hard-bottom substrates provide surface area for attachment of a wide variety of plants and sessile organisms, as well as shelter and a place to forage for fish and invertebrates. Sessile species that utilize hard-bottom substrates include mussels, sponges, anemones, tunicates, barnacles, rock scallops, sea fans, and a variety of tube worms. These species primarily feed by filtering plankton from the water column. Invertebrates such as shrimp, crabs, sea stars, nudibranchs, octopuses, lobsters, abalone, and sea urchins forage along reefs and utilize crevices for protection against predators. Within the intertidal zone, both sessile and mobile invertebrates such as crabs and mussels are an important food source for foraging birds. In deeper water, nearshore reefs provide an anchoring point for a variety of marine algal species, such as giant kelp, bull kelp, feather boa kelp, coralline algae, oar weed, and sea palms. Larger algal species, such as the kelps and sea palms, provide a key vertical over-story component to the relatively low-relief hard-substrate habitat of Santa Monica Bay.

4.1.1.1 Kelp Beds

Kelp beds occur predominantly around rocky subtidal habitat off the northern and southern headlands of Santa Monica Bay. Giant kelp (*Macrocystis pyrifera*) plays a key role in the nearshore ecosystem by providing vertical structure within the water column that is utilized by fish, invertebrates, and marine mammals as a nursery and for food and shelter from predators. Giant kelp is an exceptionally large and fast growing brown alga that commonly grows to more than 100 ft in length and provides a three-dimensional over story to smaller algal species such as feather boa (*Egretia menziesii*) and sea palms (*Eisenia arborea*). Some of the fish species that are common to kelp forest habitat include halfmoon (*Medialuna californiensis*), sargo (*Anisotremus davidsonii*), senorita (*Oxyjulis californica*), sheephead (*Semicossyphus pulcher*), ocean sunfish (*Mola mola*), cabezon (*Scorpaenichthys marmoratus*), various rockfish (*Sebastes spp.*) blacksmith (*Chromus punctipinnus),* giant sea bass (*Sterolepis gigas*), leopard shark (*Triakis semifasciata*), horn shark (*Heterodontus franscisci*) and important sport fishing species such as kelp bass (*Paralabrax clathratus*), white sea bass (*Atractoscion nobilis*) and yellowtail (*Seriola lalandi*).

Harbor seals and sea otters use kelp forest to hunt fish and sea urchins, respectively. Sea otters, and to a lesser extent, sheephead and spiny lobsters (*Panulirus interruptus*), are considered important species for maintaining kelp habitat as they prey upon sea urchin populations and keep them from overgrazing the kelp forest (Tegner and Levin, 2008). Kelp that has broken free from its holdfast is also utilized by a host of organisms. Fisherman and marine birds often look for free floating kelp patties, which provide habitat for baitfish and larger fish, such as yellowtail and California barracuda (*Sphyraena argentea*). As pieces of kelp or whole plants break free during storms or during periods of heavy wave action the kelp and any attached invertebrates are forage for fish and birds while at sea and by birds and insects on the wrack line of the beach.

Kelp forest is considered to be Essential Fish Habitat (EFH) by the federal government. Thus, any project that may adversely impact kelp forest requires consultation with the NMFS. Mitigation may be required if impacts to EFH are otherwise unavoidable (NMFS, 2011). The extent of kelp in Santa Monica Bay is considered to be stable around Palos Verdes; however, current canopy coverage remains low in comparison to historic coverage (MBC, 2008). Canopy coverage along the coastline of Malibu has increased somewhat in recent years, possibly as a result of restoration efforts (MBC, 2008).

4.1.1.2 Artificial Reefs

Over 33 artificial reefs have been constructed in the Southern California area since 1958. These reefs have been successful in attracting fish and invertebrate species. Subsequent attempts to replicate reef structures were implemented in an experimental fashion to determine the cost-effectiveness of materials and the success of different structural designs. Various materials were used to construct these reefs, ranging from automobiles, streetcars, scuttled ships, cement boxes and quarry rocks. Many of these older reefs were successful in attracting fish, but deteriorated over time due to the materials used. Reefs built in the last twenty years have used cement and quarry rock to create reef habitats for marine species with greater longevity than their predecessors.

Artificial reefs have been constructed in Santa Monica Bay since 1960 to provide additional hard-bottom habitat for marine species, since the Bay is characterized primarily by soft-bottom substrates (Santa Monica Bay Restoration Commission, 2010). Of the nine artificial reefs that still remain intact in the Bay, two of the reefs fall within the study area (Figure 4-3). The Santa Monica Artificial Reef (SMAR), Santa Monica Bay Artificial Reef (SMBAR), and Topanga Artificial Reef (TAR) were constructed near the location of the existing electrode array. Located within approximately 1.0 nautical mile of each other (Figure 4-3), each artificial reef varies in design, purpose, and construction materials. Built in 1961, SMAR is the oldest and smallest of the three reefs and is located approximately 60 feet below the surface. Both SMBAR and TAR were constructed in 1987, using only quarry rock. SMBAR consists of three separate modules located at the depths of 42, 57, and 72 ft and covers 3.58 acres. TAR is located approximately 28 ft below the surface and covers an area of approximately 2 acres. Table 4-1 provides additional descriptions and comparisons of SMAR, SBMAR, and TAR.

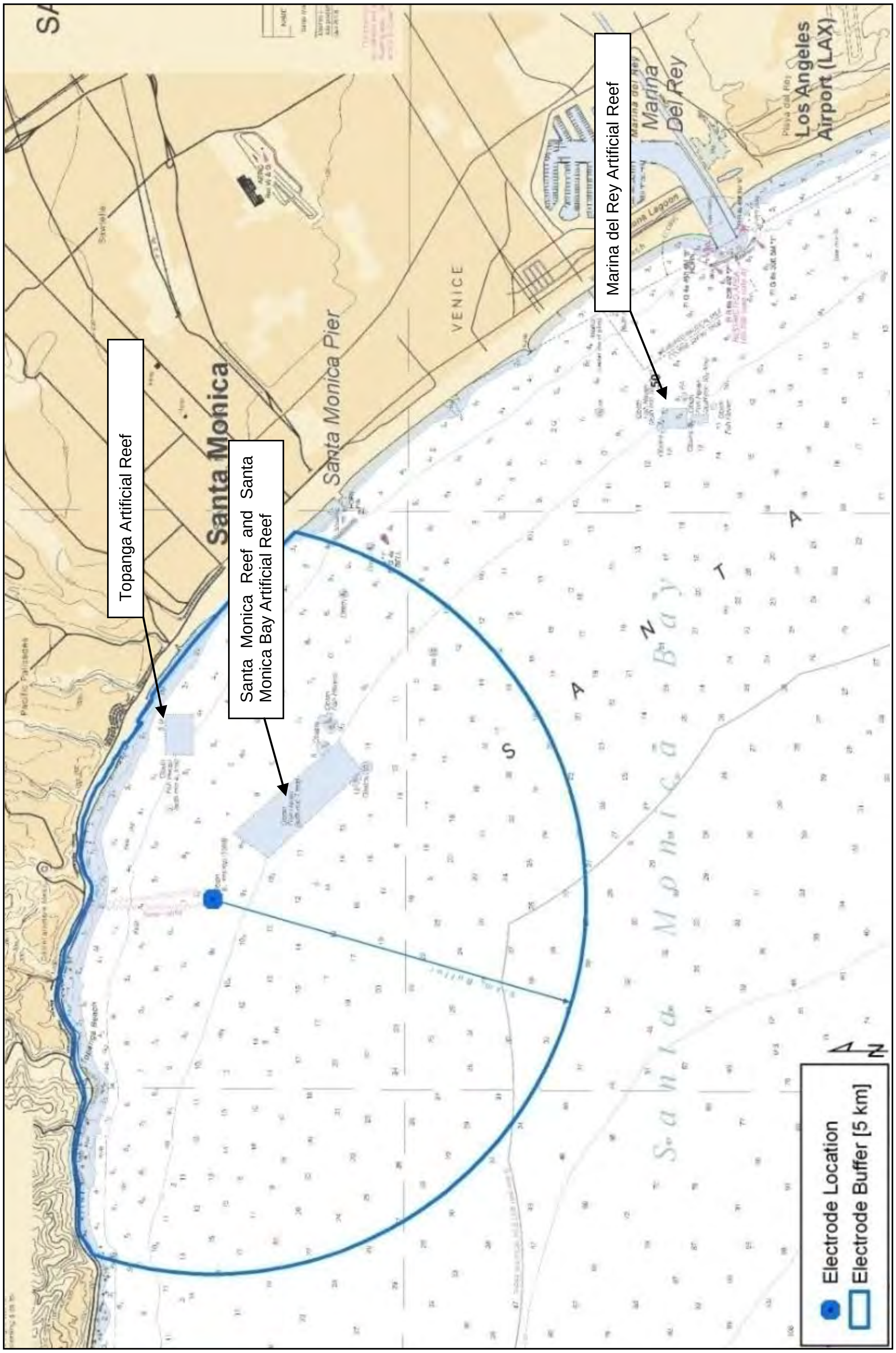


Figure 4-3. Artificial Reef Locations within the Study Area in Santa Monica Bay

Table 4-1. Description of Artificial Reefs within the Vicinity of the Study Area

Reef	Module	Depth (ft)	Height (ft)	Latitude (N)	Longitude (W)	Year Constructed	Area	Materials	Notes
Santa Monica Artificial Reef (SMAR)	SMAR	60	NA	34° 00' 34"	118° 31' 47"	1961	0.5	330 tons of quarry rock, 44 concrete shelters, 4 car bodies, 1 street car. 110 tons of pier pilings added in 1971	An original "replication reef." Automobiles and streetcar have disintegrated.
Santa Monica Bay Artificial Reef (SMBAR)	SMBAR 3	42	13	34° 01' 02"	118° 32' 09"	1987	3.58	20,000 tons of quarry rock	Designed to replicate environmental and structural variables in reefs.
	SMBAR 10	57	14	34° 00' 36"	118° 32' 02"				
	SMBAR 18	72	14	34° 00' 17"	118° 32' 13"				
Topanga Artificial Reef (TAR)	TAR	28	7	34° 01' 38"	118° 31' 54"	1987	2	10,000 tons of quarry rock	Designed to promote kelp habitat development.

4.1.2 Subtidal Soft-Bottom Habitat

Muddy substrates are the predominant habitat throughout Santa Monica Bay, from the 20-m isobath to the adjacent Santa Monica basin floor (780 m) based upon multi-beam sonar imagery (Edwards et al., 2003). Coarser-grained sandy substrates lie predominantly along the innermost mainland shelf and a narrow outer shelf band north of Santa Monica Canyon, while cobble and gravel substrates are predominantly restricted to the innermost shelf south of El Segundo and limited parts of the shelf edge.

4.1.2.1 Infauna

The soft-bottom habitat of Santa Monica Bay supports a diverse infaunal community (animals that live within the substrate). Summer and winter infaunal surveys conducted in the Bay in 2002 identified 28,184 individuals in 625 taxa during NPDES monitoring. The ten most common species inhabiting soft-bottom habitats were the polychaete worms: *Spiophanes duplex*, *Paraprionospio pinnata*, *Euclymeninae sp.*, *Prionospio jubata*, *Paradiopatra parva*, and *Glycera nana;* the brittle star *Amphiodia urtica*, the horseshoe worm *Phoronis* sp.; the capitellid worm Mediomastus sp.; and the amphipod *Ampelisca brevisimulata* (City of Los Angeles, 2003).

Most polychaetes feed by engulfing soft sediments and detritus and digesting the entrained microorganisms, while others filter feed on bits of organic detritus in the water, or prey on other infauna. Other common infaunal groups include crustaceans, such as amphipods, mollusks, and echinoderms. The abundance and distribution of infauna has been shown to vary both spatially and temporally (City of Los Angeles, 2003).

4.1.2.2 Epifauna

Epibenthic invertebrates (animals that live on the surface of the substrate) of Santa Monica Bay include sea stars, sea cucumbers, sand dollars, sea urchins, crabs, shrimp, snails, tube worms, nudibranchs, and sea slugs. During quarterly trawls at nine stations in Santa Monica Bay in 2001, a total of 15,820 individuals representing 53 species were captured. In 2002, the quarterly trawls yielded a total of 8,780 individuals representing 55 species. The most abundant species were echinoderms in terms of both numbers and biomass. The white urchin *Lytechinus pictus* and the spiny sea star *Astropecten verrilli* were the most abundant species throughout the Bay. The third most abundant invertebrate was the California sea cucumber *Parastichopus californicus* followed by the ridgeback prawn *Sicyonia ingentis*, sea slug *Philine auriformis*, sandstar *Luidia foliolata*, the serpent star *Ophiura lutkeni*, and the spiny brittle star *Ophiothrix spiculata* (City of Los Angeles, 2003).

4.1.3 Sandy Shoreline

Sandy shorelines in the Southern California Bight typically consist of exposed medium- to coarse-grain sand beaches. Santa Monica Bay has approximately 26 miles of sandy shoreline, extending from Malibu Point to Flat Rock Point, located near the Palos Verdes Peninsula. Sandy shoreline can be relatively dynamic in nature since it is subjected to tidal extremes, nearshore currents, storm surge, and wave activity that can move sand within the littoral cell and re-contour beach profiles.

The intertidal community of Santa Monica Bay consists largely of infaunal organisms such as polychaetes, bivalves and crustaceans. Blood worms (*Glycera dibranchiate*) are an infaunal polychaete that is often found in the sandy shoreline habitat, feeding on bacteria, microalgae, and small invertebrates beneath the sand. Though their populations have declined, bivalves that typically inhabit sandy shoreline habitat include the pismo clam (*Tivela stultorum*), Pacific littleneck (*Leukoma staminea*), and Gould bean clam (*Donax gouldi*).

The sand crab (*Emerita analoga*) is one of the most identifiable sandy intertidal crustaceans. Individuals can be found burrowing into the sand in the wave swash zone of beaches with moderate- to high-energy wave activity. Sand crabs are prey for shorebirds and several species of fish that include the California corbina (*Mentichirrhus undulatus*), barred surfperch (*Amphisticus argenteus*) and black croaker (*Cheiliotrema saturnum*). Consequently, the sand crab is often used as bait for recreational anglers fishing from the shoreline.

The California grunion (*Leuresthes tenuis*) is another species of interest that inhabits sandy shorelines. California grunion are small slender fish that average in length between 5 and 6 inches. They have bluish-green backs with silvery sides and bellies. This species of fish is endemic to the Bight and common in Santa Monica Bay. Grunion are unique in that they spawn on sandy beaches during large tidal swings that occur during full moons between the months of March and September. Eggs are deposited and fertilized in sandy reaches of the beach located within the intertidal zone. The eggs hatch in the sand and grunion larvae re-enters the ocean environment from the beach on subsequent high tides. While grunion can be taken from the beach during spawning, this fishery is regulated by California Department of Fish and Game (CDFG). “No take” periods generally occur during grunion runs between April and May. Protection during these months also extends to other beach activities (e.g. sand replenishment, construction) that may directly or indirectly impact grunion spawning. Grunion spawning has been documented in Santa Monica Bay, occurring at locations such as Hermosa Beach and Santa Monica Beach.

4.1.4 Rocky Shoreline

Rocky shorelines comprise a small part of Santa Monica Bay's shoreline habitats. Natural rocky shorelines are located primarily in the north between Point Dume and Malibu and in the south along the Palos Verdes Peninsula. Human-made rocky shoreline habitats exist within the Bay as well, primarily in the form of jetties and groins. Both types of rocky shorelines provide habitat within the intertidal zone for diverse assemblages of algae, invertebrates, and fish. Both diversity and abundance of intertidal species can vary according to tidal elevation, as location can affect competition, desiccation, and predation.

Plants in the rocky shoreline areas of Santa Monica Bay typically display vertical zonation. Species assemblages tend to be distinct at different tidal levels unless disturbed by marine animals. Lichens dominate the highest zone, identified as the splash zone. Located below the splash zone, the upper intertidal zone includes green algae (Subphylum Clorophyta), brown algae (Subphylum Phaeophyta) and various red algae (Subphylum Rhodophyta). The middle intertidal zone includes more diverse algal assemblage of red and brown algae. The lower intertidal consists of red and brown algae, along with surfgrass (*Phyllospadix* spp.).

Invertebrates living in the highest intertidal zones are typically shelled species that are able to tolerate extended periods of exposure to air. These species include barnacles (*Balanus* and *Chthamalus* spp.), periwinkels (*Littornia* spp.), limpets, and rock lice (*Ligia* spp.). In the upper tidal zone, species diversity tends to increase with the addition other snails (Class Gastropoda), bivalves (Class Bivalvia), chitons (Class Polyplacophora), hermit crabs (*Tribe Paguridea*), and striped shore crabs (*Pachygrapsus crassipes*). The middle intertidal usually supports a diverse assemblage of invertebrates that can include filter feeders, like the California mussel (*Mytilus californicus*) and gooseneck barnacles (*Lepas* spp.), as well as sea anemones, snails, sea slugs, octopus, polychaetes, barnacles, isopods, crab, and shrimp. Similar to the rocky subtidal habitat, the lower intertidal supports a wide range of invertebrates that include sponges, sea anemones, polychaetes, snails, sea slugs, shrimp, crab, bivalves, octopus, sea stars, sea cucumbers, sea urchins, isopods, tunicates, and brittle stars.

4.1.5 Pelagic Habitat

Pelagic habitat is by far the most extensive of any of the coastal and marine habitats in Santa Monica Bay. Phytoplankton and zooplankton communities form the base of the marine food web, supporting the Bay's extensive populations of invertebrates, fish, seabirds, and marine mammals. Within the Bight, over 40% of the total fish species are pelagic in nature (Santa Monica Bay Restoration Commission, 2010). Pelagic species commonly observed in Santa Monica Bay include: blue whales, long and short-beaked common dolphin, purple-striped jellyfish (*Pelagia colorata*), California sea lions, blue sharks (*Prionace glauca*), brown pelicans (*Pelecanus occidentalis*), *least terns* (*Sterna antillarum*), short-fin mako sharks (*Isurus oxyrinchus*), white sharks (*Carcharodon carcharias)*, krill, pacific sardines (*Sardinops sagax*), pacific bonito (*Sarda chiliensis*), and fish larvae.

El Niño and La Niña events can affect productivity within the plankton community. Harmful algal blooms occurring within the pelagic zone can indicate shifts in oceanographic conditions and can lead to sickness and sometimes death for marine species such as sea lions, otters, cetaceans, and humans. Currently, there is no validated modeling tool that is predictive of algal blooms based on oceanographic data (Bay Restoration Commission, 2011).

4.1.6 Marine Protected Areas

Currently the State is in the process of establishing a network of Marine Protected Areas (MPAs) in an attempt to protect marine habitats, ecosystems and species. Activities allowed within MPAs vary according to its classification within the MPA system. MPA classifications include State Marine Reserves (SMR), State Marine Parks (SMP) and State Marine Conservation Areas (SMCA). The only MPAs within Santa Monica Bay are located off of Point Dume and the Palos Verdes Peninsula. As of 2010, no additional MPAs have been proposed for Santa Monica Bay.

4.1.7 Areas of Special Biological Significance

Areas of Special Biological Significance (ASBS) are coastal areas with special status under the California Ocean Plan. Discharges of any waste into the ASBS are prohibited in order to maintain natural water quality and protect the uniqueness of these areas, their habitats and species. The only ASBS in Santa Monica Bay is the Mugu Lagoon to Latigo Point ASBS. As the name implies, this ASBS stretches from Mugu Lagoon in the north to Latigo Point in the south, which is located in Santa Monica Bay, between Point Dume and Malibu, approximately three miles north of the study area.

4.2 Marine Species

Santa Monica Bay is home to numerous sensitive and special status marine species ranging from marine mammals and sea turtles to marine birds, mollusks, and bony and cartilaginous fishes. Although some of these species may only rarely enter Santa Monica Bay, others spend a significant portion of their lives within the Bay's diverse marine habitats. For the purposes of this document, species that have been observed within Santa Monica Bay's waters in the past are assumed to have the potential to occur in the study area.

4.2.1 Marine Mammals

Over 40 different species of marine mammals are known to occur within the Southern California Bight (from Point Conception to the U.S.-Mexican border), including cetaceans (whales, dolphins, and porpoise), pinnipeds (seals and sea lions), and sea otters (Carretta el al., 2005). Special protections for each of these species fall under the Marine Mammal Protection Act (MMPA). Of these, five cetacean species that may be expected to occur within the nearshore waters of the study area are listed as federally endangered under the Endangered Species Act (ESA). These include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*) (U.S. Navy Southern California Range Complex EIS). Stocks of all species listed as endangered under the ESA are automatically considered to be "depleted" and "strategic" under the MMPA. The California/Oregon/Washington Stock of the short-finned pilot whale (*Globicephala macrorhynchus*) is also considered to be strategic (Carreta et al., 2004).

Seven cetacean species are commonly observed in nearshore waters in significant numbers and are likely to occur in the study area either seasonally or on a year-round basis. These species include bottlenose dolphin, short-beaked common dolphin, Risso's dolphin, Dall's porpoise, Pacific white-sided dolphin, long-beaked common dolphin, and gray whale. Each of the dolphin and porpoise species live in the region year-round, while a significant portion of the gray whale population (currently estimated to be approximately 22,000 animals) migrates through the area from December through April. Blue whales, fin whales, humpback whales, killer whales, and northern right whale dolphins have the possibility of entering the study area. Blue whales and fin whales are typically observed further offshore than the study area, but are known to feed close to shore during times when krill or bait fish are overly abundant. Similarly, killer whales are occasionally observed in this area during winter months as they hunt gray whale calves during the gray whale migration to and from Mexican breeding grounds. Northern right whale dolphins and humpback whales are also periodically observed in nearshore waters but generally prefer to frequent deeper offshore locations. Other cetacean species listed in Table 4-2 are less likely to occur within the study area due to their limited population size in Southern California, their preference for deeper offshore waters, or because Santa Monica Bay is considered to be outside of their existing range.

Table 4-2. Status, Abundance, and Likelihood of Occurrence of Cetacean Species in the Study Area

Cetaceans Common Name Species Name	Southern California Abundance	Occurrence	Status	Likelihood of Occurrence in Study Area
Blue Whale *Balaenoptera musculus*	842	Seasonal- late spring to fall	Endangered; MMPA	Possible
Fin Whale *Balaenoptera physalus*	359	Small year round population	Endangered; MMPA	Possible
Humpback Whale *Megaptera*	36	Seasonal- late spring to fall	Endangered; MMPA	Possible
Sei Whale *Balaenoptera borealis*	Unknown (7 Brydes or Sei whales observed)	Rare- only 3 sightings in last 30 years	Endangered; MMPA	Unlikely
Sperm Whale *Physeter macrocephalus*	607	Common year round- typically found in waters greater than 1000 m in depth	Endangered; MMPA	Unlikely
Bryde's whale *Balaenoptera edeni*	Unknown (7 Brydes or Sei whales observed)	Rare	MMPA	Unknown
Gray whale *Eschrichtius robustus*	Population migrates through California	Common from December through April	MMPA	Likely
Minke Whale *Balaenoptera acutrorostrata*	226	Less common in summer	MMPA	Possible
Baird's Beaked Whale *Berardius bairdii*	127	Rare	MMPA	Unlikely
Bottlenose Dolphin *Tursiops truncatus*	323	Common	MMPA	Likely
Cuvier's Beaked Whale *Ziphius cavirostris*	911	Uncommon- typically observed in water greater than 1000 m in depth	MMPA	Unlikely

Table 4-2. Status, Abundance, and Likelihood of Occurrence of Cetacean Species in the Study Area

Cetaceans Common Name Species Name	Southern California Abundance	Occurrence	Status	Likelihood of Occurrence in Study Area
Dall's porpoise *Phocoenoides dalli*	727	Common year round	MMPA	Likely
Dwarf Sperm Whale *Kogia sima*	0	Possible visitor- observed only in deep water in Southern California	MMPA	Unlikely
False Killer Whale *Pseudorca crassidens*	Unknown	Unknown- strandings have occurred in Channel Islands	MMPA	Unlikely
Killer Whale *Orcinus orca*	30	Uncommon- typically observed during winter months	MMPA, southern resident population is Endangered	Possible
Long-beaked Common Dolphin	17,530	Common year round	MMPA	Likely
Melon-headed Whale *Peponocephala electra*	Unknown	May occasionally visit California waters	MMPA	Unlikely
Mesoplodont Beaked Whales *Five species*	132	Rare- typically observed only in deep water (>1000 m)	MMPA	Unlikely
Northern Right Whale Dolphin *Lissodelphis borealis*	1,172	Common during fall through early spring	MMPA	Possible
Pacific White-sided Dolphin *Lagenorhynchus obliquidens*	2,196	Common	MMPA	Likely
Pygmy Sperm Whale *Kogia breviceps*	0	May occasionally visit California waters	MMPA	Unlikely
Risso's Dolphin *Grampus griseus*	3,418	Common	MMPA	Likely
Short-beaked Common Dolphin *Delphinius delphis*	165,400	Common year round	MMPA	Likely
Short-finned Pilot Whale *Globicephala macrorhynchus*	118	Unknown	MMPA	Unlikely
Striped Dolphin *Stenella coreruleoalba*	12,529	Occasional visitor- generally observed during winter months	MMPA	Unlikely

Sources: Carretta et al., 2005; Carretta et al., 2007; California Fish and Game Code Section 4500

The occurrence, spatial distribution, and behavior of different cetacean species were investigated in Santa Monica Bay from 1997 and 2001. The three species of cetaceans that were found to inhabit the Bay year-round included the bottlenose dolphin, the long-beaked common dolphin, and the short-beaked common dolphin. Seven other species of cetaceans were found to occur only occasionally in Santa Monica Bay. These included Pacific white-sided dolphin, Risso's dolphin, Dall's porpoise, gray whale, minke whale, blue whale, and humpback whale. Bottlenose dolphins were found in waters within 0.5 km from shore in 80.0% of the sightings but were also found in deeper waters further offshore. All other species were generally seen in areas greater than 0.5 km from shore and showed a preference for bathymetric features such as escarpments and submarine canyons where they were observed traveling, foraging, and feeding (Bearzi, 2005).

Three species of pinnipeds are abundant in nearshore waters of Southern California and are likely to occur in the study area (Table 4-3). These include harbor seals, California sea lions, and northern elephant seals. One fissiped species, the southern sea otter *Enhydra lutris*, is typically found in nearshore waters north of Point Conception. As their population continues to increase, it is possible that their range could extend into Santa Monica Bay in the near future.

California sea lions (*Zalophus californianus*) northern elephant seals (*Mirounga angustirostris*) and harbor seals (*Phoca vitulina*) each maintain breeding colonies in the nearby Channel Islands. Sea lions have the ability to climb onto surface buoys, jetties, docks, and rock riprap to rest during the day when they are not actively feeding. Because harbor seals and elephant seals lack the large front flippers possessed by sea lions, they cannot climb onto structures and must haul out onto sandy beaches to seek refuge from the water. Each species of pinniped listed in Table 4-3 frequently dives to depths greater than 300 ft in search of food. Major predators for pinnipeds in Southern California include white sharks and occasionally killer whales.

Table 4-3. Status, Abundance, and Likelihood of Occurrence of Pinniped and Fissiped Species in the Study Area

Pinnepeds and Fissipeds Common Name Species Name	Southern California Abundance	Occurrence	Status	Likelihood of Occurrence in the Study Area
Harbor Seal *Phoca vitulina*	5,271	Common	MMPA	Likely
Northern Elephant Seal *Mirounga angustirostris*	9,794	Occasional	MMPA	Likely
California Sea Lion *Zalophus californianus*	50,750	Common	MMPA	Likely
Southern Sea Otter *Enhydra lutris*	29	Uncommon below Point Conception	Threatened, MMPA	Possible

Sources: Carretta et al., 2005; California Fish and Game Code Section 4500; Carretta et al., 2007.

4.2.2 Sea Turtles

Four of the five species of sea turtles that have been observed along the west coast of the United States, have the potential to occur within the study area. Olive Ridley (*Lepidochelys olivacea)*, green (*Chelonia mydas*), and loggerhead (*Caretta Caretta*) sea turtles are listed as federally threatened species, while the leatherback sea turtle (*Dermochelys coriacea*) is listed as a federally endangered species (Table 4-4). Each sea turtle species listed in Table 4-4 has been observed along the coast of Southern California.

Table 4-4. Status and Likelihood of Occurrence of Sea Turtle Species in the Study Area

Sea Turtles Common Name Species Name	Occurrence in Southern California	Status	Likelihood of Occurrence in Study Area
Loggerhead Sea Turtle *Caretta Caretta*	Uncommon	Federally Endangered (north pacific population); State of CA Endangered	Possible
Green Sea Turtle *Chelonia mydas*	Uncommon	Federally Threatened; State of CA Endangered	Possible
Olive Ridley Sea Turtle *Lepidochelys olivacea*	Rare	Federally Threatened	Unlikely
Leatherback Sea Turtle *Dermochelys coriacea*	Uncommon	Federally Endangered; State of CA Endangered	Unlikely

Source: California Herps.com

There are no known nesting sites on the west coast of the United States for any of the sea turtles listed in Table 4-4 (National Oceanographic and Atmospheric Administration [NOAA] Fisheries, 2011). NMFS and USFWS have joint jurisdiction over sea turtles within the U.S. NOAA maintains jurisdiction over the aquatic marine environment while USFWS has jurisdiction over nesting beaches, which occur only on the southeastern seaboard within the U.S. Sea turtles spend the vast majority of their lives swimming in the open water of the ocean and are known to migrate great distances from the nesting beaches where they were hatched. Although there have been recorded sea turtle sightings in waters as far north as Alaska, they most commonly occur along the west coast in more tropical waters from Mexico to South America. Additionally, there is a small resident population of green sea turtles in south San Diego Bay near the warm water discharge of the formerly operating South Bay Power Plant in Chula Vista, CA.

Loggerhead Sea Turtle

Loggerhead sea turtles are circumglobal, and are found in both temperate and tropical waters in the Pacific Ocean. Along the U.S. coastline, loggerheads are occasionally sighted off the coasts of Washington and Oregon and are most commonly sighted off the coast of California. The Baja Peninsula of Mexico provides critical habitat for juvenile loggerheads. As with other sea turtles, they are known to migrate across oceans and have been tracked thousands of miles away from their nesting beaches. The only known breeding grounds in the North Pacific for these sea turtles are in southern Japan (NOAA Fisheries, 2011). In 2002, NMFS issued an interim final rule to protect loggerhead sea turtles that follow warmer El Niño currents into drift gillnet fishing areas off of Southern California. The north Pacific population of loggerheads is currently listed as both a federally endangered species and a State of California endangered species.

Green Sea Turtle

Green sea turtles are the only sea turtle species that is completely herbivorous and are the most commonly observed sea turtle along the California coastline. Sightings of green sea turtles in Southern California have occurred year round, but are more frequent during the late summer when water temperatures are typically their warmest. They are currently listed as a federally threatened species and a state endangered species (NOAA Fisheries, 2011).

Olive Ridley Sea Turtle

Olive Ridley sea turtles are considered to be mainly pelagic turtles but have been known to inhabit coastal areas (NOAA Fisheries, 2011). These turtles are omnivorous and are known to eat lobster, crabs, algae, shrimp, fish, and benthic invertebrates. Olive Ridleys spend the vast majority of their lives in the open ocean and have been observed from trans-oceanic ships over 2,400 miles (4,000 km) from shore. Along the west coast of the U.S., the primary threats to the Olive Ridley appear to be incidental take in fisheries and boat collisions. No known nesting areas are located on the Pacific coast of the U.S. Olive Ridley sea turtles are currently listed as federally threatened, with breeding populations in Mexico currently listed as endangered.

Leatherback Sea Turtle

Leatherback sea turtles are the most migratory and wide-ranging of all the sea turtle species. They are known to be primarily pelagic, preferring the open ocean to nearshore waters but have been observed foraging along the coastline in search of jellyfish and other soft-bodied invertebrates (NOAA Fisheries, 2011). Leatherbacks are considered to be seasonal visitors to the central California coast, arriving in late summer and fall to forage on large aggregations of brown sea nettles (*Chrysaora fuscescens*) before migrating to waters off Hawaii. They then return to California the following summer, and may repeat this journey two or three times before swimming back to nesting beaches in Indonesia (Benson et al., 2011). Leatherback sea turtles are currently listed as both federally and state endangered species (NOAA Fisheries, 2011).

4.2.3 Fish

Santa Monica Bay has a rich diversity of migratory and resident species of fish. Table 4-5 provides a list of fish species that have been observed within the Santa Monica Bay or are identified for this portion of the Southern California Bight. In the following section, fish will be described according to:

- Internal support structure (bone or cartilage); and
- Assemblages by habitats; and

Fish are generally divided into two major groups based on whether they have a bony skeleton (Class Osteichthyes) or an internal support structure comprised of cartilage (Class Chondrichthyes). The dominant pelagic bony fish species in Santa Monica Bay are:

- Pacific (Chub) mackerel (*Scomber japonicas*);
- Jack mackerel (*Trachurus symmetricus*);
- Northern anchovy (*Engraulis mordax*); and

- Pacific sardine (*Sardinops sagax caerulea*).

The dominant cartilaginous fish in Santa Monica Bay tend to be sharks, although their abundance has declined. Sharks species found in the Bay and common to the region include:

- Basking sharks (*Cetorhinus maximus*);
- Blue sharks (*Prionace glauca*);
- Gray Smoothhound sharks (*Mustelus californicus*);
- Great white sharks (*Carcharodon carcharias*);
- Leopard sharks (*Triakis seimfasciata);*
- Mako sharks (*Isurus oxyrinchus*); and
- Thresher sharks (*Alopias vulpinus*).

Table 4-5. Fish Species in Santa Monica Bay

Common Name	Species	Habitat	Commercially (COM) or Recreationally (REC) Fished	Status
Anchovy, Northern	*Engraulis mordax*	pelagic	Yes (REC), Yes (COM)	
Sea bass, Giant (Black)	*Stereolepis gigas*	hard bottom	No (Moratorium)	Listed
Grunion, California	*Leuresthes tenuis*	surf area, soft bottom	Yes (REC)	Protected during (April - May)
Damselfish, Garibaldi	*Hypsypops rubicundus*	kelp, hard bottom	No	Protected, State Fish
Barracuda, California	*Sphyraena argentea*	pelagic	Yes (REC)	
Bass, Barred Sand	*Paralabrax nebulifer*	soft bottom	Yes (REC)	
Bass, Kelp	*Paralabrax clathratus*	kelp, hard bottom	Yes (REC)	
Bass, Spotted Sand	*Paralabrax maculatofasciatus*	bay environment	Yes (REC)	
Bass, Striped	*Roccus saxatilis (or Morone saxatilis)*	bay environment	Yes (REC)	
Bonito, Pacific	*Sarda chiliensis*	pelagic (seasonal)	Yes (REC)	
Cod, Ling	*Ophiodon elongatus*	hard bottom (deep)	Yes (REC)	
Cod, Rock	*Lotella rhacina*	hard bottom (deep)	Yes (REC)	
Corbina, California	*Menticirrhus undulatus*	surf area, soft bottom	Yes (REC)	
Croaker, Black	*Cheilotrema saturnum*	hard bottom, soft bottom, structures	Yes (REC)	
Croaker, Spotfin	*Roncador sternsii*	soft bottom	Yes (REC)	
Croaker, White	*Genyonemus lineatus*	soft bottom, structures	Yes (REC)	
Croaker, Yellowfin	*Umbrina roncador*	soft bottom	Yes (REC)	
Damselfish, Blacksmith	*Chromis punctipinnis*	kelp, hard bottom	No	
Dogfish, Spiny	*Squalus acanthias*	soft bottom	Yes (REC)	
Dorado (Dolphinfish)	*Coryphaena hippurus*	pelagic	Yes (REC)	
Giant Kelpfish	*Heterostichus rostratus*	kelp, hard bottom	Yes (REC)	
Goby, Black Eye	*Coryphopterus nicholsi*	hard bottom, soft bottom	No	
Goby, Bluebanded	*Catalina gobies*	hard bottom	No	

Table 4-5. Fish Species in Santa Monica Bay

Common Name	Species	Habitat	Commercially (COM) or Recreationally (REC) Fished	Status
Hake, Pacific (Pacific Whiting)	*Merluccius productus*	soft bottom	Yes (REC), usually incidentally	
Halfmoon	*Medialuna californiensis*	kelp, hard bottom	Yes (REC)	
Halibut, California	*Paralichthys californicus*	soft bottom	Yes (REC)	
Jacksmelt	*Atherinopsis californiensis*	bay environment, surf area, structures	Yes (REC)	
Lizardfish, California	*Synodus lucioceps*	soft bottom	Yes (REC), usually incidentally	
Mackerel, Jack	*Trachurus symmetricus*	pelagic	Yes (REC)	
Mackerel, Pacific (Chub)	*Scomber japonicus*	pelagic	Yes (REC)	
Opaleye	*Girella nigricans*	hard bottom	Yes (REC)	
Perch, Black	*Embiotoca jacksoni*	kelp, hard bottom, structures	Yes (REC)	
Perch, Pile	*Rhacochilus vacca*	kelp, hard bottom, structures	Yes (REC)	
Perch, Zebra	*Hermosilla azurea*	kelp, hard bottom, structures	Yes (REC)	
Queenfish	*Seriphus politus*	soft bottom, structures	Yes (REC)	
Ray, Bat	*Myliobatis californicus*	soft bottom	Yes (REC)	
Rockfish	*Sebastes* spp.	hard bottom, soft bottom near rocky reef	Yes (REC)	
Rockfish, Brown	*Sebastes auriculatus*	hard bottom, soft bottom near rocky reef	Yes (REC)	
Rockfish, Vermillion	*Sebastes miniatus*	hard bottom, soft bottom near rocky reef	Yes (REC)	
Sablefish	*Anoplopoma*	soft bottom	Yes (REC)	
Sanddab, California	*Citharichthys sordidus*	soft bottom	Yes (REC)	
Sanddab, Longfin	*Citharichthys xanthostigma*	soft bottom	Yes (REC)	
Sanddab, Speckled	*Citharichthys stigmaeus*	soft bottom	Yes (REC)	
Sardine, Pacific	*Sardinops sagax caerulea*	pelagic	Yes (COM)	
Sargo	*Anisotremus davidsonii*	hard bottom	Yes (REC), usually incidentally	
Sculpin, Cabezon	*Scorpaenichthys marmoratus*	hard bottom	Yes (REC)	
Sculpin, Pacific Staghorn	*Leptocottus armatus*	bay environment, soft bottom, hard bottom	Yes (REC)	
Sea bass, White	*Atractoscion nobilis (Cynoscion nobilis)*	hard bottom	Yes (REC)	
Señorita	*Oxyjulis californica*	kelp, hard bottom	No	
Shark, Basking	*Cetorhinus maximus*	pelagic	No	
Shark, Blue	*Prionace glauca*	pelagic	Yes (REC), usually incidentally	
Shark, Gray Smoothhound	*Mustelus californicus*	soft bottom	Yes (REC)	
Shark, Great White	*Carcharodon carharias*	pelagic	No	
Shark, Leopard	*Triakis seimfasciata*	bay environment, soft bottom	Yes (REC)	
Shark, Mako (Bonito)	*Isurus oxyrinchus*	pelagic	Yes (REC)	
Shark, Thresher	*Alopias vulpinus*	pelagic	Yes (REC)	
Sheephead, California	*Semicossyphus pulcher*	kelp, hard bottom	Yes (REC)	

Table 4-5. Fish Species in Santa Monica Bay

Common Name	Species	Habitat	Commercially (COM) or Recreationally (REC) Fished	Status
Shovelnose Guitarfish	*Rhinobatos productus*	soft bottom	Yes (REC)	
Sole, Petrale	*Eopsetta jordani*	soft bottom (usually near hard bottom)	Yes (REC)	
Stingray, Round	*Urolophus halleri*	soft bottom	Yes (REC), usually incidentally	
Surfperch, Pile	*Damalichthys vacca*	kelp, hard bottom, structures	Yes (REC)	
Surfperch, Rainbow	*Hypsurus caryi*	hard bottom	Yes (REC)	
Surfperch, Rubberlip	*Rhacochilus toxotes*	kelp, hard bottom	Yes (REC)	
Surfperch, Surf	*Embiotoca jacksoni*	kelp, hard bottom, soft bottom, structures	Yes (REC)	
Surfperch, Walleye	*Hyperprosopon argenteum*	bay environment, soft bottom, hard bottom	Yes (REC)	
Surfperch, White	*Phanerodon furcatus*	structures, hard bottom	Yes (REC)	
Topsmelt	*Atherinops affinis*	pelagic, bay environment, kelp	Yes (REC)	
Trigger Fish, Finescale	*Balistes polyepis*	hard bottom	Yes (REC)	
Turbot, Curlfin	*Pleuronichthys decurrens*	soft bottom	Yes (REC)	
Wrasse, Rock	*Halichoeres semicinctus*	soft bottom, hard bottoms	No	
Yellowtail, California	*Seriola lalandi (or S. dorsalis)*	pelagic	Yes (REC)	

4.2.3.1 Soft-Bottom Fish Species

The extensive soft-bottom habitat within Santa Monica Bay supports an abundant and diverse assemblage of over 100 species of demersal fish. For the most part, soft-bottom species derive much of their food from benthic infauna. Flatfish, rockfish, sculpins, combfishes and eelpouts comprise the majority of the soft-bottom fish found in the Bay (MBC, 1993). Quarterly trawls in 2001 and 2002 yielded a total of 15,122 individuals consisting of 58 species and 13,693 individuals representing 51 species respectively (City of Los Angeles, 2003). The number of fish species, abundance and biomass generally increase with water depth. Nearshore areas usually support a high abundance of species such as flatfish, surfperch and croakers. Middle and outer shelf species include numerous kinds of flatfish, sculpin, and rockfish.

4.2.3.2 Hard-Bottom Fish Species

Hard-bottom habitats (e.g., rocky reef) also support an abundant and diverse assemblage of fish, with community composition often varying according to depth. Areas of hard-bottom substrate may also have kelp of varying density and height. Within kelp beds, assemblages of fish and their composition will often vary according to the depth from under the canopy to the bottom. Common shallow-water fish include sea basses, rockfishes, kelpfishes, sculpins, damselfishes, and wrasses. Dominant deeper water species include vermillion rockfish, bocaccio, cowcod, and flag rockfish. Natural hard-bottom habitats and kelp beds in Santa Monica Bay are limited mostly to areas adjacent to rocky headlands located at the north and south of the Bay. Man-made hard-bottom habitats in Santa Monica Bay include pipeline systems, vaults and artificial reefs.

Monitoring studies conducted at three artificial reefs in Santa Monica Bay (i.e., SMAR, SMBAR and TAR) found several species of fish indicative of rocky reef habitats. Results from these surveys are provided in Table 4-6. Similar to the artificial reefs, the concrete vaults that house the electrodes provide habitat for algae, invertebrates, and fishes that commonly inhabit hard-bottom habitats of the Bay.

Table 4-6. Fish Species Observed During Artificial Reef Monitoring*

Common Name	Species	Location (Depth)	Reef	Abundance (1995)*
Bass, Barred Sand	*Paralabrax nebulifer*	28 - 72 feet	SMBAR/TAR	C
Bass, Kelp	*Paralabrax clathratus*	28 - 72 feet	SMBAR/TAR	C
Croaker, Black	*Cheilotrema saturnum*	28 - 57 feet	SMBAR/TAR	C
Croaker, White	*Genyonemus lineatus*	28 feet	TAR	R
Curlfin Turbot, Curlfin	*Pleuronichthys decurrens*	72 feet	SMBAR	R
Damselfish, Blacksmith	*Chromis punctipinnis*	28 - 72 feet	SMBAR/TAR	A
Damselfish, Garibaldi	*Hypsypops rubicundus*	28 feet	TAR	O
Goby, Black Eye	*Coryphopterus nicholsi*	72 feet	SMBAR	C
Goby, Bluebanded	*Catalina gobies*	72 feet	SMBAR	O
Halfmoon	*Medialuna californiensis*	28 - 57 feet	SMBAR/TAR	C
Opaleye	*Girella nigricans*	42 - 72 feet	SMBAR	O
Rockfish, Brown	*Sebastes auriculatus*	28 - 42 feet	SMBAR/TAR	R
Sargo	*Anisotremus davidsonii*	42 feet	SMBAR	C
Sculpin	*Scorpaena guttata*	42 - 72 feet	SMBAR	O
Señorita	*Oxyjulis californica*	28 feet, 57 feet	SMBAR/TAR	A
Sheephead, California	*Semicossyphus pulcher*	42 - 57 feet	SMBAR	C
Surfperch, Black	*Embiotoca jacksoni*	28 - 57 feet	SMBAR/TAR	C
Surfperch, Pile	*Damalichthys vacca*	28 - 72 feet	SMBAR/TAR	C
Surfperch, Rainbow	*Hypsurus caryi*	57 feet	SMBAR	O
Surfperch, Rubberlip	*Rhacochilus toxotes*	42 - 72 feet	SMBAR	O
Surfperch, White	*Phanerodon furcatus*	28 - 57 feet	SMBAR/TAR	O
Trigger Fish, Finescale	*Balistes polyepis*	42 feet	SMBAR	O
Wrasse, Rock	*Halichoeres semicinctus*	28 - 57 feet	SMBAR/TAR	O

* Abundance varied by reef and depth. The highest frequency of observed species is listed here.

A = Abundant O = Occasional

C = Common R = Rare

Table adapted from - Bedford et al 1996

4.2.3.3 Protected Fish and Invertebrate Species

Species that have prohibited take status with CDFG

Several species of fish are prohibited to target, catch, or possess according to California Fish and Game regulations. These species include the giant black sea bass (*Stereolepis gigas*), white shark (*Carcharodon carcharias*), steelhead (*Oncorhynchus mykiss*), broomtail grouper (*Mycteroperca xenarcha*), Garibaldi (*Hypsypops rubicundus*), silver salmon (*Oncorhynchus kisutch*), bronzespotted rockfish (*Sebastes gilli*), canary rockfish (*Sebastes pinniger*), yelloweye rockfish (*Sebastes ruberrimus*), and cowcod rockfish (*Sebastes levis*).

Two of these species (cowcod rockfish and steelhead) are also listed as species of concern by NMFS. Other species of concern that may occur in Santa Monica Bay include the basking shark (*Cetorhinus maximus*), and the bocaccio rockfish (*Sebastes paucispinis*).

Giant (Black) Sea Bass

Giant sea bass (*Stereolepis gigas*), also referred to as black sea bass, is a native to the Bight. Reaching sizes of between six- to eight-feet and a weight over 400 pounds; these fish prefer relatively shallow waters near kelp forests, drop offs, or rocky bottoms. Once a relatively common inhabitant of Southern California waters, the giant sea bass faced the threat of local extinction in the 1980s due to overfishing. In 1982 a moratorium was placed on catching and keeping giant sea bass that remains in place today. Giant sea bass cannot be actively sought and must be released if caught incidentally. The giant sea bass reproduces slowly with a population doubling time of more than 14 years, and is still listed as critically endangered by CDFG.

White Shark

Although a definitive population size has not yet been established for the white shark (*Carcharodon carcharias*), they are thought to be low in number along the west coast of the U.S. and worldwide. White sharks feed primarily on fish until they reach approximately 10 ft in length, whereupon they begin to feed predominantly on marine mammals. CDFG prohibits the possession or take of white sharks in California. White sharks are not uncommon along the Southern California coastline and are occasionally spotted by surfers and paddle boarders in the nearshore waters of Santa Monica Bay. The Monterey Bay Aquarium has tagged and tracked several small white sharks and has observed that that they like to remain in the waters off Will Rogers State Beach and Malibu before migrating to Baja California (Monterey Bay Aquarium Foundation, 2011).

Steelhead

Steelhead (*Oncorhynchus mykiss*) are anadromous salmonids that typically return to freshwater to spawn after spending two to three years at sea. The recovery of steelhead in Malibu Creek and the Bay watershed is threatened by reduced access to spawning and rearing habitat. It has been estimated that more than 80% of the spawning habitat, and 60% of the rearing habitat has been made inaccessible to steelhead in Malibu Creek as a result of passage barriers such as Rindge Dam, culverts, and Arizona crossings" (SMBRC, 2010). Southern steelhead are considered a "Distinct Population Segment (DPS)" of steelhead by the NMFS and as a Species of Special Concern within the State of California.

Broomtail Grouper

Broomtail grouper (*Mycteroperca xenarcha*) range from San Francisco Bay to Peru. They grow up to four ft in length and over 100 lbs. This species is typically found in Mexican waters and is illegal to possess or take within the State of California (Eschmeyer et al., 1983).

Garibaldi

The Garibaldi or Garibaldi damselfish (*Hypsypops rubicundus*) grow up to 15 inches in length and are identified by their bright orange color as adults. Juvenile Garibaldi are not as bright in color, having iridescent blue spots which fade as they become adult. The Garibaldi is the California state fish, and is protected in state waters. They may not be actively fished and must be released if caught incidentally.

Silver Salmon

Silver, or "coho" salmon (*Oncorhynchus kisutch*) are anadromous fish, hatching in freshwater and spending their lives at sea. They range from Alaska to northern Baja California and typically live in saltwater for 1-3 years before migrating to the freshwater stream of their birth. The silver salmon population is estimated to be less than 6% of what it was in the 1940s. The SMBRC is currently providing money through Proposition 84 for projects that protect Santa Monica Bay beaches and coastal waters, including projects to prevent contamination and degradation of coastal waters and watersheds, so that species such as silver salmon and steelhead trout populations in coastal streams can be restored.

Bronzespotted Rockfish

Bronzespotted rockfish (*Sebastes gilli*) range from Monterey Bay to northern Baja California. Bronzespotted rockfish are typically found along rocky substrates in 250 ft-750 ft of water. Historically, bronzespotted rockfish were relatively common in deeper waters off Southern California, but have since declined in numbers (CDFG, 2011). They are currently are protected under a "no possession, no take" rule by CDFG.

Canary Rockfish

Canary rockfish (*Sebastes pinniger*) range from the western Gulf of Alaska to Baja California. They are a densely aggregating fish that is usually associated with rock pinnacles or sharp drop-offs. Typically, they are near, but usually not on the bottom, and often associate with yellowtail, and widow and silvergray rockfishes. These rockfish grow to over 30 inches in length and live for longer than 75 years. Adults eat demersal invertebrates and small fishes, including other species of rockfish (Love, 1996). The CDFG prohibits the take or possession of canary rockfish.

Yelloweye Rockfish

Yelloweye rockfish (*Sebastes ruberrimus*) range from the Allutian Islands of Alaska to Baja California. They more commonly occur in Central California to Alaska. They are a typically caught in 450-600 ft depths and are mostly solidary, living on or just above reefs. Yelloweye rockfish grow to over 36 inches in length and live for longer than 114 years. Adults eat fish, crabs, shrimps and snails and spanwn between February and September (Love, 1996). The CDFT prohibits the take or possession of canary rockfish.

Cowcod Rockfish

Cowcod rockfish (*Sebastes levis*) range from Oregon to Baja California and are typically caught in water ranging from 100 ft to 800 ft. As with all rockfish species, cowcods inhabit rocky bottom substrates and prefer to live in crevices or caves. Cowcods are one of the biggest rockfish in the world, and grow to over 35 inches and 20 pounds (Love, 1996).

Basking Shark

Basking sharks (*Cetorhinus maximus*) grow to over 30 ft in length and feed on plankton. Basking sharks are most commonly seen in Southern California waters between spring and summer. Basking shark populations have declined dramatically since the 1900s and they are now are considered a Species of Special Concern in California and are protected under the Highly Migratory Species Fishery Management Plan (NMFS, 2011).

Bocaccio Rockfish

Boccacio rockfish (*Sebastes paucispinis*) range from Alaska to Baja California and predominantly occur in waters that range from 150 to 1,000 ft in depth, but occasionally come into depths as shallow as 60 ft as adults. Juvenile bocaccio stay in shallow waters (30 to 90 ft) but swim into deeper waters as they grow. Predators include harbor seals, elephant seals, and California sea lions (Love, 1996). Boccacio are currently listed as a Species of Special Concern by NMFS.

California Grunion

California grunion (*Leuresthes tenuis*) are a small slender fish with bluish-green backs, silvery sides and bellies that average in length between 5 and 6 inches. This species of fish is endemic to the SCB and has been observed in Santa Monica Bay. Grunion are unique in that they spawn on sandy beaches during large tidal swings that occur in the early morning hours between the months of March and September. Eggs are deposited and fertilized in sandy reaches of the beach located within the intertidal zone. Grunion larvae re-enters the ocean environment from the beach on subsequent high tides. While grunion can be taken from the beach during spawning, this fishery is regulated by CDFG. “No take” periods generally occur during grunion runs between April and May. Protection during these months also extends to other beach activities (e.g., sand replenishment and construction) that may directly or indirectly impact grunion spawning. Grunion spawning has been documented in Santa Monica Bay, occurring at locations such as Hermosa Beach and Santa Monica Beach.

5.0 SEABIRDS

5.1 Background

The Southern California Bight, including Santa Monica Bay, supports an abundant and diverse population of both resident and migratory seabirds (Baird, 1993), also referred to as marine birds. Seabirds have adapted to life within the marine environments and generally live longer, breed later, and have fewer young than other birds. Most seabird species nest in colonies and rely on habitats within the Bay for nesting, foraging, and refuge.

Santa Monica Bay is located within the Pacific Flyway, a major north-south avian migratory route that extends from Alaska to South America. Every spring and fall, migratory birds travel some of all of the Flyway to follow food sources, head to breeding grounds or travel to overwintering sites. Each bird species tends to follow the same route with regard to both distance and timing. Therefore, distribution of seabird species within the Bay will likely exhibit both seasonal and spatial variation to some degree (Pierson et al., 2000).

Seabirds can be primarily characterized as being coastal or pelagic. Coastal seabirds may feed in the pelagic realm, but tend to remain in the proximity of the mainland shore (i.e., approximately within 5 miles). Common coastal seabirds found in Santa Monica Bay include:

- Western grebes (*Aechmophorus occidentalis*);
- Clark's grebes (*Aechmophorus clarkii*);
- Surf scooters (*Melanitta perspicillata*);
- Cormorants (*Phalacrocorax* spp.);
- Loons* (*Gavia* spp.);
- California brown pelicans (*Pelecanus occidentalis californicus*); and
- Gulls (Subfamily Laridae) (CLSC, 2010).

Highest densities of coastal seabirds in the Bay tend to occur in winter, although the California brown pelican populations generally peak in the summer months when they migrate northward from Mexico. Monitoring of shorebirds in wetlands indicates that fall is the dominate season for shorebirds in Santa Monica Bay, followed by winter, with wetlands serving as the key coastal areas used by these birds (Page et al., 1992). Shorebirds appearing in abundance (i.e., over 1,000 birds) during the fall in Santa Monica Bay's lagoons include:

- Black-bellied Plover (*Pluvialis squatarola*);
- Semipalmated Plover (*Charadrius semipalmatus*);
- Black-necked Stilt (*Himantopus mexicanus*);
- American Avocet (*Recurvirostra americana*);
- Yellowlegs (*Tringa* spp.);
- Willet (*Tringa semipalmata*);
- Whimbrel (*Numenius phaeopus*);
- Long-billed Curlew (*Numenius americanus*);
- Marbled Gowit (*Limosa fedoa*);

- Red Knot (*Calidris canutus*);
- Sanderling (*Calidris alba*);
- Western Sandpiper (*Calidris mauri*);
- Least Sandpiper (*Calidris minutilla*);
- Dowitcheers *(Limnodromus* spp.);
- Wilson's Phalarope (*Phalaropus tricolor*); and
- Red-necked Phalarope (*Phalaropus lobatus*) (Page et al 1992).

In contrast to shorebirds, pelagic seabirds spend most of their time farther from the coast. Unlike shorebird populations, pelagic seabird populations are comparatively stable (Minerals Management Service, 2001). Most seabird rookeries in the region are located on offshore islands, to the north of Santa Monica Bay. These rookeries occur predominately in the northern Channel Islands while few, if any, nest on the mainland along the Bight (Carter et al., 1992). Common pelagic, or offshore, seabirds in the region include:

- Shearwaters (*Puffinus* spp.);
- Northern fulmars (*Fulamarus glacialis*);
- Jaegers (*Stercorarius* spp.);
- Common murres (*Uria aalge*);
- Storm-petrels (*Ocenaodroma* spp.);
- Puffins (*Fratercula* spp.); and
- Auklets (Family Alcidae).

5.2 Feeding Strategies

Seabirds have evolved in both behavior and physiology to exploit food resources in the marine environment, both on and below the surface. Several species (e.g., gulls, petrels, frigatebirds) implement multiple strategies to capture prey in the marine environment, while other species depend primarily on a single strategy (e.g., cormorants). The four basic strategies that seabirds use for feeding are described as follows.

5.2.1 Surface Feeding

Many seabirds feed by dipping their head in the ocean surface where ocean currents can concentrate food types such as krill, small fish, and squid. Surface feeding itself can be separated into two distinct types: flying or swimming. Surface feeding using flight include snatching food in flight, "walking" (i.e. pattering and hovering on the water's surface) (Withers, 1979) and skimming. Many seabirds that utilize this method of feeding do not ever land in the water, since some species (e.g., frigatebirds) have difficulty in getting airborne again (Metz, 2002). Seabirds that use flight surface feeding include petrels, frigatebirds, and skimmers. Much like surface feeders that fly, surface feeders that swim often have unique bill types that help them catch prey on the water surface. Fulmars, shearwaters, gulls and petrels utilize swimming to surface feed, though some of these species also use the flight technique for surface feeding.

5.2.2 Pursuit Diving

Pursuit diving seabirds propel themselves under water using their wings (e.g., auks and petrels) or feet (e.g., cormorants, grebes, and loons) to chase after prey below the surface. While this strategy tends to be more successful in acquiring prey than surface feeding, bird species that are well adapted to use this strategy generally have poor flying abilities (Gaston, 1998) and are more limited in their foraging range.

5.2.3 Plunge Diving

Plunge diving consists of using the energy from the momentum of an aerial dive to momentarily offset a seabird's natural buoyancy (Robert-Coudert, 2004), allowing it to capture fish below the surface using less energy than needed for pursuit diving. In general this is the most specialized form of feeding strategy, with some of the more successful species, such as the California brown pelican, taking years to fully develop it in order to maximum diving height while minimizing bodily injury (Elliot, 1992). While water clarity can play a role in the success and overall foraging range of seabirds that rely on plunge diving, it has not been determined to be a conclusive factor (Haney, 1988). Seabirds that commonly use the plunge diving strategy include: gannets, some terns, gulls and California brown pelicans.

5.2.4 Stealing, Predation, and Scavenging

This group of feeding strategies involves stealing food from other seabirds, preying upon other seabirds (e.g. eggs and chicks), or scavenging on carrion or trash. Kleptoparasites are seabirds that make a part of their feeding behavior on stealing food from other seabirds. This group includes frigatebirds, gulls, terns, and other species that will steal opportunistically. It is believed that stealing is used to supplement food usually obtained through hunting (Schreiber, 2001). Some species, including gulls and some petrels, will actively feed on other seabirds by taking eggs, chicks or small adults from nesting colonies (Punta, 1995). Gulls and some petrels also rely on scavenging to augment their food supply.

5.3 Special Status Seabirds

Special status seabirds that occur in Santa Monica Bay (i.e., are protected or were recently de-listed under state or federal ESAs) are presented in Table 5-1.

Table 5-1. Special Status Seabirds of the Southern California Bight

Common Name	Species	Status
Bald eagle	*Haliaeetus leucocephalus*	Delisted in 2007
California brown pelican	*Pelecanus occidentalis californicus*	Delisted in 2009
California least tern	*Sterna antillarum browni*	Federally listed
Western snowy plover	*Charadrius alexandrinus nivosus*	Federally listed
Marbled murrelet	*Brachyramphus marmoratus*	State Endangered
Xantus's murrelet	*Synthliboramphus hypoleucus*	State Threatened
Ashy storm petrel	*Oceanodroma homchroa*	SCC
Black storm petrel	*Oceanodroma melania*	SCC
Rhinoceros auklet	*Cerorhinca monocerata*	SSC

SSC = State Species of Special Concern

Bald Eagle

The bald eagle is a type of sea eagle found only in North America and is an active predator in the Channel Islands. Once numbering around 50,000 with over 30 different nesting areas on the Channel Islands from 1800 through 1950, bald eagles disappeared from the Channel Islands in the early 1960s due primarily to the effects of pesticides (e.g., DDT) that impacted the eagles reproductive success (CSLC, 2010). Since that time, bald eagle populations have rebounded due largely to the restriction of the use of DDT by the federal government in 1972. In 1995, the USFWS reclassified the bald eagle from “endangered” to “threatened.” It was eventually delisted in 2007, although the bald eagle is still protected under the Migratory Bird Treaty Act and Bald Eagle and Golden Eagle Protection Act.

The bald eagle is a key species in the ecosystem of the Channel Islands. During its decline, it was replaced by the non-native golden eagles, which led to the sharp decline in the native island fox due to predation. Bald eagles have been successfully reproducing in the Channel Islands since 2006, with Catalina Island producing the most eaglets in 2008 (National Park Service, 2008).

California Brown Pelican

California brown pelicans are large, fish-eating birds commonly seen plunge diving off the coast of Santa Monica Bay. Populations of this bird species seriously declined due to bioaccumulation of chlorinated hydrocarbon pesticides (i.e., DDT) that led to both state and federal listing in the early 1970s (CLCS, 2010). Habitat loss, human disturbance of nesting sites, excessive commercial fishing and food scarcity also contributed to the species decline (Keith et al., 1971). Following the delisting of the California brown pelican in 2009, the primary regulatory authority for protection of this species became the Migratory Bird Treaty Act; therefore, harming or killing a brown pelican remains illegal.

Pelicans often glide up and down the coastline in a “v” formation, sometimes just above the water’s surface. They forage by plunge diving for small schooling fish. They generally roost on offshore rocks and coastal habitats such as rocky shores, sandy beaches, piers and wetlands, sometimes preferring freshwater for bathing. They generally return to specific roosts, isolated from human disturbance or predation, and do not remain at sea overnight. Most nesting activity takes place in the Channel Islands and in Mexico (USFWS, 2008). Breeding season extends from March through early August with the numbers of California brown pelicans generally highest in the summer and lowest in the late winter and early spring (Lehman, 1994).

California Least Tern

The California least tern is a sub-species of the least tern that breeds primarily in the bay systems of the Bight. It is a federally listed endangered species due to its limited breeding range, small and declining population, and vulnerability to threats that include predation, human disturbance, and loss of habitat. While numbers have gradually increased since 1974, the species is still considered endangered (USFWS, 2006, 2005).

California least terns nesting season extends from May to June, with the preferred nesting habitat being sandy or gravely substrates, and sometimes salt flats. Breeding colonies are not as dense as other seabirds and generally occur along marine or estuarine habitats. Presently, there is only one California least tern colony in Santa Monica Bay, located near Venice Beach (USFWS, 2006).

California least terns hunt primarily in shallow estuaries and lagoons, preying on smaller fish species found in these habitats. Prey for this seabird include northern anchovy, smelt, surfperch, silversides, and small crustaceans. California least terns also forage in the nearshore, especially in proximity to lagoons or river mouths.

Western Snowy Plover

The western snowy plover was listed as a federally threatened species in 1993. The plover is a small shorebird that is approximately the size of a sparrow. It is listed as threatened due to its limited breeding range, small and declining global population, and vulnerability to threats that include predation, loss of habitat, and human disturbance (USFWS, 2007). The western snowy plover nesting period is between March through September. Preferring to nest in small indentions or scrapes within sandy areas, the western snowy plover will also use kelp, driftwood, and rocks for nesting habitat. Western snowy plovers are believed to be extremely sensitive to both direct and indirect disturbance during nesting periods and will easily abandon their nests. The western snowy plover forages in the intertidal areas and sandy beaches, feeding primarily on invertebrates.

Marbled Murrelet

The marbled murrelet is a small Pacific seabird belonging to the family Alcidae that is currently listed as a threatened species in the states of Oregon, Washington, and California. They are long-lived seabirds that spend most of their lives in the marine environment but tend to use old growth forests for nesting. Marbled murrelets feed primarily on fish and invertebrates in nearshore marine waters, although they have also been observed foraging in rivers and inland lakes. Threats to these birds include loss of habitat, predation, gill-net fishing operations, oil spills, marine pollution, and disease. Recent reviews have concluded that the risk of predation may be a larger threat than was previously considered (USFWS, 2011).

Xantus' Murrelet

The Xantus' murrelet is a small diving bird of the family Alcidae. It is listed as threatened by CDFG and is currently a candidate for federal listing due to its limited breeding range, small and declining global population and vulnerability to threats that include predation, oil spills, loss of habitat, and artificial light pollution from boats operating near nesting colonies (Wolf et al., 2005). The murrelet is thought to breed primarily on 13 islands between the Point Conception and Punta Abreojos, in Baja California Mexico. Santa Barbara Island is one the key breeding areas near Santa Monica Bay.

Murrelets feed on zooplankton and small fish that include the northern anchovy, sardines and rockfish. They are pelagic seabirds, spending most of their lives at sea and returning to shore only to breed. Their nesting period extends from February to July, but may vary depending on food supplies. During nesting season, they generally forage near their colony. In the non-breeding season, the majority of the murrelet population winters in the waters of the California Current, from 20 to 60 miles offshore.

California Gull

California gulls are considered a State Species of Special Concern due to the decline in breeding populations in California caused by anthropogenic impacts that have affected interior colonies. California gulls nest primarily inland on islands and lakes, visiting the coast during the non-breeding season that occurs from late summer through March. Along the coast, this gull prefers sandy beaches, mudflats, rocky intertidal, and pelagic areas of marine and estuarine habitats. California gulls are omnivorous and feed opportunistically on garbage, carrion, fish, insects, and shrimp.

Double-Crested Cormorant

The double-crested cormorant is a large, heavy-bodied water bird that can be found within both marine and freshwater habitats of the Bay. When found in marine environments, the double-crested cormorant tends to feed in relatively shallow, open coastal and estuarine waters, although they have can be observed in waters with depths up to 70 feet. Skilled swimmers, they use pursuit diving to feed primarily on subsurface schooling fish. Nesting colonies and roost sites are generally located near large estuaries, rocky shorelines, and offshore rocks. Unlike other water bird species, cormorants do not have well-developed oil glands to protect their feathers from getting saturated by water and, therefore, must visit perches to periodically dry out their plumage so that they can fly. Similar to the California brown pelican, the cormorant suffered substantial declines to its population in California due to pesticide bioaccumulation and habitat loss. It was listed as a California Species of Concern with approximately 364,000 nesting pairs in North America (Hatch, 1995).

Double-crested cormorants are found throughout the Bight, with breeding populations in Southern California localized predominantly in the Channel Islands (Carter et al., 1992). Breeding season for marine colonies generally occurs between April and August.

Storm Petrels and Auklets

Similar to murrelets, ashy and black storm petrels and rhinoceros auklets are pelagic and come ashore primarily for breeding, with colonies generally found along rocky shorelines and cliffs of offshore islands. Both storm petrels and auklets are considered Species of Special Concern in California, due to their declining population sizes and threats to breeding habitats. These species are generally found far from shore, well beyond the shelf, as well as in areas adjacent to submarine canyons and other deep water features, or around islands where they breed.

5.3.1 Invertebrates

5.3.1.1 Plankton

Plankton are invertebrate aquatic organisms that drift or float with ocean currents. Though many species are microscopic, plankton include organisms that cover a wide range of sizes, including larger organisms such as jellyfish. Plankton play important roles in marine environments that include breaking down organic matter, producing oxygen through photosynthesis and providing the base food source for many organisms endemic to the Southern California Bight that range in size from microscopic invertebrates to 100-foot blue whales. Plankton are primarily divided into three broad trophic level groups: bacterioplankton, phytoplankton, and zooplankton.

Bacterioplankton

Bacterioplankton are comprised of the bacterial component of plankton that drifts in the water column. Bacterioplankton consist of species that are saprothrophic, obtaining energy by consuming organic material produced by other organisms, as well as autotrophic, deriving energy from either photosynthesis or chemosynthesis. Bacterioplankton occupy a range of ecological niches in aquatic systems and play roles in nitrogen fixation, nitrification, denitrification, reminieralisation, and methanogenesis. Bacterioplankton are the most important decomposers of organic matter, balancing phytoplankton and other primary producers that create new organic matter.

Phytoplankton

Phytoplankton are comprised of primary producers that form the base of the marine food web through photosynthesis. Comprised primarily of unicellular or colonial algae, phytoplankton provides a food source for zooplankton, fish and marine bacteria. The primary phytoplankton species located within Santa Monica Bay are: dinoflagellates (Order Dinoflagellata), diatoms (Class Bacillariophyceae) and blue-green algae (Class Myxophyceae). Dinoflagellates tend to dominate the water column. However, during periods of upwelling or storm runoff, diatoms can dominate the phytoplankton community in the water column due to the increased levels of nutrients in the photic zone.

Zooplankton

Zooplankton are comprised of animals that consume other organisms or organic material. Zooplankton forms the primary link between phytoplankton and larger organisms and represents a wide array of organisms that may spend all or only a portion of their life cycle as plankton. Protozoan, gelatinous animals and small crustaceans are examples of holoplankton, organisms that remain plankton throughout their lives. On the other hand, meroplankton only spend part of their lives as plankton, usually during the larval stage, before they become nektonic or benthic in their juvenile and adult stages.

While not invertebrates, the planktonic larvae of bony fish are an example of meroplankton, comprising a large portion of the zooplankton collectively referred to as ichthyoplankton. Ichthyoplankton serve as an important indicator of the strength of a fish stock as the abundance of fish larvae is typically an indication of abundance of adult species. Ichthyoplankton common to the nearshore waters of the Bight include northern anchovy (*Engraulis mordax*), white croaker (*Genyonemus lineatus*), Pacific sardine (*Sardinops sagax*), queenfish (*Seriphus politus*), California halibut (*Paralichthys californicus*), and sea basses (*Paralabrax* ssp.) (Watson et al., 2002). Fish larvae previously collected in Santa Monica Bay include northern anchovy, white croaker, unidentified gobies, queenfish, spotted kelpfish (*Gibboisa elegans*), black croaker (*Cheilotrema saturnum*), California clingfish (*Gobiesox rhessodon*), giant kelpfish (*Heterostichus rostratus*) and slender sole (*Lyopsetta exilis*) (CSLC, 2010).

Generally, plankton distribution, abundance and productivity are dependent on light, nutrients, water quality, runoff from land sources and upwelling. Bacterioplankton are found throughout the water column. Phytoplankton are generally restricted to the photic zone since they rely on photosynthesis. Zooplankton tend to be found throughout the water column with species distribution varying according to depth. Plankton distribution within Santa Monica Bay tends to be patchy and characterized by high seasonality and inter-annual variability (CSLC, 2010). Most plankton blooms in Santa Monica Bay occur in response to local conditions that increase nutrient levels. These conditions include runoff, wastewater discharges, and upwelling often caused by nearshore winds and/or coastal eddies. Spring and summer months usually produce more plankton blooms due to longer periods of sunlight. However, blooms can still take place in the fall when stratification breaks down and nutrients from below enter the photic zone. El Niño/La Niña events affect plankton abundance through changes in water temperature, salinity and transport. El Niño events are usually characterized by low zooplankton biomass, while La Niña Events show increases in zooplankton biomass.

5.3.1.2 Infaunal and Epibenthic Invertebrates

The soft-bottom and hard-bottom habitats of Santa Monica Bay support a diverse and abundant assemblage of both infauna and epibenthic invertebrates. Some of these species are listed in Table 5-2.

Table 5-2. Infaunal and Epibenthic Invertebrates in Santa Monica Bay

Common Name	Species	Habitat Type
Anemones	several species	hard bottom
Barnacles	several species	hard bottom
Clams	several species	hard bottom
Cockles	several species	soft bottom
Corals, Brown Cup	*Paracyathus stearnsi*	hard bottom
Corals, Orange Cup	*Balanophyllia elegans*	hard bottom
Crab, Pelagic Red (squat lobster)	*Pleruon planipes*	pelagic
Crab, Red	*Cancer productus*	hard bottom
Crab, Rock	*Cancer antennarius*	kelp, hard bottom
Crab, Sheep	*Loxorhynchus grandis*	soft bottoms
Crab, Yellow	*Cancer anthonyi*	hard bottom
Ectoproct	several species	hard bottom
Gorgonian	several species	hard bottom
Hydroids	several species	hard bottom
Leafy Hornmouth	*Ceratostoma foliatum*	hard bottom
Limpet, Giant Keyhole	*Megathura crenulate*	hard bottom
Limpets	several species	hard bottom
Lobster, California Spiny	*Panulirus interruptus*	kelp, hard bottom
Mussels	several species	hard bottom
Nudibranch	several species	hard bottom
Octopus	several species	kelp, hard bottom, soft bottom
Polychaetes	several species	soft bottoms
Prawn, Ridgeback	*Sicyonia ingentis*	soft bottoms
Prawn, Spot	*Pandalus platyceros*	hard and soft bottom
Rock Scallop	*Crassedoma giganteum*	hard bottom
Sea Cucumber, California	*Sicyonia igentis*	hard and soft bottom
Sea Hare, California	*Aplysia californica*	hard and soft bottom
Sea Slug	*Philine auriformis*	hard bottom, soft bottom
Shrimp, Bay	*Crangon franciscorum*	soft bottom

Table 5-2. Infaunal and Epibenthic Invertebrates in Santa Monica Bay

Common Name	Species	Habitat Type
Snail, Moon	several species	soft bottom
Snail, Top	several species	kelp, hard bottom
Snail, Turban	several species	kelp, hard bottom
Sponges	several species	hard bottom
Squid, California market	*Loligo ssp.*	soft bottom
Star, Serpent	*Ophiura lutkeni*	hard and soft bottom
Star, Spiny brittle	*Ophiothrix spiculata*	hard and soft bottom
Star, Spiny Sandstar	*Astropecten verrilli*	hard and soft bottom
Stars	several species	hard and soft bottom
Urchin, Purple	*Strongylocentrotus purpuratus*	hard bottom
Urchin, White	*Lytechinus picuts*	hard and soft bottom
Whelk, Kellet's	*Kelletia kelletii*	hard bottom

Residing within sediments of the seafloor, abundance and distribution of infauna typically varies seasonally and inter-annually. However, in Santa Monica Bay the dominant infaunal organism is polychaete worms. Polychaete worms for the most part feed by ingesting sediments and digesting the attached bacteria, filter feed on bits of organic detritus in the water or prey upon other infauna. Polychaetes play an important role in the marine benthos by reworking sediments, while serving as a food source for many demersal fish.

Santa Monica Bay has diverse and abundant assemblage of epibenthic invertebrates that reside on the seafloor. These species are larger than infauna and are generally less common. While single species tend to be dispersed spatially from each other, sand dollars and sea urchins tend to occur in dense, single-species patches. Epibenthic invertebrates can be motile (mobile) or sessile (non-mobile). Motile epibenthic invertebrates include: sea stars, sea cucumbers, sand dollars, sea urchins, crabs, lobster, snails, octopus, shrimp and sea slugs. Sessile species often inhabit hard-bottom substrate and include mussels, rock scallops, barnacles, sponges, sea anemones, sea fans, feather duster worms, worm snails, and sea squirts. Most of these sessile invertebrates feed by filtering plankton and detritus from the water column.

Trawls conducted within Santa Monica Bay in 2001 and 2002 indicated that echinoderms were the most abundant group in terms of both numbers and biomass (City of Los Angeles, 2003). Epibenthic species trawl-caught included:

- White urchin (*Lytechinus pictus*)
- Spiny sandstar (*Astropecten verrilli*)
- California sea cucumber (*Parastichopus californicus*)
- Ridgeback prawn (*Sicyonia ingentis*)
- Sea slug (*Philine auriformis*)
- Sand star (*Luidia foliolata*)
- Serpent star (*Ophiura lutkeni*)
- Spiny brittle star (*Ophiothrix spiculata*)

5.3.1.3 Protected Invertebrate Species

Abalone

Abalone are large marine snails historically found in rocky intertidal and subtidal areas, clinging to rocks and feeding off kelp and other algae. Abalone species used to comprise a highly valuable fishery in Southern California; however, their numbers have greatly dropped due to factors that include overharvesting, illegal harvesting, predation, disease, and El Niño events. Of the seven abalone species historically found in the Bight and Santa Monica Bay, four are federally listed as either endangered or as a species of concern and one (flat abalone) is no longer found south of Point Conception (Table 5-3).

Table 5-3. Abalone Species of the Santa Monica Bay

Common Name	Species Name	Protected Status	Preferred Depth (Feet)
Black Abalone	*Haliotis cracheirodii*	Federal Endangered	Intertidal to 20’
Green Abalone	*Haliotis fulgens*	Federal Species of Concern	Intertidal to > 30’
Pink Abalone	*Haliotis corrugate*	Federal Species of Concern	20’ to >120’
White Abalone	*Haliotis sorenseni*	Federal Endangered	Subtidal to >200’
Red Abalone	*Haliotis refescens*	None	Subtidal to >100’
Threaded Abalone	*Haliotis assimilis*	None	20’ to >80’

Source: CSLC, 2010

6.0 HUMAN USES

This section describes the marine infrastructure and human activities within the study area that may be impacted by construction, operation, and maintenance activities associated with the undersea ground electrode system.

6.1 Infrastructure

Based on a review of marine charts of Santa Monica Bay, no existing outfall pipes, bridges, ramps, or other corrodible metallic structures occur within a 5-km radius of the existing marine electrode location. Several piers and large outfall pipes are located in Santa Monica Bay; however, all reside outside of the study area (Figure 6-1). The Santa Monica Pier is the closest infrastructure to the existing electrode location and is just outside of the 5-km study area. Other major infrastructure along the coastline such as the Hyperion WWTP, Chevron El Segundo Refinery, and Joint WPCP are each located well south of the study area, while the Malibu Pier is located well to the north.

Figure 6-1. Existing Infrastructure in the Vicinity of the Study Area

6.2 Commercial and Recreational Uses

The coastal and offshore portions of the study area support a myriad of commercial and recreational uses. The location is a popular recreational and leisure area located between Topanga State Beach to the west by approximately 1.5 miles and Will Rogers State Beach to the south and east by approximately 0.75 miles.

Santa Monica Bay is one of the world's most populous urban areas. Nearly 1.9 million people live in the Santa Monica Bay watershed, which comprises 22 public beaches, 22 miles of bike path, and 55 miles of shoreline (Heal the Bay, 2011). Each year, approximately 50 million people visit Santa Monica Bay beaches to enjoy recreational sports, such as fishing, surfing, swimming, kayaking, offshore canoeing, windsurfing, paddle boarding, kite boarding, beach combing, boating, parasailing, and diving. Much of California's coastal economy, which is valued at $43 billion, and the Los Angeles area's economy, depend upon tourism and recreation (Heal the Bay, 2011). Jobs depend on tourist dollars and also on the fishing opportunities, surf lessons, and surf stores, and over 7,200 private boats at two harbors within the area. The nearest harbors to the study area include Marina Del Rey and Redondo Beach.

6.2.1 Commercial Uses

Commercial uses within the study area predominantly involve commercial fishing, but also include tourism-related businesses such as surfing instruction, whale watching, parasailing, party boat fishing, scuba diving, photography, and movie production. Although kelp harvesting occurs along the California coast, the study area is in Administrative Kelp Bed Area 15, which is closed to harvesting. A similar environmental impact study was recently conducted in Santa Monica Bay for the Chevron El Segundo Marine Terminal Lease Renewal Project and was used as source information for this discussion (CSLC, 2010).

6.2.1.1 Commercial Fishing

The study area lies within CDFG statistical fish-block unit 679 and is adjacent to blocks 680 to the west and 701, 702, and 703 to the south (Figure 6-2). Fish-block data specific to the study area block can be obtained through written requests to the CDFG Field Office in Los Alamitos, CA but was beyond the scope of this initial investigation. Because the recent data was not readily available, the data provided in the CSLC, 2010 report were used to provide an overview of commercial fishing activities found in the area. Rankings of the commercial landings of the 16 block area of Santa Monica Bay are provided in Table 6-1 by weight and by dollar value. Sardine, squid, mackerel, anchovy, and urchin comprised the largest mass of commercial fish landings in the area. By dollar value, squid, sardine, and urchin comprised the top three landings.

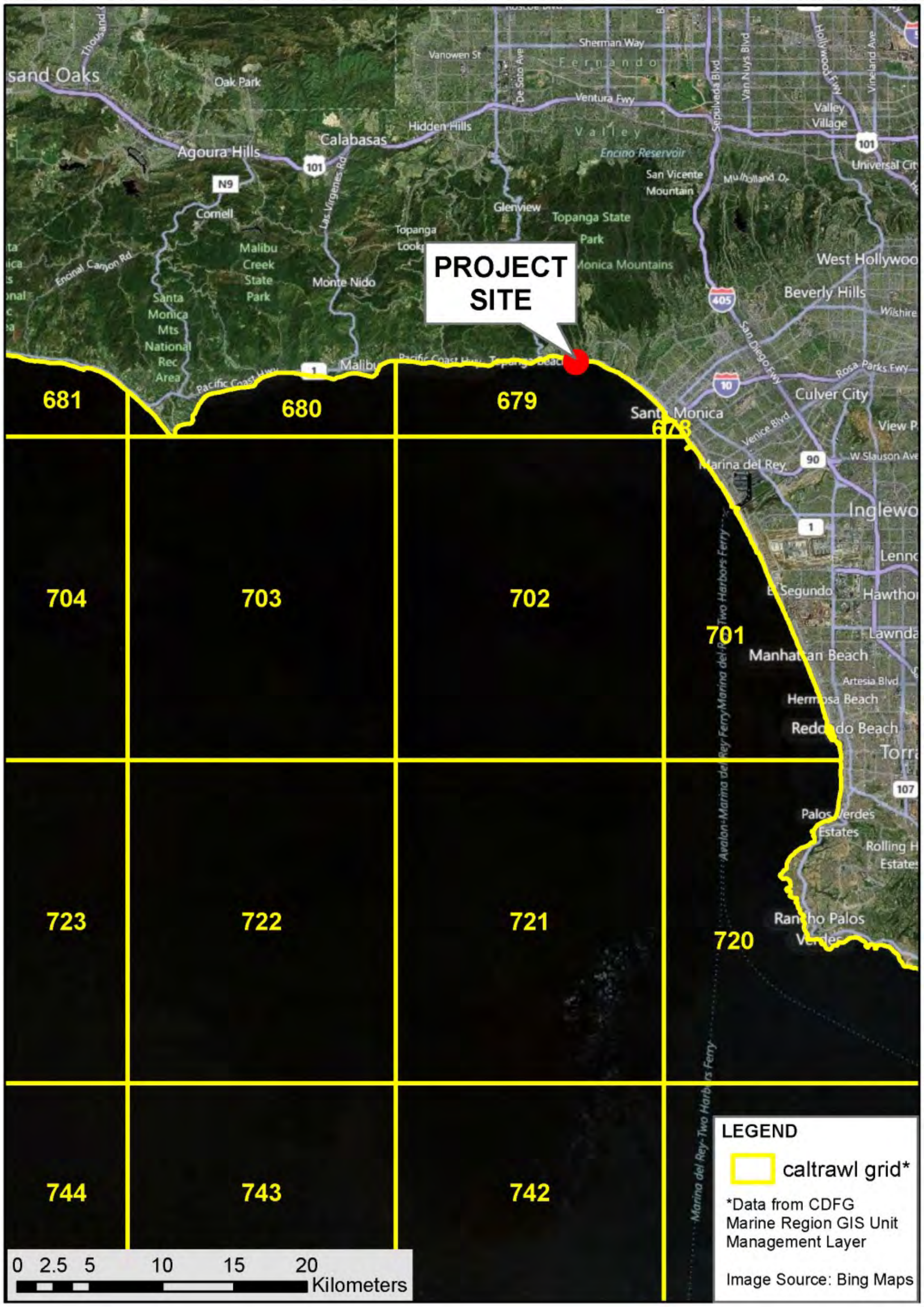


Figure 6-2. Location of California Department of Fish and Game Fish Blocks in the Project Vicinity

Table 6-1. Ranking of Commercial Fisheries in the Santa Monica Bay 16-Block Survey Area

Fishery	Total Pounds (Tons)		Fishery	Dollar Value (M)	
	Weight	Percent		$ Value	Percent
Sardine	98,132.30	58.10%	Squid	13.83	34.40%
Squid	45,426.30	26.90%	Sardine	8.12	20.20%
Mackerel	15,171.10	9.00%	Urchin	4.51	11.20%
Anchovy	4,577.90	2.70%	Lobster	3.95	9.80%
Urchin	2,551.80	1.50%	Rockfish	2.43	6.00%
Tuna	653.1	0.40%	Mackerel	1.96	4.90%
Rockfish	550.7	0.30%	Crab	1.23	3.10%
Crab	450.2	0.30%	Sablefish	0.55	1.40%
Lobster	251.9	0.10%	Shrimp	0.49	1.20%
Sablefish	245.5	0.10%	Halibut	0.45	1.10%
Barracuda	163	0.10%	Anchovy	0.38	0.90%
Sea Cucumber	163	0.10%	Tuna	0.38	0.90%
Shark	116.5	0.10%	Shark	0.29	0.70%
Shrimp	80.2	0.00%	Sea Cucumber	0.28	0.70%
Other fish	77.8	0.00%	Seabass	0.26	0.60%
Halibut	69.4	0.00%	Sheephead	0.24	0.60%
Sheephead	66.4	0.00%	Other invertebrate	0.2	0.50%
Seabass	50	0.00%	Swordfish	0.18	0.50%
Herring	44.3	0.00%	Barracuda	0.14	0.40%
Snail	27.9	0.00%	Other fish	0.14	0.40%
Other taxa	148.5	0.10%	Other taxa	0.17	0.50%
Grand Total	**169,017.90**	**100.00%**	**Grand Total**	**40.19**	**100.00%**

Notes: 1 ton = 0.9 metric ton; M= millions of dollars.
Source: CSLC, 2010; CDFG, 2007.

Although data was not readily available (at the time of this report) for Block 679, the study area is directly adjacent to Block 701, which is readily available and provides insight into Block 679. Block 701 represents only 0.5% of the overall landings value and mass in comparison to the entire Santa Monica Bay wide 16-Block Area (Table 6-2).

Commercial Fishing Gear

Commercial fishers utilize fishing gear capable of targeting multiple species, including:

- Seines for coastal pelagics such as sardine, northern anchovy, mackerel, and market squid;
- Trawls for shrimp, sole, flounder, and halibut;
- Hook and line/longlines for rockfish and other rocky outcrop fish;
- Traps for crab and lobster;
- Drift/set gillnets for shark and swordfish; and
- Trawls for albacore and salmon (CSLC, 2010).

Table 6-2. Ranking of Top 15 Commercial Fisheries Operating in Fish Block 701

Fishery	Weight (Tons)	Fishery	Value ($M)
Squid	728.5	Squid	0.2
Sardine	166.5	Halibut	0.03
Urchin	12.3	Sardine	0.02
Shark	9.3	Shark	0.02
Halibut	4.7	Urchin	0.02
Anchovy	3.6	Lobster	0.01
Sea Cucumber	1.6	Crab	<0.01
Mackerel	1.5	Rockfish	<0.01
Crab	1.3	Seabass	<0.01
Barracuda	1	Sea Cucumber	<0.01
Rockfish	0.9	Barracuda	<0.01
Seabass	0.6	Other invertebrates	<0.01
Lobster	0.5	Sheephead	<0.01
Surfperch	0.5	Anchovy	<0.01
Mussel	0.5	Surfperch	<0.01
Total	**933.2**	**Total**	**0.32**

Source: CLSC, 2010, CDFG 2007.

Comparisons of gear type in Block 701 are provided in Table 6-3. Seiners targeting squid were responsible for landing the largest biomass within the 16-block study area, and accounted for the largest catch within the Block 701, which is directly adjacent to the project location (CSLC, 2010). Trawls and traps were listed as the predominantly used method in Block 701 to catch the non-finfish, such as urchin, shrimp, lobster, and crab that have historically been the most profitable catch at that site over the past decade (CLSC, 2010).

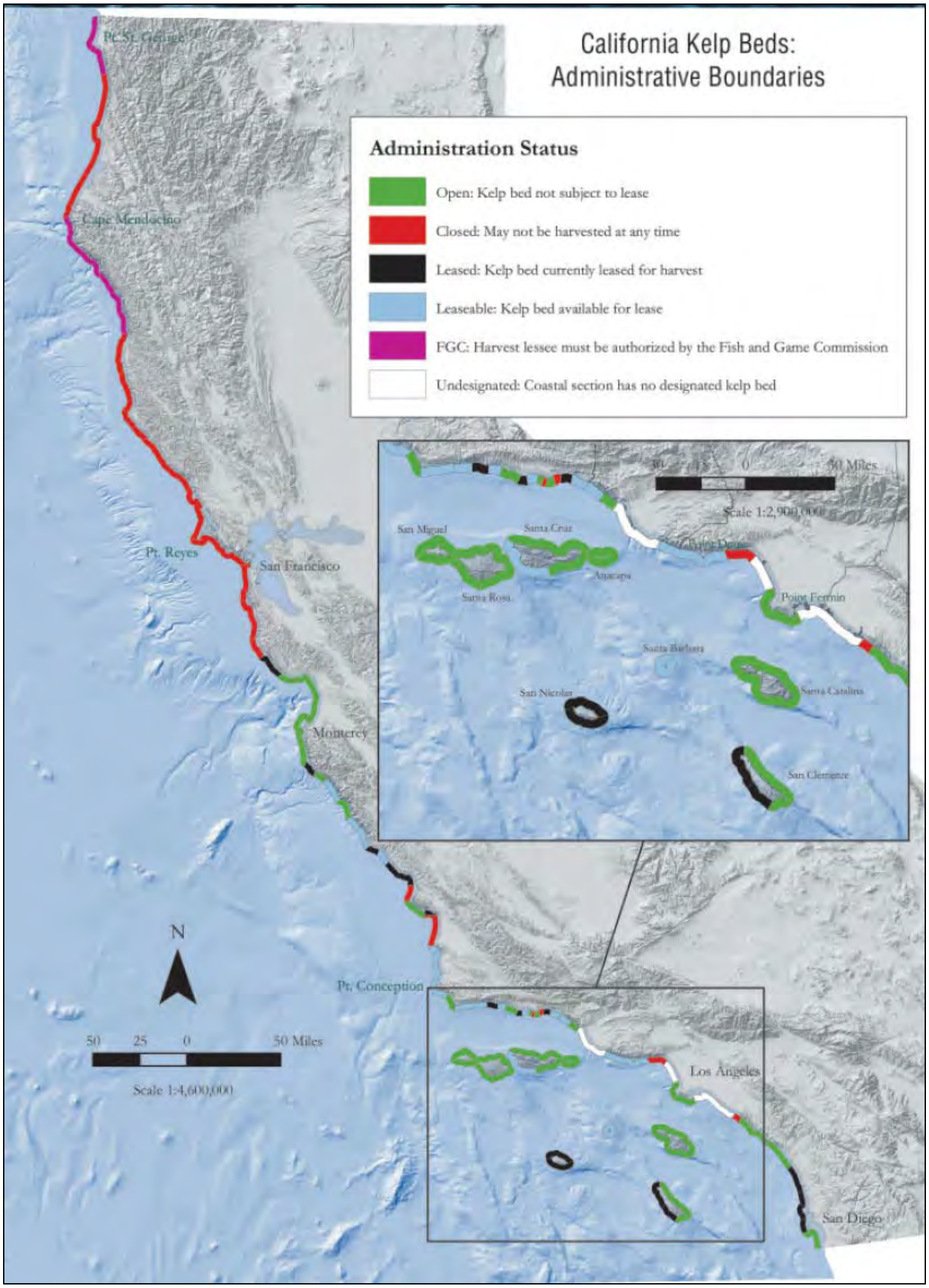
Table 6-3. Comparison of Commercial Fish Landings as a Function of Gear Type

Gear	Weight (Tons)		Gear	Value ($M)	
	Region	Block 701		Region	Block 701
Seine	160,432.50	616.1	Seine	23.37	0.12
Net	3,066.40	282.7	Trap	6	0.01
Diving	2,668.30	14	Diving	4.87	0.03
Hook & Line	932.4	16	Hook & Line	3.19	0.06
Trap	883.6	2.1	Net	1.23	0.1
Gill Net	415.5	3.1	Gill Net	1	0.01
Other	251.8	0.7	Trawl	0.34	0
Trawl	154	0.1	Harpoon	0.14	0
Troll	92.6	0	Troll	0.03	0
Harpoon	55.4	0	Other	0.03	0
Grand Total	**169,017.90**	**934.6**	**Grand Total**	**40.19**	**0.33**

Notes: data from 1996-2007
Source: CDFG, 2007

6.2.1.2 Kelp Harvesting

Although kelp harvesting occurs along the California coast, the study area is in Administrative Kelp Bed Area 15, which is closed harvesting at any time (Figure 6-3).



Source: CDFG, 2001

Figure 6-3. California's Administrative Kelp Beds

6.2.2 Recreational Uses

Recreational uses include sports like fishing, surfing, swimming, kayaking, paddle boarding, kite boarding, beach combing, boating, parasailing, and diving. Additionally, whale watching is also enjoyed by many visitors who board party boat fishing charter vessels from December through April of each year.

6.2.2.1 Fishing

Recreational fishing includes fishing from the shore, from boats originating from the two local harbors (Marina Del Rey and Redondo Beach), from kayaks launching from local shores, and by divers. Within the vicinity of the study area, two artificial reef locations exist. The TAR and SMBAR complexes were both constructed of 20,000 and 10,000 tons of quarry rock, respectively (Table 4-1). Both reef complexes provide rock structure desirable for recreational boaters to visit and lie in water depths ranging from 28 ft for TAR to 78 ft for SMBAR, making them readily accessible for diving and recreational fishing.

Primary species targeted by recreational fishermen include California halibut, kelp bass (*Paralabrax clathratus*), barred sand bass (*Paralabrax nebulifer*), rockfishes, chub mackerel, Pacific bonito (*Sarda chiliensis*), white seabass (*Atractoscion nobilis*), and Pacific barracuda (*Sphyraena argentea*). The sandy shelf areas are fished mainly for pelagic species such as bonito and barracuda, and bottom dwelling species, such as California halibut (*Hippoglossus stenolepis*). In contrast, vermilion rockfish (*Sebastes miniatus*), bocaccio (*Sebastodes paucispinus*), and chilipepper rockfish (*Sebastes goodei*) are taken along the Redondo and Santa Monica Submarine Canyons and along the shelf off Hermosa Beach. Vermilion rockfish, olive rockfish, and bocaccio are caught in the rocky substrates off Point Dume (Squire and Smith, 1977) (CSLC, 2010).

Due to the lack of reliable recreational fish landing data specific to the study area, recreational fishing effort was analyzed for the region comprising the coastlines of San Diego, Orange, and Los Angeles Counties. Table 6-4 provides a summary of the top 10 fish species caught in nearshore (less than 3 nautical miles) coastal waters throughout this region from 2004-2009. The numbers provided in the table are conservative estimates of catch landings because reporting is voluntary, and many catches go unreported (CSLC, 2010).

Table 6-4. Top 10 Individual Fish Species Recreationally Harvested Within 3 Nautical Miles of Shore in Southern California from 2004 to 2009

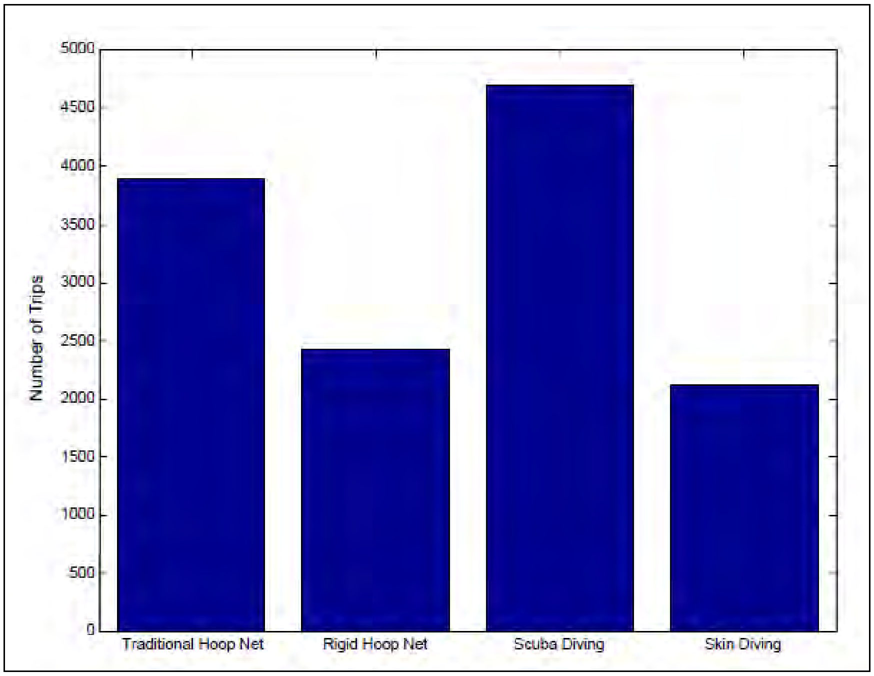
Taxon	Reported Catch[3] (# of fish)	
	2004-2009	2009
Pacific Mackerel (*Scomber japonicas*)	3955	475
Pacific Sardine (*Sardinops sagax caerulea*)	1877	361
Barred Sand Bass (*Paralabrax nebulifer*)	1218	66
Kelp Bass (*Paralabrax clathratus*)	1098	108
Pacific Bonito (*Sarda chiliensis lineolata)*	888	20
Barred Surfperch (*Amphistichus argenteus*)	837	72
Queenfish (*Seriphus politus*)	701	61
Jacksmelt (*Atherinopsis californiensis*)	583	78
Yellowfin Croaker (*Umbrina roncador*)	402	73
California Scorpionfish (*Scorpaena guttata*)	328	33

Notes: 3 Total fish counts for San Diego to Los Angeles areas as defined by RecFIN database.

Source: CSLC, 2010 and Pacific States Marine Fisheries Commission, 2010.

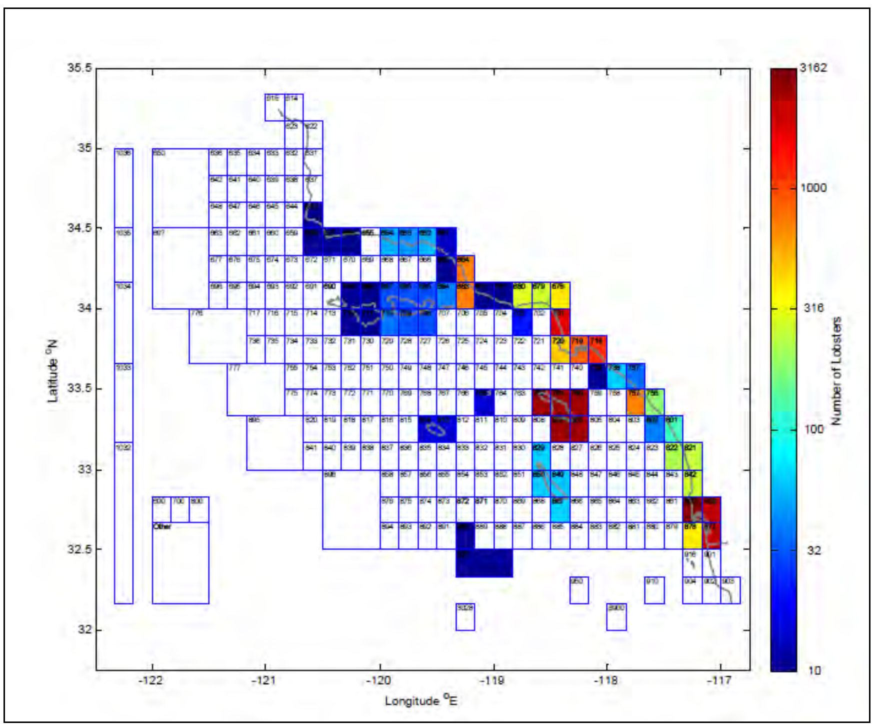
Several nearshore fishes are targeted in the surf zone in the Santa Monica Bay, where they are commonly caught from piers or the beach. These include California corbina (*Menticirrhus undulates*), barred surfperch (*Amphistichus argenteus*), and shovelnose guitarfish (*Rhinobatos productus*). California halibut are frequently caught from shore as well, particularly when they move inshore to feed on California grunion (*Leuresthes tenuis*), which come ashore to spawn on the sandy beaches within the Santa Monica Bay (CSLC, 2010).

Lobster fishing is also a popular recreational activity. The legal season occurs primarily from October 1 through mid-March of each year and specified annually by CDFG. The California spiny lobster (*Panulirus interruptus*) is taken primarily by diving (scuba or skin) or hoop netting. CDFG conducted a study during the first half of the 2008-2009 Lobster Season and included surveys of data taken from Block 679 (study area) and adjacent blocks up and down the California coast. The area from Santa Monica to Malibu Point ranked in the top 12 (at #9) of all California locations during the 2008-2009 Season and the 2009 Season and represented 2.8% of the overall recreational catch in California (CDFG, 2011). The total number of trips within LA County was estimated upwards of 3,000 trips (at 20% estimated reporting). Scuba diving was the single most common method used to collect lobsters (Figure 6-4). Specific catch data via hoop netting for the 6-block area adjacent to the study area ranged from as low as 10 lobsters in Block 703 to over 1,000 lobsters in Block 701. Block 679 was approximated between 100 and 300 lobsters (Figure 6-5). In contrast, specific catch data via diving for the 6-block area adjacent to the study area ranged from approximately 300 lobsters in Block 679 to over 1,000 lobsters in Blocks 680 and 701 (Figure 6-6).



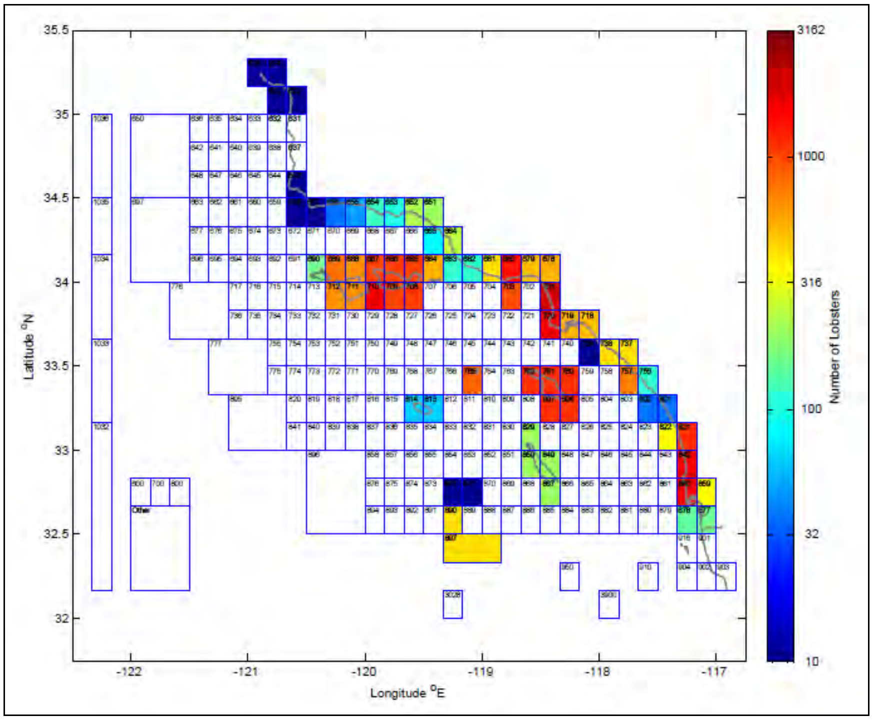
Source: CDFG, 2010.

Figure 6-4. Lobster Catch Methods and Trip Counts during the First Half of the 2008-2009 Lobster Season



Source: CDFG, 2010.

Figure 6-5. Geographic Block Data Showing Estimated Lobster Catches via Hoop Netting during the First Half of the 2008-2009 Lobster Season.



Source: CDFG, 2010.

Figure 6-6. Geographic Block Data Showing Estimated Lobster Catches via Diving during the First Half of the 2008-2009 Lobster Season.

6.2.2.2 Surfing

A popular surf destination is located at Topanga State Beach and the Rocky Point and cove at Sunset Blvd. Topanga point is an intermediate surfing location where the waves break over a rocky point. Topanga becomes more crowded during strong south and west swells as many other popular beach breaks in Santa Monica and South Santa Monica Bay close out. Sunset Blvd (Sunset) is considered a novice/beginner spot that tends to break softly over a rocky/sand bottom. It is primarily a right point break but also has a short left break that approaches the project site. Similar to Topanga, Sunset also becomes more crowded with larger swells as the South Santa Monica Bay beach breaks begin to close out. These periods of larger swells can occur year round with large winter swells from Pacific storms and during summer from Mexican hurricane swells and southern hemisphere swells. Project construction has the potential to impact the Sunset surf break since the cable route to the Gladstone Vault is immediately adjacent to the location. Impacts that could occur include limited accessibility to parking, access to the beach, and potential for shifting sands. However, potential shifting sands and rock alignments also has the potential to cause short-term improvements in the surfing conditions as well.

6.2.2.3 Kayaking, Paddle Boarding, and Kite Boarding

Kayaking has recently gained popularity since the advent of the plastic molded kayak. Topanga is a popular launching location for near shore kayak fishing and surf kayaking. Although kayaks may traverse the area, construction activities or underground cabling is not expected to impact accessibility to local areas.

Paddle Boarding, which includes both stand up paddling and prone position paddling, is also a common water recreational activity. Paddle boarding includes stand up paddle surfing but is more commonly done for distance and sprint racing and for exercise. Although paddle boarders may traverse the area, construction activities or underground cabling is not expected to impact accessibility to local areas.

Kite surfing, one of the newer water sports, has become very popular at Topanga State Beach in the last few years. Kite surfers like Topanga State Beach because it's easy to get to, and because it's often windy. Kites vary in size from 20 square meters to 4 square meters. The stronger the winds are, the smaller the kite. Dangers involved with kite surfing include colliding with other people in the water, and getting tangled up in the taut lines of the kite (Topanga Messenger, 2003). Kite surfing has the potential to be impacted by construction activities and warning signs would be recommended at upwind locations such as Topanga if construction activities include cranes or other heavy equipment that pose a tangling potential with kiting activities.

7.0 REQUIRED REGULATORY PERMITS AND APPROVALS

Biological resources in the vicinity of the study area are regulated by a variety of federal, state, and local laws. This section discusses the relevance of these statutes to the proposed Project. In addition, quantitative guidelines, standards, limits, and restrictions promulgated in the regulations form the basis for many of the criteria used to evaluate the significance of the proposed Project's impacts to marine resources.

7.1 Federal

7.1.1 Regulatory Agencies

NMFS, USFWS, and USEPA are the federal agencies responsible for the protection of biological resources and water quality within Santa Monica Bay. The USCG is responsible for enforcing U.S. maritime laws, including the enforcement of environmental regulations. The mission and jurisdiction of each of these agencies is listed below:

National Marine Fisheries Service

The mission of the NMFS reads "Stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems." NMFS, which is also known as NOAA Fisheries, is responsible for the management, conservation and protection of living marine resources within the United States Exclusive Economic Zone. The agency also plays a supportive and advisory role in the management of living marine resources in coastal areas under state jurisdiction and provides scientific and policy leadership in international conservation and management (NOAA Fisheries, 2011).

U.S. Fish and Wildlife Service

The mission of the USFWS is "working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people." USFWS activities include, but are not limited to: enforcing the federal Endangered Species Act; acquiring wetlands, fishery habitats, and other lands for restoration and preservation; insuring compliance with the National Environmental Policy Act (NEPA); managing National Wildlife Refuges and National Fish Hatcheries; and reviewing and commenting on all water resource projects (California Environmental Resources Evaluation System, 2011).

U.S. Environmental Protection Agency

The mission of the USEPA is "to protect human health and the environment." The USEPA ensures that environmental laws are enforced fairly and effectively and that environmental protection is considered in policies of the United States (USEPA, 2011). USEPA, working in conjunction with state and local water boards regulates inputs of pollutants to receiving waters under the CWA.

U.S. Coast Guard

The mission of the USCG is "to protect the public, the environment, and U.S. economic interests — in the nation's ports and waterways, along the coast, on international waters, or in any maritime region as required to support national security." The USCG works together with military personnel to save lives, enforce laws, operate ports and waterways, and protect the environment (USCG, 2011). The USCG is responsible for the oversight of responses to hazardous material discharges, such as oil spills, and ensures that safe navigation is maintained.

7.1.2 Legislations and Regulations

Federal legislation covering the protection of biological resources in the Santa Monica Bay region includes:

- Bald and Golden Eagle Protection Act;
- Clean Water Act;
- Coastal Zone Management Act;
- Endangered Species Act;
- International Maritime Organization Resolution A.868(20);
- Magnuson-Stevens Fishery Conservation and Management Act;
- Marine Mammal Protection Act;
- Marine Protection, Research, and Sanctuary Act;
- Migratory Bird Treaty Act; and
- National Invasive Species Act.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 protects bald and golden eagles by prohibiting "anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Enforcement of the Bald and Golden Eagle Protection Act falls under the USFWS (USFWS, 2010).

Clean Water Act

The CWA of 1972 established the basic structure for regulating discharges of pollutants into the waters of the U.S. and established minimum water quality standards for surface waters. Enforcement of CWA falls under the USEPA and USCG. Compliance with the CWA is provided by approval of a NPDES permit from the California State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) (USEPA, 2011).

Coastal Zone Management Act

The Coastal Zone Management Act is administered by NOAA's Office of Ocean and Coastal Resource Management and provides for management of the nation's coastal resources and balances economic development with environmental conservation. Specifically, the objectives of the Coastal Zone Management Act are to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone" (U.S. Department of Commerce, 2011).

Endangered Species Act

The Endangered Species Act (ESA) of 1973 protects and conserves threatened and endangered species of plants and animals and their ecosystems. The law "requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species." The "taking" of any listed species of endangered fish or wildlife is prohibited under this act. Similarly, the import, export, interstate, and foreign commerce of listed species are all generally prohibited. Enforcement of ESA falls under USFWS and NMFS jurisdiction (USEPA, 2011b).

International Maritime Organization Resolution A.868(20)

The International Maritime Organization adopted Resolution A.868(20) entitled "Guidelines for the Control and Management of Ship's Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens." This resolution regulated the development and maintenance of ballast water management plans for international shipping and transport and is aimed at minimizing the transfer and dispersal of nonindigenous aquatic organisms.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 established U.S. jurisdiction over the ocean area from 3 to 200 miles offshore (the Fishery Conservation Zone) and it established a new system of government for managing fishery resources in the form of eight regional fishery management councils. Additionally, the Magnuson-Stevens Act established new goals and criteria for fisheries management and put in place new procedures for managing fisheries (NOAA/ NMFS, 1996).

Marine Mammal Protection Act

MMPA was enacted by Congress in 1972 to prohibit the taking of marine mammals in U.S. waters and to prohibit the taking of marine mammals by U.S. citizens on the high seas. It also prohibits the importation of marine mammals and marine mammal products into the U.S. MMPA was substantially amended in 1994 to provide for certain exceptions to the take prohibitions. It defines "take" to mean "to hunt harass, capture, or kill" any marine mammal or attempt to do so. The inclusion of harassment in the definition was a groundbreaking action by Congress. Exceptions to the moratorium can be made through permitting actions for take incidental to commercial fishing and other nonfishing activities; for scientific research; and for public display at licensed institutions such as aquaria and science centers. NMFS is charged with protecting whales, dolphins, porpoises, seals, and sea lions, while USFWS is charged with protecting walrus, manatees, otters, and polar bears (NOAA Fisheries, 2011).

Marine Protection, Research, and Sanctuary Act

Titles I and II of the Marine Protection, Research, and Sanctuaries Act, prohibit the transportation of material from the U.S. for the purpose of ocean dumping; the transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels; and the dumping of material transported from outside the U.S. into the U.S. territorial sea. Deviation from any of these statutes requires a permit issued by NOAA (USEPA, 2011c).

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits the "take" of migratory birds, their eggs, feathers or nests without a permit. "Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof." In total, 836 bird species are protected by the MBTA, 58 of which are currently legally hunted as game birds. A migratory bird is defined as any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle. The responsibilities of federal agencies to protect migratory birds are set forth in Executive Order 13186. USFWS is the lead agency for migratory birds (USFWS, 2011b).

National Invasive Species Act

The National Invasive Species Act was originally passed by Congress in 1990 in response to a zebra mussel invasion that impacted the Great Lakes. The Act has since been reauthorized in 1996 and 2007 and expanded to include salt water flushing of ballast water. Under the National Invasive Species Act, ships arriving from outside the US Exclusive Economic Zone (a 200-mile boundary around the US) are required to exchange their ballast water at sea (National Environmental Coalition on Invasive Species, 2011).

7.2 State

Biological resource protection for waters within the State of California is primarily the responsibility of CDFG. CDFG regulates both fishing and hunting within the state's boundaries and is also responsible for the protection of all state-listed threatened and endangered species, as well as candidates for listing as threatened or endangered. Additionally, habitat protection of biological resources and protection of California Species of Special Concern falls under the responsibility of the CDFG.

Water quality standards within the State of California are set forth and enforced by SWRCB and regionally by the LARWQCB. Water quality standards for Santa Monica Bay and other coastal water bodies within the state are prescribed in the California Ocean Plan.

State legislation that applies to the protection of biological resources within Santa Monica Bay and its surrounding waters includes:

- California Coastal Act of 1976;
- California ESA;
- California Fish and Game Code;
- California Environmental Quality Act of 1970;
- California Marine Invasive Species Act of 2004;
- California Ocean Plan of 2005
- Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties
- Marine Life Protection Act of 1999;
- California Marine Managed Areas Improvement Act of 2000; and
- Porter-Cologne Water Quality Control Act.

California Coastal Act

The California Coastal Act was enacted in 1976 to regulate development within the "coastal zone," a zone extending three miles seaward and generally 1,000 yards inland. Almost all development within the coastal zone, and its wetlands, requires a coastal development permit from either the Coastal Commission or a local government that has a certified Local Coastal Program (California Environmental Resources Evaluation System, 2011). The California Coastal Act was designed to guide local and state decision-makers in the management of coastal and marine resources, and mandates that coastal development shall not interfere with the public's right to access the beach. Priority is placed on public and private recreation over residential development and limitations are placed on coastal armoring and land alteration. The California Coastal Act includes protections for environmentally sensitive habitat, water quality, and wetlands, stating that "Marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes."

California Endangered Species Act

The California Endangered Species Act (CESA) provides for the protection of all native endangered or threatened species of plants, and their habitats, within the State of California (CDFG, 2011b). It also provides protection for those species experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation. The CDFG is responsible for enforcing the CESA and for establishing criteria for determining the threatened or endangered status of a given species. State agencies are required to consult with the CDFG to ensure that any actions they undertake will not adversely impact essential habitat or jeopardize the existence of threatened or endangered species.

California Fish and Game Code

The California Fish and Game Code places restrictions on the take of protected species, defines sport fishing and hunting regulations and seasons, defines refuge boundaries and addresses other licensure requirements for particular varieties of fish and game (Justia.com, 2011).

California Environmental Quality Act

The California Environmental Quality Act (CEQA) is a state statute passed in 1970 that institutes a statewide policy for environmental protection. This passing of this act followed the federal government's ratification of NEPA. CEQA requires state and local agencies within California to follow a protocol of analysis, provide public disclosure of environmental impacts for proposed projects, and adopt feasible measures to mitigate any perceived impacts to the environment from said project (CDFG, 2011)

Water Quality Control Plan: Los Angeles Region
Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

The Water Quality Control Plan for the Santa Clara River and Los Angeles River Basins (Basin Plan) for the Los Angeles Region is "designed to preserve and enhance water quality and protect the beneficial uses of all regional waters." Beneficial uses and water quality objectives are specified within this plan for surface and ground waters within Los Angeles and Ventura Counties. The Basin Plan incorporates all applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations for the region and is the main policy document that guides the LARWQCB. The Basin Plan is the primary policy document that guides the LARWQCB. The Basin plan is reviewed and updated regularly and following adoption by the RWQCB is subject to review by the SWRCB and the USEPA (SWRCB, 2011).

Marine Life Protection Act

MLPA directs the state of California to reevaluate and redesign California's network of MPAs to more effectively protect the state's biological marine resources and to improve recreational, scientific, and educational opportunities provided by minimally disturbed marine ecosystems. The redesigned network of MPAs is to be done using the best available science and based upon recommendations from stakeholders, the general public, scientists, and resource managers. The six goals of the MLPA are as follows:

- Protect the natural diversity and abundance of marine life, and the structure, function and integrity of marine ecosystems;
- Help sustain, conserve and protect marine life populations, including those of economic value, and rebuild those that are depleted;
- Improve recreational, educational and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity;
- Protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic values;
- Ensure California's MPAs have clearly defined objectives, effective management measures and adequate enforcement and are based on sound scientific guidelines; and
- Ensure the State's MPAs are designed and managed, to the extent possible, as a network.

New regulations for the South Coast Region (Point Conception to the Mexican Border) go into effect beginning January 2012 (CDFG, 2011d). No MLPAs occur within the study area but do occur at Point Dume (Point Dume State Marine Conservation Area [SMCA] and Point Dume State Marine Reserve [SMR]) and off Palos Verdes (Point Vicente SMCA and Abalone Cove SMCA).

California Marine Managed Areas Improvement Act of 2000

The California Department of Parks and Recreation (DPR) was designated as the Principal State Agency for marine managed areas by Executive Order in 2000. The California Marine Managed Areas Improvement Act of 2000 extends the DPR management jurisdiction into the marine environment and gives priority to MPAs adjacent to protected terrestrial lands. The act also established the California Marine Managed Areas System, a system that designates three classification levels of marine life protection, as well as one classification level each for water quality protection, cultural heritage protection and recreation use. These designations are State Marine Reserve, State Marine Park, State Marine Conservation Area, State Marine Cultural Preservation Area, State Marine Recreational Management Area and State Marine Water Quality Protection Area. The DPR is the only state agency that has delegated management authority over all State Marine Managed Areas designations (CDFG, 2011e).

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act established nine regional water quality control boards to oversee water quality at a local and regional level. The creation and maintenance of each region's Basin Plan is one the main duties of the RWQCBs. The Basin Plan establishes beneficial uses, water quality objectives, and actions necessary to maintain beneficial uses and control point and non-point sources of pollution for water bodies. Under the auspices of the USEPA, the SWRCB, and nine RWQCBs also have the responsibility of granting CWA NPDES permits for point-source discharges. It should be noted that RWQCB decisions must ultimately be approved by the SWRCB, which has final authority over State water rights and water quality policy (California Environmental Resources Evaluation System, 2011b).

California Ocean Plan

The Water Quality Control Plan, Ocean Waters of California 2005 (California Ocean Plan), is the policy document that guides the SWRCB. The California Ocean Plan provides for the "protection of the quality of the ocean waters for use and enjoyment by the people of the State" by setting forth provisions for the discharge of waste to ocean waters. Essentially, the California Ocean Plan specifies water quality criteria for the protection of beneficial uses of ocean waters of California such as water contact recreation, navigation, sport and commercial fishing, preservation and enhancement of ASBS, marine habitat, and endangered species habitat. The SWRCB reviews the plan at least every three years to guarantee that the current standards are adequate and are not allowing degradation to marine species or posing a threat to public health (SWRCB, 2011).

7.3 Local

Local legislation applicable to the protection of biological resources in the study area includes:

- County of Los Angeles Local Coastal Plan; and
- The Santa Monica Bay Restoration Plan.

The County of Los Angeles and City of Malibu Local Coastal Plans

Both the City of Malibu and the County of Los Angeles have Local Coastal Plans that have been certified by the California Coastal Commission. Certification of these plans indicates that they are consistent with the goals and directives of the California Coastal Act, and thus allow the local governments to directly apply the development, conservation, environmental, and public access protection goals of the Coastal Act to development within their jurisdictions (Coastal California website, 2011).

The Santa Monica Bay Restoration Plan

The Bay Restoration Plan was originally adopted in 1994 and identified almost 250 actions that were needed to address critical problems such as storm water and urban runoff pollution, habitat loss and degradation, and public health risks associated with seafood consumption and swimming near storm drain outlets. The Plan both outlined specific programs to address the environmental problems facing the Bay and identified implementers, timelines, and funding needs. In 2008 the Bay Restoration Plan was updated to acknowledge completed actions and progress made in restoration efforts since its adoption in 1994. The 2008 Bay Restoration Plan consists of 14 goals, 67 objectives, and 170 milestones to fulfill its mission to "improve water quality, conserve and rehabilitate natural resources, and protect the Bay's benefits and values" (Santa Monica Bay Restoration Commission, 2010).

8.0 BIGHT '08 DATA RESULTS

The Sylmar Electrode Array lies just offshore of Sunset Blvd. within Santa Monica Bay and within the Southern California Bight (Bight). The Southern California Coastal Water Research Project (SCCWRP) has conducted a regional Bight-wide survey of the health of the waters and sediment in the Bight since 1994. The program is conducted approximately every five years with the most recent survey being conducted during Summer 2008 (Bight '08). These surveys included the analysis of sediment chemistry, toxicity, and benthos from stations within relevant proximity to the Sylmar Electrode Array. These results are presented for the purpose of comparing to the baseline samples collected from the Proposed Primary and Secondary cable routes. The Bight '08 sample locations within proximity to the project include 11 stations ranging from Inner Shelf samples (7517 and 7474) to Upper Slope samples (7428 and 7479). The remaining sample locations occurred on the mid to lower shelf. For the purposes of comparing to the Project Area, the most relevant locations are the two Inner Shelf samples (7517 and 7474), however, all sample results are provided for this discussion.

8.1 Bight '08 Sediment Chemistry

Sediments collected during Bight '08 were tested for general chemistry, particle size, trace metals, chlorinated pesticides, PCB congeners, and polynuclear aromatic hydrocarbons (PAHs). Sample results from the area of Santa Monica Bay in proximity to the Sylmar Project are provided in Appendix A. Samples consisted of primarily silts ranging from 7.9% to 55.0% and sands ranging from 36.0% to 90.7% with some clays <8.9%.

Results of chemical analyses (metals, PCBs, chlorinated pesticides, and PAHs were compared to Effects Range-Low (ER-L) and Effects Range-Median (ER-M) values developed by Long et al. (1995). The effects range values are helpful in assessing the potential significance of elevated sediment-associated contaminants of concern, in conjunction with biological analyses. Briefly, these values were developed from a large data set where results of both benthic organism effects (e.g., amphipod toxicity tests) and chemical analysis were available for individual samples. The ER-L was then calculated as the lower 10th percentile of the observed effects concentrations and the ER-M as the 50^{th} percentile of the observed effects concentrations. Therefore, results less than the ER-L do not suggest any effect would occur, results between the ER-L and ER-M may suggest a potential for an effect, and results above the ER-M have a likely potential to cause an effect. While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. The ER-L and ER-M sediment quality values are included for comparative purposes only.

8.1.1 Trace Metals

While several trace metals were detected in all samples, no sample results were above the ER-M. Several metals results were detected above the ER-L but below the ER-M and include arsenic, cadmium, chromium, mercury, nickel, and silver. However, all results detected between the ER-L and ER-M occurred in samples collected from the mid shelf (7410 and 7461), outer shelf

(7477), or upper slope (7428 and 7479). All samples collected from the inner shelf had metals detected below the ER-L.

8.1.2 Chlorinated Pesticides

Chlorinated pesticides were detected in all samples within Santa Monica Bay. Several samples had results above the ER-M for Total Detectable DDT primarily related to the legacy breakdown isomers of 4-4' DDD and 4-4' DDE. The sample location closest to the Project Site (7571) had trace level detections of 4-4' DDE and Total Detectable DDT above the ER-L but below the ER-M.

8.1.3 Total PCBs

Trace levels of PCB congeners were detected in all samples collected. However, all Total PCB results were below the ER-L.

8.1.4 Total PCBs

Trace levels of PAHs were detected only in samples 7417, 7458, and 7517. However, all Total PAH results were below the ER-L.

8.2 Bight '08 Sediment Toxicity

Sediment toxicity testing was conducted on a subset of samples (7417, 7517, and 7461) from the project area using the marine amphipod *Eohaustorius estuarius.* Toxicity test results are provided in Appendix A. No toxicity was observed from any samples collected from the project area.

8.3 Bight '08 Benthic Community Measures

Benthic community measures from offshore sites from Bight '08 were also available. The Mainland Shelf Benthic Response Index (BRI; Smith et al., 2001) was used for evaluation purposes and condition assessments were based on those developed by the Bight '08 Program. Response Levels related to the condition assessment are provided in Table 8-1. Other metrics provided include the abundance, number of taxa, Shannon-Wiener Diversity Index (Shannon), Evenness (Pielou, 1969) and Dominance (Swartz et al., 2001). Summary results are shown in Table 8-2 while the benthic invertebrate taxonomy and infaunal taxonomy data are provided in Appendix A.

Sample results for Inner Shelf stations 7474 and 7517 near the project area, had BRI scores of 26.1 and 27.2, respectively and Response Levels of 1, indicating marginal deviation from reference conditions. The remaining stations had BRI scores less than 25 classifying them as reference conditions.

Table 8-1. Response Level Condition Assessment Categories

Response Level	Characterization	Definition	BRI Threshold
Reference	Reference		< 25
Response Level 1	Marginal deviation	> 90% tolerance interval for reference index values	25-34
Response Level 2	Biodiversity loss	> 25% of reference species lost	34-< 44
Response Level 3	Community function loss	> 90% of echinoderm and 75% arthropod species lost	44-72
Response Level 4	Defaunation	> 90% of reference species lost	> 72

Table 8-2. Benthic Community Summary Results

Site	Stratum	Abundance (0.1 m2)	No. of Taxa (0.1 m2)	Shannon-Weiner Index (nats)	Evenness	Dominance	Shelf BRI	Condition
7474	Inner Shelf	194	66	3.63	0.87	26	26.1	RL 1
7517	Inner Shelf	782	137	4.00	0.81	35	27.2	RL 1
7410	Mid Shelf	257	95	4.11	0.90	38	11.1	Reference
7415	Mid Shelf	448	118	4.10	0.86	37	14.5	Reference
7417	Mid Shelf	277	90	4.00	0.89	35	16.6	Reference
7426	Mid Shelf	281	105	4.32	0.93	47	8.4	Reference
7458	Mid Shelf	309	106	4.20	0.90	42	18.4	Reference
7461	Mid Shelf	508	117	4.09	0.86	36	17.4	Reference
7477	Outer Shelf	121	55	3.56	0.89	25	21.1	Reference
7428	Upper Slope	258	47	3.09	0.80	12	NA	NA
7479	Upper Slope	86	26	2.72	0.83	10	NA	NA

NA-Not applicable; No validated condition evaluation tool available.
Source: Appendix E Bight ’08 Community Measures.

9.0 POTENTIAL ELECTROMAGNETIC IMPACTS

The purpose of this discussion is to provide a review of potential effects from electromagnetic fields (EMF) and is based on a literature review of approximately 20 applicable scientific articles reviewing the effects of EMF on marine organisms. A review of existing literature related to the effects of EMF, focusing on direct current (DC) applications was conducted. DC is characterized by a constant flow of electrical charge in one direction from high to low potential (as opposed to alternating current (AC), which is characterized by current that oscillates from high to low magnitude and reverses direction many times per second). Magnetic fields are created by the flow of electric current. The Sylmar Electrode System is a high voltage DC (HVDC) system. Within all the literature cited in this document, researches generally described the potential for varied effects from EMF and were primarily associated with elasmobranch species (cartilaginous fishes, such as sharks, skates, and rays). Many of the papers reviewed called for a need to address the potential effects on the behavior and or navigation issues of marine organisms associated with weak electric and magnetic fields (Gradient Corporation, 2006).

Gill et al., (2005) indicated that high voltage AC and DC cables that transmit power between devices such as undersea electrodes and the mainland have the potential to interact with aquatic animals that are sensitive to electric and magnetic fields. These fields primarily affect fish and mainly the elasomobranchs (skates, rays, and sharks), and potentially marine mammals that use the earth's magnetic field for navigation. Only the elasmobranchs are able to detect electrical impulses through the ampullae of Lorenzini (subdermal electroreceptor sensory organs). This system detects weak extrinsic voltage gradients that occur across the body and encodes information about the direction, polarity, and intensity of the source (Tricas and New, 1997). Few other marine animals possess this ability.

In all the papers reviewed, elasmobranchs were suggested to have a higher potential for sensitivity to EMFs resulting in either attraction or avoidance within near proximity to the source of the EMF. Some elasmobranchs have been shown to be attracted to undersea cables and in some cases have attacked the cable itself (Kalmijn, 2000). Kalmijn (2000) described that electrical excitability is an inherent property of animal life and electric fields abound in natural waters. Additional documentation of shark attacks on undersea cables were reported for dogfish (*Mustelus canis*), stingray (*Urolophus halleri*), blue shark (*Prionace glauca*), and bonnet head sharks (*Sphyrna tiburo*) (Cameron Fischer, Ecology & Environment, Inc., 2010).

Extensive studies have been conducted by several researchers to better understand the science behind electrosensory ability in marine animals. In most cases, the researchers concluded that navigation and prey detection were the two primary uses of detecting electromagnetic fields. Of the majority of literature reviewed, reported detection thresholds for steady DC electric fields ranged from 10^{-6} to 10^{-3} volts/meter (V/m) (Gradient Corporation, 2006). Further, the numerical threshold levels were limited largely to elasmobranchs. Of 380 shark species, only nine have been tested for electroreceptive response (Kajiura and Holland, 2002). Fisher and Slater (2010) reported that some elasmobranchs are capable of detecting electric fields as weak as 1 nV/m (10^{-9} V/m). Similarly, round stingrays were shown to have behavioral responses to uniform electrical fields of 5 x 10^{-7} V/mr (Tricas and New, 1997). Evidence of shark bites on submarine optical telecommunications cables were associated with electromagnetic fields between 1 x 10^{-6} and 6.3 x 10^{-6} V/m (Gill, 2005). Additionally, Gill described studies demonstrating attraction by

European eels (*Anguilla anguilla*) and the prawn (*Crangon crangon*). In laboratory studies, two nurse sharks were trained to respond to dipole fields in the ranges of 1 x 10^{-6} and 4 x 10^{-6} V/m with and without a background electric field (Johnson, et al., 1984). Meyer, et al., 2005 also performed captive studies using conditioned sharks and showed that sharks converged on electrically generated artificial targets when no food was presented. Sessile stingrays have also demonstrated orientation responses to electromagnetic fields similar to those generated by ocean currents (Kalmijn, 1982). At certain amplifications, elasmobranchs generally practiced avoidance of the cable. However, no other effects were noted.

Gill, 2005 suggested that electric fields emanating from undersea cables have the potential to be detected by electrosensitive species. At levels that approximate the bioelectric fields of natural prey there is the potential for these species to be attracted to them. However, Gill further stated that whether the species would be attracted or repelled is unknown at this time. Magnetosensitive species do occur in coastal waters world-wide (e.g., migratory fish, elasmobrachs, mammals, and crustaceans) and these species are thought to be sensitive to the Earth's magnetic field (Gill, 2005). However, whether these species would be affected by short term discharges associated with the Sylmar HVDC link is unknown at this time and is similar to most findings in the literature reviewed.

Other species have been described that have the potential for impacts. Cameron Fischer, Ecology & Environment, Inc., 2010 described changes in embryonic development and juvenile stages of life for numerous species including sea urchins, barnacles, and blue mussels (*Mytilus edulis*). However, they also described no negative impacts to the spiny lobster even under the influence of anthropogenic fields. No differences in survival were noted to the blue mussel (*Mytilus edulis*), North sea prawn (*Crangon crangon*), round crab (*Rhithropanopeus harrisii*), and the flounder (*Plathychthys flesus*) when exposed to static B-fields for several weeks (Bocher and Zettler, 2004). The marine mammals were described as using a magnetic map which allows them to travel in areas of low magnetic intensity and gradient such as valleys and peaks (Walker et al., 2003). Many whale and dolphin species are sensitive to stranding when Earth's B-field has a total intensity variation of less than 0.5 mG (Cameron Fischer, Ecology & Environment, Inc., 2010). Significantly sensitive species included the common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), finwhale (*Balaenoptera physalus*), and the long-finned pilot whale (*Globicephala malaena*) (Kischvink, et al., 1986).

Gill further described DC cables in the Baltic Sea and suggested that electromagnetic fields equal to that of the Earth's magnetic field were detectable at distances of up to 6 meters. Such a field may also have the potential to affect a ships compass and has the potential to interact with the navigation and orientation of any animal relying on the Earth's magnetic field for direction (Gill, 2005). This finding is similarly described by Elder and Whitney, 1968 in the discussion of the Los Angeles HVDC Ocean Electrode. The current in each electrode an in the cable produces magnetic fields that may deflect compass needles in passing ships or they may magnetize a ship's hull in they are in the area during the discharge event, thereby throwing off calibration even after passing the area.

The conclusions for this study are similar to the findings of the majority of the literature reviewed. Undersea cables do produce electromagnetic fields to varying degrees. Marine organisms do have the potential for some local effects; however, there are no conclusive studies that suggest significant impacts are to be expected. In the case of the Sylmar HVDC discharge cable and array, the cable is limited to a proposed 6,000 to 15,000 feet offshore and does not impose a barrier to migratory pathways. In the case of other extensive long distance cables reviewed (e.g., those crossing the Baltic Sea), a higher potential for impacts were noted when the cable bridged a migratory pathway and if continuously operated. Avoidance or attraction may occur during short term discharge periods. Since the operational duration of the discharge is estimated to be only 20 hours per year, long term impacts to marine life are not expected. While elasmobranch species can detect and respond to electromagnetic fields in the range of undersea cables, no studies were found describing levels that affect elasmobranchs under field conditions. Although there is a lack of research for sea-turtles and marine mammals, sea-turtles do not appear as sensitive to electromagnetic fields. However, statistical evidence suggests that some marine mammals are susceptible to stranding as a result of increase levels of electromagnetic fields (Cameron Fischer, Ecology & Environment, Inc., 2010). The Sylmar HVDC Electrode has been in operation since 1969 and it is presently unknown if there have been any documented mammal strandings associated with grounding discharges over the history of the operations. This data gap may be useful for review to determine the potential for marine mammal impacts.

10.0 POTENTIAL CHEMICAL IMPACTS

The potential chemical effects of the Sylmar ground return associated with electrolysis are discussed in this section. Electrolysis occurs when a direct electric current (DC) is applied to drive a non-spontaneous chemical reaction that leads separation of elements from naturally occurring sources (such as seawater in this case). For example, chlorine gas, hydrogen gas, and sodium hydroxide solution (commonly called "caustic soda" or simply "caustic") can be produced by passing an electric current (electrolyzing) through an aqueous solution of sodium chloride. If the electrolyte is maintained at a pH of 6.5 or 10, one can form chlorate or hypochlorite from the electrogenerated chlorine and caustic. In industrial applications, this is the basis for the electrolytic production of sodium chlorate or sodium hypochlorite (commonly known as "bleach"). In addition, oxidizing compounds can be generated by the chlorination of sea water, such as hypobromous acid and bromamines when ammonia nitrogen is present. These compounds rapidly disappear from the water after its discharge in coastal waters (Allonier and Khalanski, 1998, Abarnou and Miossec, 1992, Burton and Fisher, 2001). Chlorine reactions quickly combine with other substances in water, typically forming inert compounds. However, if water contains large amounts of decaying materials, free chlorine can combine with them to form trihalomethanes (THMs). In high concentrations, THMs can persist in the environment and has been shown to be carcinogenic to some vertebrates. The amount of chloride evolution is complicated by the specific features of the electrodes, in particular by the pH dependence of the surface charging (Trasatti, 1986).

The copper submarine cables of the Sylmar Ground Return Undersea Electrode is a DC system that will be capable of operating at a maximum amperage of 3,650 A (with an overall current value of 4,867A) and is expected to operate for less than 50 hour per year. Electrolysis produced by the DC current in the seawater environment will have the potential to generate chemical by-products, such as chlorine gas, hydrogen gas, and sodium hydroxide solution, as discussed above. Operation of the existing electrode system has been reported to generate chlorine gas as a byproduct of the electrolysis process, and the proposed conceptual electrode array has been modeled to produce up to 140 kg of chlorine per year. However, there is very little information available on the resulting concentrations in the surrounding seawater, and the potential toxicity to native marine organisms.

Although the impacts of chlorine by-product production from undersea electrodes has not been well-studied, there is a large body of literature available on the effects of chlorine on marine organisms. A few of these studies are summarized below, with a focus on fish, invertebrate, and community level effects.

Alderson (1969) studied the response of the developmental stages of flatfish eggs under constant flow conditions using direct electrolysis of sea water as a source of chlorine. From LC_{50} determinations, the eggs of the American plaice (*Hipoglossoides platessoides*) were found to be more tolerant than the newly-hatched larvae, and for both plaice and Dover sole (*Microstomus pacificus*) the tolerance of the larvae increased as their development proceeded up to metamorphosis. Less change in tolerance was evident with increasing size of fish after metamorphosis. Determinations of time to kill 50% of a test population showed that at chlorine concentrations only slightly higher than LC_{50} level the time for survival was considerably reduced.

The differential effects of free chlorine and chloramine on three species of juvenile marine fish were investigated in continuous flow bioassay units (Capuzzo et al. 1976a). The toxicity of both chlorine forms to winter flounder, *Pseudopleuronectes americanus*, scup, *Stenotomus versicolor* and killifish, *Fundulus heteroclitus*, appeared to be a threshold effect: an abrupt increase in mortality was observed over a narrow range of toxicant concentrations. The three species were similar in their responses to free chlorine, the more toxic of the two chlorine forms. There was a difference in chloramine toxicity among the three species; killifish were more susceptible than either of the other two species, probably reflecting differences in metabolic regulation or uptake rates.

Dempsey (1986) studies postlarvae of *Clupea harengus* exposed to chlorinated sea water for 30 minutes, to simulate passage through a typical power station cooling water circuit, and 24-h, during which detectable chlorine decayed away, to simulate a 'worst case' exposure. Twenty-four hour LC_{50s} were 0.63 ppm initial concentration for 30 minutes exposure and 0.36 ppm initial concentration for 24-h exposure.

The viable hatch, survival, growth and lethal concentrations (LC_{50}) for early life stages of northern anchovy (*Engraulis mordax*) were examined after seawater chlorination (Rosales Casian, 1991). Varying life stages were exposed to replicated concentrations of 0.0 (controls), 0.05, 0.1, 0.2, 0.5, 0.8 and 1.0 mg/L chlorine. Egg bioassays were of 24-hr duration only in static technique, and up to 12 days after hatching for larval series in semistatic technique.

Rosales Casian et al. (1990) conducted a series of bioassays to determine the chlorine effect on the survival and growth of 1, 4 and 16 day old grunion (*Leuresthes tenuis*) larvae maintained under semistatic conditions. After chlorination, there was a decrease in survival with 0.2 mg/L Cl_2 and survival was zero in less than two hours with 1.0 mg/L. The lethal LC_{50s} after the first two hours for 1, 4 and 16 day larvae were 0.255, 0.15 and 0.119 mg/L Cl_2 respectively. The LC_{50} values at 24 h and 48 h were similar. Eggs and larvae of white perch (*Morone americana*), striped bass (*Morone saxatilis*) and blueback herring (*Alosa aestivalis*) and eggs of Atlantic silversides (*Menidia menidia*) and tidewater silversides (*M. beryllina*) were exposed to various residual chlorine levels for pre-established periods by larvae (Morgan and Prince, 1977). Almost all LC_{50} values fell between 0.20-0.40 ppm of total residual chlorine for eggs, and between 0.20-0.32 ppm for larvae. Age-related effects in sensitivity to chlorine were observed. Abnormal larvae issued from blueback herring eggs exposed to low chlorine concentrations.

Capuzzo (1977) studied the non-lethal effects of chlorine on larval lobsters (*Homarus americanus*). The length, dry weight and standard respiration rates were monitored for 19 days following a 60 minute exposure at 25°C to 1.0 mg/L applied free Cl and 1.0 mg/L applied chloramine. Compared to control organisms, significantly lower increases in dry weight ($P < 0.05$) and significant reductions in standard respiration rates ($P < 0.01$) were measured among exposed organisms; greater differences were detected among chloramine exposed organisms. They concluded that acute exposure to free chlorine or chloramine results in subsequent reductions in growth and metabolic activity of larval lobsters. The differential effects of free Cl and chloramine on stage I larvae of *H. americanus* were investigated in continuous flow bioassay units (Capuzzo et al., 1976b). Applied chloramines was more toxic than corresponding concentrations of applied free Cl to lobster larvae with estimated LC_{50} values at 25°C of 16.30 mg/L applied free Cl and 2.02 mg/L applied chloramine. The synergistic effect of temperature on the toxicity of both free Cl and chloramine was also demonstrated. Heinle and Beaven (1977) found LC_{50}'s of 0.175, 0.062, 0.028 mg/L of chlorine produced oxidants for adult and immature copepods (combined) of *A. tonsa* at 15°C and salinities of 10.4 to 11.8 ppt. Results with nauplii of *A. tonsa* suggest lower LC_{50}'s than those for adults at equivalent exposure times. The effects of different chlorine concentrations (0.1-1 mg/L total residual chlorine) on growth rate (k) of *Cordylophora. Caspia* (a brackish water hydroid) were studied in the laboratory Rajagopal et al., 2002c). The results show that chlorine is effective at relatively low concentrations (above 0.1 mg/L residual chlorine). The growth rate of *C. caspia* at different chlorine concentrations was dose-dependent. An average decrease of 23% in the growth rate was observed at 0.1 mg/L residual chlorine when compared to control experiments, over a period of 7 d. No growth was recorded at 1 mg/L residual chlorine, indicating threshold levels of residual chlorine on *C. caspia*.

Vanderhorst (1982) assessed the effects of chlorine on marine epibenthic communities. A single experiment provided for two years of exposure to target concentrations of 10 and 50 ppb of chlorine-produced oxidants (CPO) in sea water. Continuous and intermittent chlorination regimes were used at each of the concentrations. The experiment was conducted in triplicate and included triplicate controls not receiving chlorination. There was an increase in the number of species for communities receiving each of the treatments, but there were significant ($p = 0.05$) differences in the rate of increase between intermittent and continuous chlorination regimes and between the two target concentrations within each of the regimes. Continuously chlorinated communities increased less rapidly in the number of species than did intermittently chlorinated communities. Communities receiving 50 ppb CPO increased in the number of species less rapidly than did communities receiving 10 ppb CPO ($p = 0.05$). There were significant ($p = 0.05$) effects on community complexity attributable to the distance between microcosms and the central head tank supplying all microcosms. Experimental substrates placed closer to the in-flow end of microcosms exhibited more animal species and fewer plant species than did experimental substrates placed closer to the out-flow end of individual microcosms.

These studies reflect the high variability of lethal and non-lethal effects of exposure to chlorine in marine systems and some of the levels of exposure to chlorine and chlorinated products required to produce toxic effects. It is important to note that concentrations and exposures related in the review do not necessarily reflect those expected to be generated by the Sylmar ground return.

11.0 REFERENCES

Abarnou, A. and L. Miossec. 1992. Chlorinated waters discharged to the marine environment chemistry and environmental impact: An overview. Science Total Environment 126(1-2): 173-197.

Ahamed, M.S., K. Suresh, G. Durairaj and K.V.K. Nair. 1993. Effect of cooling water chlorination on primary productivity of entrained phytoplankton at Kalpakkam, east coastof India. Hydrobiologia 271(3): 165-168.

Alderson, R. 1972. The effects of low concentrations of free chlorine on eggs and larvae of plaice, Pleuronectes platessa L. Pp. 312-315. In: M. Ruvio (ed). Marine Pollution and Sea Life. Fishing News Books Ltd., Surrey, England.

Allonier, A.S. and M. Khalanski. 1998. Sea water chlorination by products. Journal. Research Oceanography 23(1): 21-24.

Andrulewicz, E., D. Napierska, and Z. Otremba. 2003. The Environmental Effects of the Installation and Functioning of the Submarine SwePol Link HVDC Transmission Line: A Case Study of the Polish Marine Area of the Baltic Sea. Journal of Sea Research 49 (2003). Pgs. 337-345.

Arruda JA, Marzolf GR, Faulk RT. 1983. The role of suspended sediments in the nutrition of zooplankton in turbid reservoirs. Ecology 65(5):1225-35.

Baird, P.H. 1993. "Birds". Chapter 10 in *Ecology of the southern California bight: A synthesis and interpretation.* M.D. Dailey, D.J. Reish, and J.W. Anderson, eds. Berkeley: University of California Press.

Barr BW. 1993. Environmental impacts of small boat navigation: vessel/sediment interactions and management implications. In: Magoon OT, editor. Coastal Zone '93: proceedings of the eighth Symposium on Coastal and Ocean Management; 1993 Jul 19-23; New Orleans, LA. American Shore and Beach Preservation Association. P 1756-70.

Bay SM, Jones BH, Schiff K, and Washburn L. 2003a. Water quality impacts of stormwater discharges to Santa Monica Bay. *Marine Environmental Research* 56 (1-2):205-223.

Bearzi, M. 2005.Aspects of the ecology and behaviour of bottlenose dolphins (*Tursiops truncatus*) in Santa Monica Bay, California. Journal of Cetacean Resource Management 7(1):75–83, 2005.

Bechtold, I.C. and W.R. Smythe. Ground Current Patterns of the Southern California HVDC Sea Electrode. Corrosion 68/Paper #38.

Bochert, R. and K.J. Lohman. 2003. True Navigation and Magnetic Maps in Spiny Lobsters. Nature 421: 60-63.

Benson, S. R., Eguchi, T., Foley, D. G., Forney, K.A., Bailey, H., Hitipeuw, C., Samber, B. P., Tapilatu. R. F., Rei, V., Ramohia, P., Pita, J., and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2:art84. [doi:10.1890/ES11-00053.1]).

Burns and McDonnell. 2012a. Task 2 “Electrode Cables Evaluation and Design” – FINAL REPORT. May 28, 2012.

Burns and McDonnell. 2012b. Submarine Electrode Technical Specification – Annex to Task 1 & 11 Final Report. May 30, 2012.

Burton, D.T. and D.J. Fisher. 2001. Chlorine dioxide: the state of science, regulatory, environmental issues, and case histories. Wye Research and Education Center Report: 16pp.

California State Lands Commission (CSLC). 2010. EIR for the Chevron El Segundo.

Cameron Fisher, Ecology and Environment, Inc. 2010. Electromagnetic Field Study. Effects of Electromagnetic Fields on Marine Species: A Literature Review. Prepare for the Oregon Wave Energy Trust. September 2010.

Capuzzo, J.M. 1977. The effects of free chlorine and chloramines on growth and respiration rates of larval lobsters (*Homarus americanus*). Water Research 11: 1011-1024.

Capuzzo, J.M., S.A. Lawrence, J.A. Davidson and M. Libni. 1976a. The differential effects of free and combined chlorine on juvenile marine fish. Estuarine Coastal Marine Science 5: 733-741.

Capuzzo, J.M., S.A. Lawrence and J.A. Davidson. 1976b. Combined toxicity of free chlorine, chloramines and temperature to stage I larvae of the American lobster *Homarus americanus*. Water Research 10: 1093-1099.

Centre for Marine and Coastal Studies (CMACS). 2003. A Baseline of Electromagnetic Fields Generated by Offshore Windfarm Cables. Final Report. July 2003.

California Environmental Resources Evaluation System, 2007. Websites. CEQA: The California Environmental Quality Act. Available at: http://ceres.ca.gov/ceqa/. Accessed: October, 2011.

California Environmental Resources Evaluation System, 2011. California Wetlands Information System. Summary of the California Coastal Act. Available at: http://ceres.ca.gov/wetlands/agencies/usfws.html Accessed: October, 2011.

California Environmental Resources Evaluation System, 2011b. California Wetlands Information System. Porter-Cologne Water Quality Act. Available at: http://ceres.ca.gov/wetlands/permitting/porter.html Accessed: October, 2011.

Carretta JV, Forney KA (2004) Preliminary estimates of harbor porpoise abundance in California from 1999 and 2002 aerial surveys. SWFSC administrative report LJ-04-01. Southwest Fisheries Science Center, La Jolla, CA

Carretta, J.V., Price, T., Petersen, D., &Read, R. 2005. Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996–2002. Mar Fish Rev.

Carretta, J.V., K.A. Forney, M.S. Lowry, J. Barlow, J. Baker, B. Hanson, and M.M. Muto. 2007. U.S. Pacific marine mammal stock assessments: 2007. NOAA Technical Memorandum NMFS. NOAA-TM-NMFS-SWFSC-414.

Carter, H.R., G.J. McChesney, D.L. Jaques, C.S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory, and D.L. Whitworth. 1992. Breeding populations of seabirds in California, 1989–1991. U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Dixon, California, and San Francisco Bay National Wildlife Refuge Complex, Newark, California. Draft final report to Minerals Management Service, Pacific OCS Region, under Interagency Agreement No. 14-12-001-30456. Volumes I and II.

CDFG, 1996. Biological Surveys of Santa Monica Bay Artificial Reef and Topanga Artificial Reef. 1996.

CDFG, 2001. California's Living Marine Resources: A Status Report (ANR Publication #SG01-11). Accessed at: http://www.dfg.ca.gov/marine/status/status2001.asp on October 27, 2011.

CDFG, 2007. California Commercial Landings data for 2005-2007. Fisheries database provided by California Department of Fish and Game, Marine Fisheries Statistical Unit, 4665 Lampson Avenue, Suite C, Los Alamitos, CA, 90720.

CDFG, 2010. A Summary of Preliminary California Spiny Lobster Report Card Data from the First Half of the 2008/2009 Recreational Lobster Season. Administrative Report No 2010-1. March 2010.

CDFG, 2011. Top 12 Locations for Sport Lobster Catch: 08-09 SEASON: 25% lobster report card return rate. Total of 61,857 lobsters reported kept for all locations (Locations 1-91). Accessed at: http://www.dfg.ca.gov on October 20, 2011.

CDFG, 2011b. Top 12 Locations for Sport Lobster Catch: 08-09 SEASON: 25% lobster report card return rate. Total of 61,857 lobsters reported kept for all locations (Locations 1-91). Accessed at: http://www.dfg.ca.gov on October 20, 2011

CDFG 2011c. Resource Management. California Endangered Species Act. Available at: www.dfg.**ca**.gov/habcon/cesa. Accessed: October, 2011.

CDFG, 2011d. Marine. Marine Life Protection Act South Coast Study Region. Available at: http://www.dfg.ca.gov/mlpa/southcoast.asp. Accessed: October, 2011.

CDFG. 2011e. Appendix B. California Marine Managed Areas Improvement Act. Available at: www.dfg.**ca**.gov/mlpa/pdfs/revisedmp0108b.pdf. Accessed: October, 2011.

Coastal California. 2011. Los Angeles County Local Coastal Program. Available at: coastal.ca.gov. Accessed on October 30, 2011.

Coastal California. 2011. City of Malibu Local Coastal Program. Available at: coastal.ca.gov. Accessed on October 30, 2011.

City of Los Angeles, Environmental Monitoring Division. 2003. Marine Monitoring in Santa Monica Bay: Biennial Assessment Report for the Period July 2001 through December 2002. Report submitted to EPA and RWQCB (Los Angeles). Department of Public Works, Bureau of Sanitation, Hyperion Treatment Plant, Playa del Rey, California, pp. 1-1 to 8-38 + appendices

CSLC, 2010 (California State Lands Commission): Public Draft Environmental Impact Report for the Chevron El Segundo Marine Terminal Lease Renewal Project. State Clearinghouse No. 2006031091 CSLC EIR No. 735. August, 2010. Accessed at: http://www.slc.ca.gov/division_pages/DEPM/DEPM_Programs_and_Reports/Chevron%20Long%20Wharf/Chevron_El_Segundo/Chevron_El_Segundo.html

Dempsey, C.H. 1986. The exposure of herring postlarvae to chlorine in coastal power stations. Marine Environmental Research 20 (4): 279-290.

Di Lorenzo E. 2003. Seasonal dynamics of the surface circulation in the Southern California Current System. *Deep-Sea Research II* 50 (14-16):2371-2388.

Dojiri M, Yamaguchi M, Weisberg SB, and Lee HJ. 2003. Changing anthropogenic influence on the Santa Monica Bay watershed. *Marine Environmental Research* 56 (1-2):1-14.

Edwards, B.D., Dartnell, P., Chezar, H., 2003. Characterizing benthic substrates of Santa Monica Bay with seafloor photography and multibeam sonar imagery. Marine Environmental Research, 56, 47-66.

Elder, G.R. and D.B. Whitney. The Los Angeles HVDC Electrode. Corrosion 68/Paper#39.

Elliot, A. (1992) "Family Pelecanidae (Pelicans)" in *Handbook of Birds of the World* Vol 1. Barcelona:Lynx Editions, ISBN 84-87334-10-5

Eschmeyer WN, Peterson RT, Herald ES. A *field guide* to *Pacific coast fishes*: North America. Houghton Mifflin Harcourt; 1983.

ESS Group, Inc. 2006. Cape Wind Energy Project. Appendix 3.8-C: Essential Fish Habitat Assessment. Prepared for Cape Wind Associates., LLC. ESS Project No. E159. November 2006.

Fisher, C. and M. Slater. 2010. Effects of electromagnetic fields on marine species: A literature review. Prepared on behalf of the Oregon Wave Energy Trust. Report 0905-00-001. September 2010.

Gardner, J. V., Dartnella, P., Maverb, L.A. and J. E. Hughes Clarke. 2003. Geomorphology, acoustic backscatter, and processes in Santa Monica Bay from multibeam mapping. Marine Environmental Research Vol. 56. Pages 15–46.

Gaston, Anthony J. & Jones, Ian L. (1998). *The Auks* Oxford:Oxford University Press, ISBN 0-19-854032-9

Gill, A. B. and H. Taylor. 2001. The Potential Effects of Electromagnetic Fields Generated by Cabling between Offshore Wind Turbines upon Elasmobranch Fishes. Research Project for Countryside Council for Wales. September 2001.

Gill, A.B., I. Gloyne-Phillips, K.J. Neal, and J.A. Kimber. 2005. The Potential Effects of Electromagnetic Fields Generated by Sub-sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms – A Review. Final Report in COWRIE 1.5 Electromagnetic Fields Review. Centre for Marine and Coastal Studies, Ltd. July 2005.

Gill, A.B. 2005. Offshore Renewable Energy: Ecological Implications of Generating Electricity in the Coastal Zone. Journal of Applied Ecology. Volume 42 Issue 4, 605-615. August 2005.

Gowen AW. 1978. The environmental effects of outer continental shelf (OCS) pipelines. Initial Findings. Boston (MA): New England River Basins Commission 4:24-43.

Gradient Corporation. 2006. Sensitivity of Marine Organisms to Undersea Electric and Magnetic Fields. Cape Wind Energy Project Nantucket Sound. Appendix 3.7-C. November 2006.

Greenstein D, Bay SB, Jirik A, Brown J, and Alexander C. 2003. Toxicity assessment of sediment cores from Santa Monica Bay. *Marine Environmental Research* 56 (1-2):277-297.

Haney, J.C. & Stone, A.E. (1988) "Seabird foraging tactics and water clarity: Are plunge divers really in the clear?" *Marine Ecology Progress Series* **49** 1–9

Hatch, J. J. 1995. Changing populations of Double-crested Cormorants. pp. 8-24, In: D. Nettleship and D. Duffy (eds.), The double-crested cormorant: Biology, Conservation and Management. Colonial Waterbirds 18, Special Publication 1.

Heal the Bay, 2011. Accessed at: http://www.healthebay.org/about-bay/recreation-economy. 10/25/11.

Heinle, D.R. and M.S. Beaven. 1977. Effects of chlorine on the copepod *Acartia tonsa*. Chesapeake Science 18: 140.

Marine Terminal Lease Renewal Project. State Clearinghouse No. 2006031091. CSLC EIR No. 735. Prepared by Marine Research Specialists, California State Lands Commission.

Middaugh, D.P., J.A. Couch and A.M. Crane. 1977a. Responses of early life history stages of the striped bass, *Morone saxatilis* to chlorination. Chesapeake Science 18: 141-153.

Morgan, R.P. and R.D. Prince. 1977. Chlorine toxicity to eggs and larvae of five Chesapeake Bay fishes. Transnational American. Fish Society 107: 636-641.

Hickey BM. 1979. The California Current System—hypotheses and facts. *Progress in Oceanography* 8:191–279.

Hickey BM. 1992. Circulation over the Santa Monica-San Pedro Basin and shelf. *Progress in Oceanography* 30:37–115.

Hickey BM. 1998. Coastal oceanography of western North America from the tip of Baja California to Vancouver Island. In: A. R. Robinson and K. H. Brink, editors. The Sea, Volume 11:. The Global Coastal Ocean: Regional Studies and Synthesis. New York NY: Wiley and Sons. 1090p.

Hickey BM, Dobbins EL, and Allen SE. 2003. Local and remote forcing of currents and temperature in the central Southern California Bight. *Journal of Geophysical Research* 108:1–26.

Jenkins SA and Wasyl J. 2005. Oceanographic Considerations for Desalination Plants in Southern California Coastal Waters. Scripps Institution of Oceanography technical report No. 54.

Johnson. C.S., B.L. Scronce, and M.W. McManus. 1984. Detection of DC Electric Dipoles in Background Fields by the Nurse Shark. Journal of Comparative Physiology A: Neuroethology, Sensory, Neural, and Behavioral Physiology. Vol. 155, Number 5. 681-687. August 1, 1984.

Justia.com, 2011. California Fish and Game Code Section 4500. Available at: http://law.justia.com/codes/california/2010/fgc/4500-4501.html. Accessed: October, 2011.

Kajiura, Stephan M. and K.N. Holland. 2002. Electroreception in Juvenile Scalloped Hammerhead and Sandbar Sharks. Journal of Experimental Biology 205, 3609-3621. August 21, 2002.

Kalmijn, A.J. 2000. Detection and Processing of Electromagnetic and Near-field Acoustic Signals in Elasmobranch Fishes. The Royal Society Vol. 355, pgs. 1135-1141. 2000.

Keith, J. O., L. A. Woods, Jr., and E. G. Hunt. 1971. Reproductive failure in Brown Pelicans on the Pacific Coast. Trans. N. Am. Wildl. Nat. Res. Conf. 35:56-63.

Kirschvink, J.L., A.E. Dizon, and J.A. Westphal. 1986. Evidence from Strandings of Geomagnetic Sensitive Cetaceans. Journal of Experimental Biology 120: 1-24.

Lehman, P.E. 1994. The Birds of Santa Barbara County. Allen Press. Lawrence, Kansas.

Los Angeles Regional Water Quality Control Board (LARWCB). 2005. Fact Sheet, Waste Discharge Requirements and National Pollution Elimination System Permit for the City of Los Angeles (Hyperion Treatment Plant) (NPDES No. CA0109991). April 7.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2007a. Water Quality Control Plan, Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (December 2007 Version). Available from http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/basin_plan/basin_plan_documentation.shtml.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2007b. Watershed Management Initiative Chapter. Available from http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/regional_program/wmi/wmi_chapter_2007.doc.

Love MS (1996) Probably more than you want to know about the fishes of the Pacific Coast. Really Big Press, Santa Barbara, CA.

Lyon GS, Petschauer D, and Stein ED. 2006. Effluent Discharges to the Southern California Bight from Large Municipal Wastewater Treatment Facilities in 2003 and 2004. In: S. B. Weisberg, editor. Southern California Coastal Water Research Project Annual Report 2005–2006. Westminster CA: Southern California Coastal Water Research Project.

Managing Wastewater in Coastal Urban Areas. ISBN-0-0309-04826-5. National Research Council. 1993

MBC Applied Environmental Sciences and Flow Science Incorporated. 2008. Technical Report on Cumulative Waste Water Impacts, Inc. For Christopher A. Joseph and Associates. December 4, 2008.

Messieh SN, Rowell TW, Peer DL, Cranford PJ. 1991. The effects of trawling, dredging and ocean dumping on the eastern Canadian continental shelf seabed. Continental Shelf Research 11(8-10):1237-63

Meyer, C.G., K.N. Holland, and Y.P. Papastamatiou. 2005. Sharks Can Detect Changes in the Geomagnetic Field. Journal of the Royal Society Interface. Vol. 2. No. 2 129-130. March 22, 2005.

Minerals Management Service (MMS) 2001. Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. Draft Environmental Impact Statement. U.S. Department of the Interior, Minerals Management Service. Pacific Outer Continental Shelf Region. OCS EIS/EA MMS 2001-046.

Metz, V. G., and E. A. Schreiber. 2002. Great Frigatebird (*Fregata minor*). In *The Birds of North America*, No. **681** (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Monterey Bay Aquarium Foundation. 2011. White Shark. Available at: http://www.montereybayaquarium.org/animals/AnimalDetails.aspx?enc=VsGX+Lst7QZU2Ta5WHSiRQ==. Accessed: October, 2011.

Morris TR. 2006. The Climate of Los Angeles, California. Oxnard CA: National Weather Service Forecast Office. Available from http://www.wrh.noaa.gov/lox/archive/LAClimate_text.pdf. Accessed October 25, 2011.

National Environmental Coalition on Invasive Species, 2011. National Aquatic Invasive Species Act. Available at: http://www.necis.net/intro-to-invasive-species/invasive-species-solutions/federal/naisa. Accessed: October, 2011.

National Marine Fisheries Service (NMFS). 2011. Southwest Regional Office website. Essential Fish Habitat: New Marine Fish Habitat Conservation Mandate for Federal Agencies. Available at: http://swr.nmfs.noaa.gov/hcd/efhprim.htm. Accessed October, 2011.

National Park Service (NPS). 2008b. News release. Bald Eaglets Driven From Their Nest on the Northern Channel Islands. May 20, 2008. Accessed online at http://www.nps.gov/chis/parknews/bald-eaglets-driven-from-their-nest-on-the-northern-channel-islands.htm

National Oceanic and Atmospheric Administration (NOAA). 1991. Contaminant trends in the Southern California Bight: Inventory and Assessment. NOAA Tech. Memorandum NOS ORCA 62.

NOAA Fisheries. 2011. Office of Protected Resources. Marine Mammal Protection Act (MMPA) of 1972. Available at: http://www.nmfs.noaa.gov/pr/laws/mmpa/. Accessed: October, 2011.

NOAA/ NMFS. 1996. Magnuson-Stevens Fishery Conservation and Management Act. Available at: http://www.nmfs.noaa.gov/sfa/magact/html. Accessed: October, 2011.

Newcombe CP, MacDonald DD. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11(1):72-82.

Newcombe CP, Jensen JO. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16(4):693-727.

Nezlin NP, Oram JJ, DiGiacomo PM, and Gruber N. 2004. Subseasonal to interannual variations of sea surface temperature, salinity, oxygen anomaly, and transmissivity in Santa Monica Bay, California, from 1987 to 1997. *Continental Shelf Research* 24:1053-1082.

Noble MA and Xu JP. 2003. Observations of large-amplitude cross-shore internal bores near the shelf break, Santa Monica Bay, CA. *Marine Environmental Research* 56 (1-2):127-149.

NOAA., 2011. Office of Coast Survey. Chart of Santa Monica Bay. Available from: http://www.charts.noaa.gov. Accessed on: October 26, 2011.

Obrien, M.T., M. Zavahir, M. Clark, and D. Boyle. 2006. New Zealand Bipolar HVDC Earth/Sea Return Operation – Environmental Experiences. CIGRE. 2006.

Ospar Commision. 2009. Assessment of the Environmental Impacts of Cables.

Page, G.,; Shuford, W., Kjemyr, J. and L. Stenzel. 1992. Shorebird Numbers in Wetlands of the Pacific Flyway: A Summary of Counts from April 1988 to 1992. A report conducted for the Point Reyes Bird Observatory.

Pierson, M.O., M.D. McCrary, and M.L. Bonnell. 2000. Seasonal abundance of coastal seabirds offshore Santa Barbara and Ventura Counties, California. Pp 428–434 *in* D. R. Browne,

K. L. Mitchell, and H. W. Chaney (editors). Proceedings of the Fifth California Islands Symposium, Santa Barbara Museum of Natural History. Minerals Management Service, Camarillo, CA.

Punta, G, Herrera, G. (1995) "Predation by Southern Giant Petrels *Macronectes giganteus* on adult Imperial Cormorants *Phalacrocorax atriceps*" *Marine Ornithology* **23** 166-167 (6)

Rajagopal, S., G. Van Der Velde, M. Van Der Gaag, H.A. Jenner. 2002c. Laboratory evaluation of the toxicity of chlorine to the fouling hydroid Cordylophora caspia. Biofouling. 18(1): 57-64.

Ropert-Coudert Y., Grémillet D., Ryan P., Kato A., Naito Y. & Le Maho Y. (2004) " Between air and water: the plunge dive of the Cape Gannet *Morus capensis*" *Ibis* **146**(2): 281–290.

Rosales Casian, J.A. 1991. Seawater chlorination and the survival and growth of early life stages of northern anchovy (*Engraulis mordax* Girard), with reference to power plant cooling systems. Ciencias marinas. Ensenada 17(1): 99-117.

Santa Monica Bay Restoration Commission. 2010. State of the Bay. Available at: http://www.santamonicabay.org/smbay.

Schiff, KC. 2000. Sediment chemistry on the mainland shelf of the Southern California Bight. *Marine Pollution Bulletin* 40:268–276.

Schiff, KC, Allen MJ, Zeng EY, and Bay SM. 2000. Coastal Pollution Hazards in Southern California. *Marine Pollution Bulletin* 41:76-93.

Schiff, KC and Bay S. 2003. Impacts of stormwater discharges on the nearshore benthic environment of Santa Monica Bay. *Marine Environmental Research* 56 (1-2): 225-243.

Schiff, K., K. Maruya and K. Christensen. 2006. Southern California Bight 2003 Regional Monitoring Program: II. Sediment Chemistry. Southern California Coastal Water Research Project. Westminster, CA.

Schiff, KC, Morton J, and Bay S. 2003. Retrospective evaluation of shoreline water quality along Santa Monica Bay beaches. *Marine Environmental Research* 56 (1-2): 245-253.

Schreiber, Elizabeth A. & Burger, Joanne.(2001.) *Biology of Marine Birds*, Boca Raton:CRC Press, ISBN 0-8493-9882-7.

Southern California Coastal Water Research Project (SCCWRP). 2004. Southern California Coastal Water Research Project 2003-04 Biennial Report. Subseasonal to interannual variations of sea surface temperature, salinity, oxygen anomaly, and transmissivity in Santa Monica Bay, California from 1987 to 1997. 237-263. Ar20-nezlin_pg237-263.pdf

Squire J L Jr. and Smith SE. 1977. Anglers' guide to the United States Pacific coast: Marine fish, fishing grounds & facilities, NOAA, Seattle, Washington, p. 140 pp.

State Water Resources Control Board (SWRCB). 1975. Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of

California. Available from http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/wqplans/thermpln.pdf.

State Water Resources Control Board (SWRCB). 2005a. Water Quality Control Plan, Ocean Waters of California, California Ocean Plan. California Environmental Protection Agency. Effective February 14, 2006. Available from http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/oplans/oceanplan2005.pdf.

SWRCB. 2011. LARWQCB Basin Plan. Available at: http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/basin_plan/basin_plan_documentation.shtml. Accessed: October, 2011.

SWRCB. 2011b. Water Quality Control Plan: Ocean Waters of California. Available at: http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/2009_cop_adoptedeffective_usepa.pdf. Accessed: October, 2011.

Steinberger A and Schiff KC. 2003. Characteristics of Effluents from Non-Power Industrial Facilities in 2000. In: Elmore D and Weisberg SB, editors. Southern California Coastal Water Research Project Annual Report 2001–2002. Westminster CA: Southern California Coastal Water Research Project. p. 31–46

Steinberger A and Stein ED. 2004. Characteristics of Effluents from Power Generating Stations in the Southern California Bight in 2000. In: Weisberg SB, editor. Southern California Coastal Water Research Project Annual Report 2003–2004. Westminster CA: Southern California Coastal Water Research Project. p. 31– 40

Stolzenbach KD, Lu R, Xiong C, Friedlander S, Turco R, Schiff K, and Tiefenthaler L. 2001. Measuring and Modeling of Atmospheric Deposition on Santa Monica Bay and the Santa Monica Bay Watershed. Santa Monica Bay Restoration Project. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/346_smb_atmospheric_deposition.pdf.

Surfing-Waves, 2011 Accessed at: http://www.surfing-waves.com/atlas/north_america/usa/west_coast/california/southern_california/los_angeles_county/spot/topanga.html

Tegner, M.J, and L.A. Levin. 1983. Spiny lobsters and sea urchins: Analysis of a predator-prey interaction. Journal of Experimental Marine Biology and Ecology. Volume: 73, Issue: 2, Pages: 125-150.

Terry, R.D., S.A. Keesling, and Uchupi, E. 1956. Submarine geology of Santa Monica Bay, California. Report to Hyperion Engineers, Inc., Geology Department, University of Southern California, Los Angeles, CA. 177 pp.

Topanga Messenger, 2003. Available at: (http://www.topangamessenger.com/story). Accessed on October, 2011.

Trasatti, 1987. Progress in the Understanding of the Mechniasm of Chlorine Evolution at Oxide electrodes. Electrochimica Acta, Vol. 32, No. 3, pp. 369-382.

Tricas, T.C. and J.G. New. 1997. Sensitivity and Response Dynamics of Elasmobranch Electrosensory Primary Afferent Neurons to Near Threshold Fields. Journal of Computational Physiology. 1998. Vol. 182: 89-101. June 20, 1997.

U.S. Department of Commerce, 2011. Ocean and Coastal Resource Management. Coastal Zone Management Act. Available at: http://coastalmanagement.noaa.gov/czm/czm_act.html. Accessed: October 2011.

USEPA. 2007. Available at: http://water.epa.gov/type/oceb/nep/upload/2007_05_09_oceans. Accessed on October, 2011.

USEPA 2011. National Pollutant Discharge Elimination System. Clean Water Act. Available at: (http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45). Accessed on October, 2011.

USEPA 2011b. Laws and Regulations. Endangered Species Act. Available at: http://www.epa.gov/lawsregs/laws/esa.html. Accessed: October, 2011.

USEPA, 2011c. Laws and Regulations. Summary of Marine Protection, Research, and Sanctuaries Act. Available at: http://www.epa.gov/lawsregs/laws/mprsa.html. Accessed: October, 2011.

US Fish and Wildlife Service, National Marine Fisheries Service. 1999. Status review of anadromous Atlantic salmon in the United States. Hadley (MS): USFWS. P 1-131.

United States Fish and Wildlife Service (USFWS). 2005. Threatened and Endangered Species System, Life History of the California Least Tern. http://ecos.fws.gov/docs/life_histories/B03X.html. Accessed: October 2011.

USFWS. 2006. California Least Tern (*Sternula antillarum browni*), 5-Year Review Summary and Evaluation. Published September 2006.

USFWS. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*). In 2 volumes. Sacramento, California. 751 pages.

USFWS. 2008. Endangered and Threatened Wildlife and Plants; 12-Month Petition Finding and Proposed Rule To Remove the Brown Pelican (*Pelecanus occidentalis*) From the Federal List of Endangered and Threatened Wildlife; Proposed rule. Published February 20, 2008 on the Internet: http://frwebgate.access.gpo.gov . Accessed on October, 2011.

USFWS. 2010. Bald Eagle Management Guidelines and Conservation Measures Pacific Midwest Region website. Available at: http://www.fws.gov/midwest/eagle/guidelines. Accessed: October, 2011.

USFWS. 2011. Marbled murrelet from Pacific Southwest Region website. Available at: http://www.fws.gov/arcata/es/birds/MM/m_murrelet.html. Accessed: October, 2011.

USFWS, 2011b. Migratory Bird Treaty Act. Migratory Birds and Habitat Programs. Available at: http://www.fws.gov/pacific/migratorybirds/mbta.htm. Accessed: October, 2011.

Vanderhorst, J.R. 1982. Effects of chlorine on marine benthos. Report EPRI-EA-2696. Battelle-Northwest Marine Research Lab, Sequim, WA (USA): 102 pp.

Walker , M.M., C.E. Diebel, ad J.L. Kirschvink. 2003. Detection and use of the Earth’s Magnetic Field by Aquatic Vertebrates, Pp. 53-74 In Sensory Processing in Aquatic Environments (S.P> Collins and N.J Marshall, eds.). Springer, New York.

Watson, W., R. L. Charter, H. G. Moser, D. A. Ambrose, S. R. Charter, E. M. Sandknop, L. L. Robertson, and E. A. Lynn. 2002. Part III: Distributions of planktonic fish eggs and larvae in the vicinities of Big Sycamore Canyon and Vandenberg State Ecological Reserves, and Anacapa and San Miguel Islands in the Channel Islands National Marine Sanctuary. *In* Egg and larval fish production from marine ecological reserves, R. D. Vetter, H. G. Moser, and W. Watson. Marine Ecological Reserves Research Program Research Results—1996–2001, Proj. No. 4-M-N. CD-ROM. La Jolla, Calif.: Sea Grant Coll. Prog. 154.

Withers, P.C (1979) "Aerodynamics and Hydrodynamics of the ‘Hovering’ Flight of

Wilson'S Storm Petrel" *Journal of Experimental Biology* **80**: 83–91

Wolf, S., C. Phillips, J.A. Zepeda-Dominquez, Y. Albores-Barajas, and P. Martin. 2005. Breeding biology of Xantus’s Murrelet at the San Benito Islands, Baja California, México. Marine Ornithology 33: 123–129.

THIS PAGE INTENTIONALLY LEFT BLANK