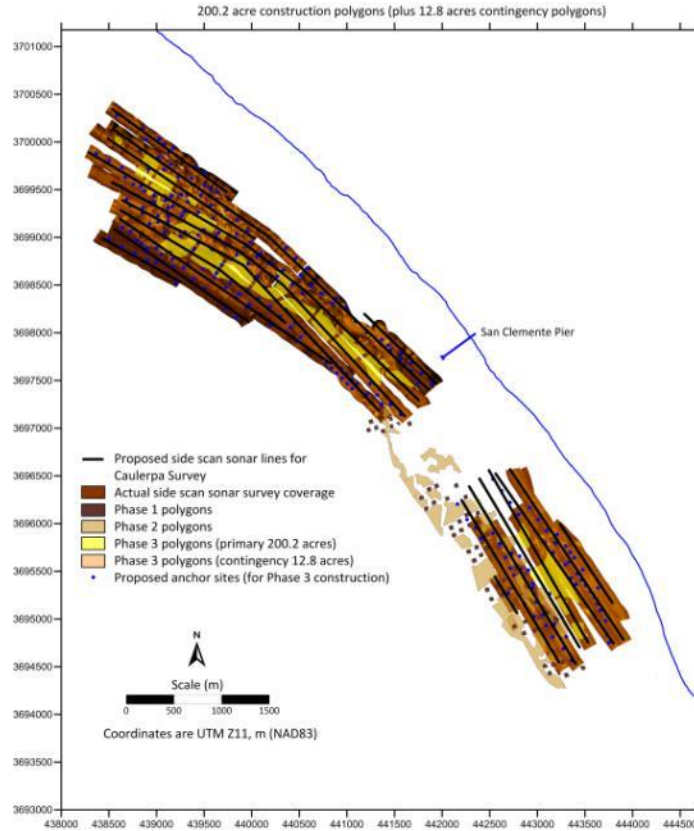


**WHEELER NORTH REEF GEOPHYSICAL SURVEY
SAN CLEMENTE, CALIFORNIA**

Field Operations Report



Submitted to:

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WHEELER NORTH REEF GEOPHYSICAL SURVEY SAN CLEMENTE, CALIFORNIA

Field Operations Report

1.0 INTRODUCTION

EcoSystems Management Associates, Inc. (ECO-M), a subsidiary of Coastal Environments (CE), conducted a geophysical survey offshore of San Clemente, California at Wheeler North Reef (WNR) on April 25, 2019. Survey operations were conducted by the *Orion*, a gasoline-powered survey vessel, using dual frequency side scan sonar. The purpose of the survey was to define and map the seafloor in the project area to assist in designing the expansion of the WNR restoration reef site.

The survey area and actual survey track lines are shown in Figures 1-1 and 1-2, respectively. Figure 1-3 illustrates the swath of side scan sonar survey coverage collected April 25, 2019. Table 1-1 gives the GPS coordinates of each survey track line. Surveys were performed approximately 0.6 miles offshore of the City of San Clemente, between the San Clemente City Pier to the north and San Mateo Point to the south, in approximately 11.5 meters (m) to 15 m water depth (38 to 49 feet [ft]).

1.1 PERMITTING: CALIFORNIA STATE LANDS COMMISSION

Prior to the geophysical survey work, ECO-M acquired the necessary permit from the California State Lands Commission (CSLC) Permit No. PRC 8536.9. As per permit requirements, a Marine Wildlife Contingency Plan was prepared, and a marine mammal observer was present during the surveys to ensure that marine mammals were not harmed by the low energy sonic pulses generated by the geophysical survey equipment. Any mammal observations made during the surveys were used to determine when survey activities should be altered or stopped to avoid interaction with marine mammals. A copy of the Marine Mammal Observer Report completed April 25, 2019 is provided in Appendix A.

1.2 BACKGROUND ON WHEELER NORTH REEF

WNR is currently the largest man-made reef in United States (174.4 acres), constructed in two phases by Southern California Edison Company (SCE) to mitigate for impacts to the marine environment. Although the WNR restoration reef site has seen many successes, it has yet to comply with fish standing stock absolute standards established in the California Coastal Commission (CCC) Permit No. 6-81-370-A. Therefore, in order to satisfy the CCC permit requirements, SCE has proposed to expand WNR restoration reef site by approximately 210 acres (Phase 3). Phase 3 aims to supplement the existing reef site and increase the overall fish standing stock. The results of the geophysical survey outlined in this report will assist in designing the project area for the Phase 3 expansion to more effectively comply with the goals of the WNR restoration reef site.

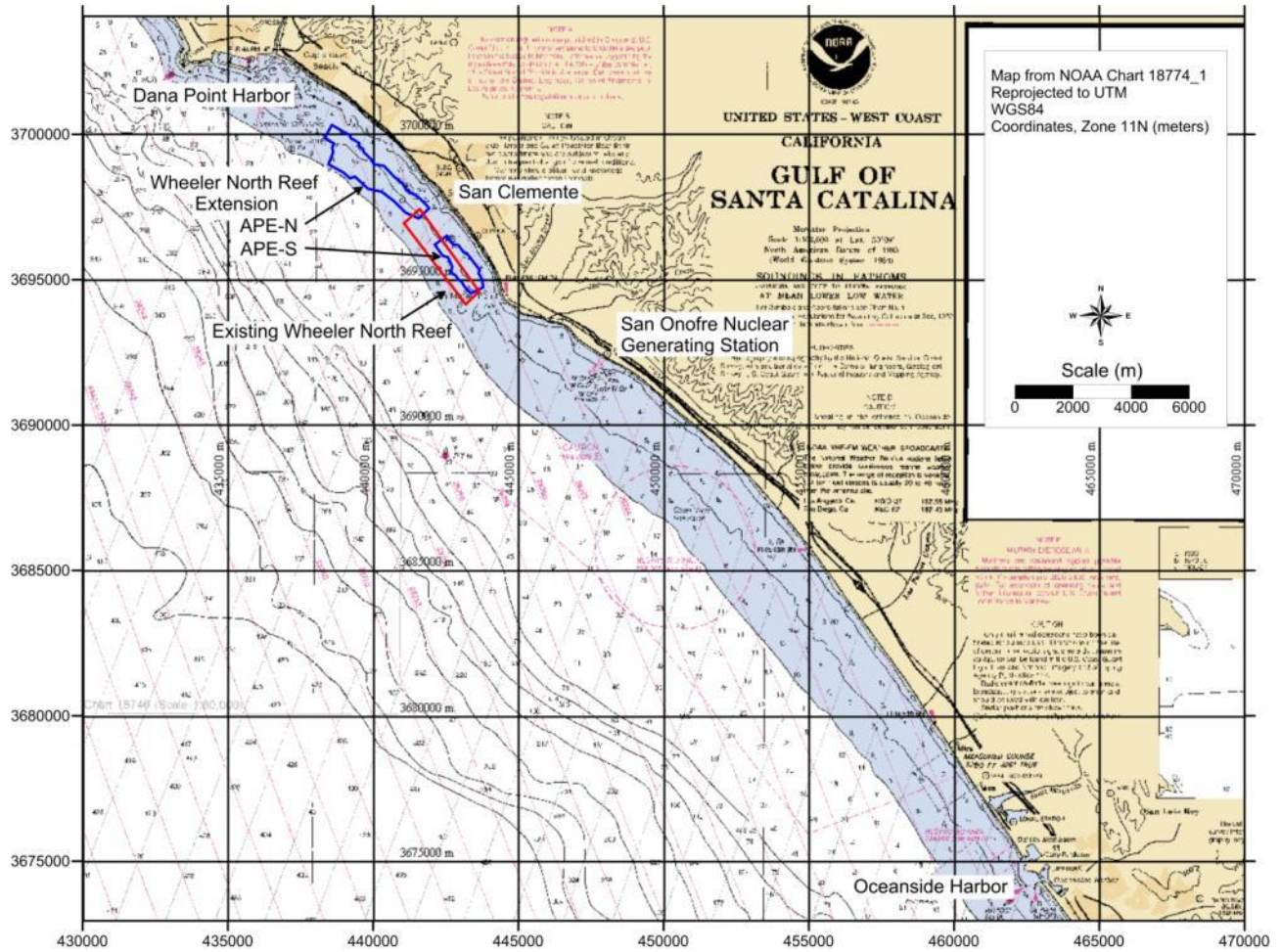


Figure 1-1. Map showing location of the geophysical survey offshore of San Clemente at Wheeler North Reef. The surveys were conducted in the Areas of Potential Effect (APEs) for the proposed Wheeler North Reef Extension and are shown outlined by the blue boxes. APE-N and APE-S are composite areas including all the anchor sites and designed reef polygons. The location of the existing Wheeler North Reef is outlined in red.

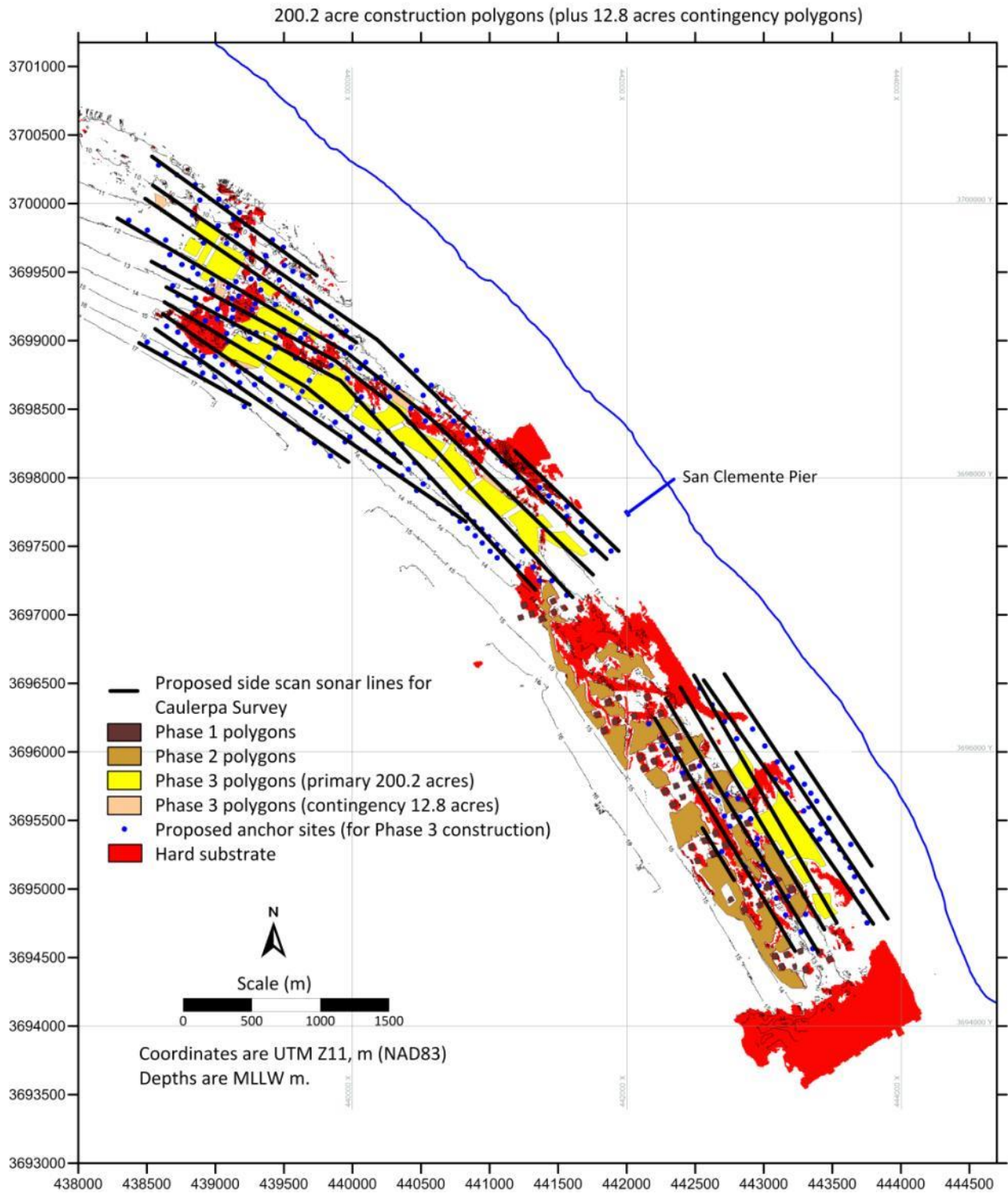


Figure 1-2. Map showing actual survey tack lines completed April 25, 2019 during the geophysical survey offshore of San Clemente at Wheeler North Reef.

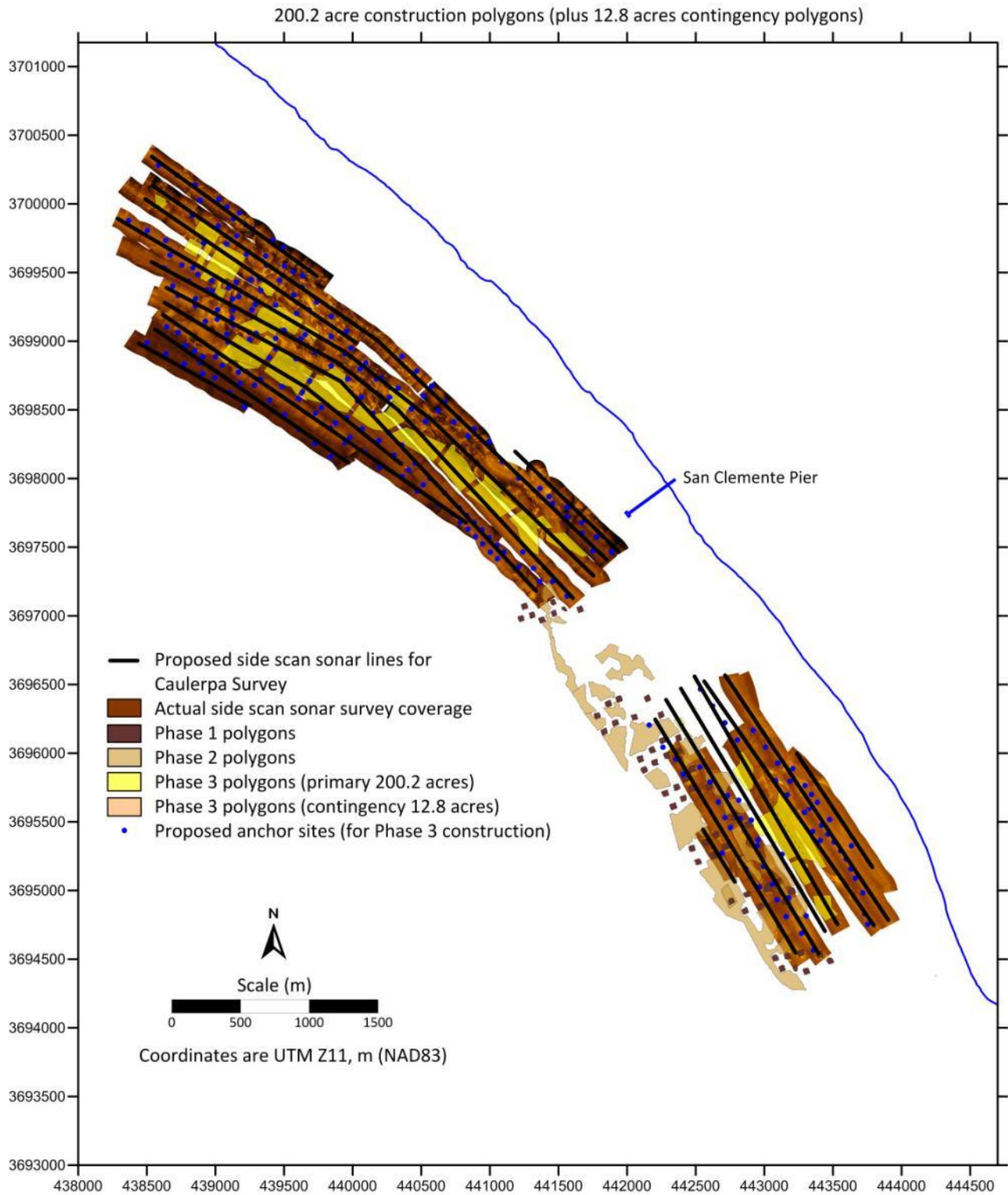


Figure 1-3. Map showing the actual side scan sonar survey coverage completed April 25, 2019 during the geophysical survey offshore of San Clemente at Wheeler North Reef.

Table 1-1. GPS longitude and latitude coordinates for the start and end points of each survey line completed April 25, 2019 during the geophysical survey offshore of San Clemente at Wheeler North Reef.

Line	Longitude Start	Latitude Start	Longitude End	Latitude End
1	-117.603168	33.390877	-117.616080	33.406904
2	-117.604298	33.390528	-117.617712	33.406500
3	-117.607160	33.390593	-117.618469	33.406813
4	-117.608624	33.388660	-117.620692	33.405272
5	-117.610417	33.388704	-117.621532	33.403975
6	-117.624441	33.414961	-117.632635	33.421514
7a	-117.625381	33.414428	-117.643478	33.428765
7b	-117.643478	33.428765	-117.661172	33.438827
8	-117.648260	33.432961	-117.661249	33.440726
9	-117.661763	33.437954	-117.645113	33.428572
10a	-117.626443	33.413394	-117.639161	33.423538
10b	-117.639161	33.423538	-117.645926	33.427934
10c	-117.645926	33.427934	-117.663924	33.436650
11a	-117.661228	33.433815	-117.646771	33.427376
11b	-117.646771	33.427376	-117.641840	33.424210
11c	-117.641840	33.424210	-117.628036	33.411909
12a	-117.630933	33.412369	-117.646352	33.426059
12b	-117.646352	33.426059	-117.660051	33.432133
13a	-117.660201	33.431157	-117.649023	33.425623
13b	-117.649023	33.425623	-117.641562	33.420650
14	-117.636439	33.416825	-117.660321	33.430365
15	-117.660912	33.429385	-117.645684	33.420708
16	-117.653450	33.424439	-117.662163	33.428455
17	-117.604355	33.394274	-117.610604	33.402025
18	-117.615549	33.394034	-117.617421	33.396399

2.0 SURVEY METHODS AND INSTRUMENTATION

2.1 SURVEY DATE

The survey was conducted on April 25, 2019 to provide data to assess the suitability and locations for the expansion of the WNR restoration reef site.

2.2 SURVEY VESSEL

Operations were conducted from the *Orion* (CA Registration CF 2250 TT), a 28 ft, gasoline-powered survey vessel. The vessel was equipped with the following primary equipment for execution of the survey:

1. Dual frequency side scan sonar; and
2. Trimble Global Positioning Satellite (GPS) antenna and differential GPS receiver.

2.4 DATA ACQUISITION AND INSTRUMENTATION

2.4.1 Global Positioning Satellite

A differential GPS navigation system was used to record the shot points at precisely one-second intervals during acquisition. The differential system used ties to the Coast Guard maintained permanent GPS base station in the area. Nominal GPS position accuracy is 10 m, and with differential technique, we achieved sub-meter position accuracy (< 1 m). The shot point navigation (geographic coordinates) during acquisition was based upon the World Geodetic System of 1984 (WGS84) and were converted to the California State Plane Coordinate System, zone 6, North American Datum of 1983 (NAD83), in ft. Shot point positions were determined by adding corrections for the layback or acoustic source distance behind the GPS antenna on the boat.

2.4.2 Dual frequency side scan sonar

The dual frequency side scan sonar was attached to the survey vessel via a cable tow in length of approximately 10 m. The equipment was deployed to 10-20 m below sea level and towed at an approximate speed of 3 knots. The frequency, source level and pulse rate are presented in Table 2-1.

2.5 DATA PROCESSING

The data collected from the side-scan surveys was performed using the Chesapeake™ post-processing module of SonarWiz 5. Data processing were tied to the local datum of Mean Lower Low Water (MLLW) by applying appropriate corrections for velocity of sound in seawater, transducer depth offset, and local tidal variations, depth of source, and receiver. Side-scan data were analyzed to map seafloor substrate distribution, particularly the presence of rocky outcroppings.

Table 2-1. Equipment specifications for dual frequency side scan sonar used on April 25, 2019 during the geophysical survey offshore of San Clemente at Wheeler North Reef.

Equipment	kHz	Source Level (dB re 1 μPa at 1 m [root mean square (rms)])	Pulse Rate and Length
Dual frequency side scan sonar	400	202 or 226 dB	0.2 ms

3.0 RESULTS

The results of the geophysical survey are shown in Figures 1-1, 1-2, and 1-3. Table 1-1 gives the GPS coordinates of each survey track line completed April 25, 2019.

The side-scan survey data confirmed that the survey area consisted of unconsolidated sediment bottom habitat. The hard substrate outcroppings were determined from the side-scan survey data (red areas in Figure 1-2). The existence of unconsolidated sediment bottom habitat suggests that the area surveyed may be conducive to reef placement. However, additional surveys to determine sediment thickness will be necessary to determine the ideal reef placement locations.

APPENDIX A
MARINE MAMMAL OBSERVER REPORT

WHEELER NORTH REEF GEOPHYSICAL SURVEY SAN CLEMENTE, CALIFORNIA

Marine Mammal Observer Report

Vessel: R/V Survey

Survey Team: Chris Esposito, Kyle Burger

Marine Mammal Observer: James Peeler

Date of Survey: April 25, 2019

The results of the Marine Mammal Observer report are described below. Daily field log reports are found in Table A-1.

Departure from Dana Point Marina: 7:15 AM

In transit to the survey site, one California sea lion (*Zalophus californianus*) was observed in the Dana Point Marina main channel. The sea lion was resting and was not disturbed by our vessel passing by. Approximately 10 minutes later, when passing by Permanent Buoy #2, just outside of the Dana Point Harbor jetty, two California sea lions were seen resting on the buoy. The sea lions were not disturbed by our vessel passing by.

Survey Sighting 1: 8:45 AM

Three Bottlenose Dolphins (*Tursiops truncatus*) were observed following and dining on a school of fish approximately 100 m on the starboard side of the vessel at 8:45 AM. The dolphins were observed while operating a 400 and 900 kHz dual frequency side scan sonar. They appeared to be exhibiting normal behavior with no change in behavior observed. There were multiple brown pelicans diving on the same school of fish. All the dolphins were traveling northwest. No mitigation required or taken.

Direction of travel: NW - 300 degrees

Total animals: 3

Distance when first observed: 100 m

Closest distance to the vessel: 80 m

Mitigation action: None taken, animals far away, and no change in behavior observed.

Survey Sighting 2: 8:53 AM

Six Bottlenose Dolphins (*Tursiops truncatus*) were observed following and dining on a school of fish approximately 80 m on the starboard side of the vessel at 8:53 AM. These were the same dolphins seen at 8:45, but a larger number of them. The dolphins were observed while operating a 400 and 900 kHz dual frequency side scan sonar. They appeared to be exhibiting normal behavior with no change in behavior observed. All the dolphins were traveling northwest. No mitigation required or taken.

Direction of travel: NW - 295 degrees

Total animals: 6

Distance when first observed: 80 m

Closest distance to the vessel: 60 m

Mitigation action: None taken, animals far away, and no change in behavior observed.

Survey Sighting 3: 11:40 AM

One California sea lion (*Zalophus californianus*) was observed at 11:40 AM approximately 80 m off the stern. The sea lion was resting and playing with a seagull who was sitting on the water next to the sea lion. The sea lion was observed while operating a 400 and 900 kHz dual frequency side scan sonar. The sea lion was demonstrating normal behavior and its behavior did not change when the survey was ongoing. No mitigation required or taken.

Direction of travel: None - resting

Total animals: 1

Distance when first observed: 80 m

Closest distance to the vessel: 80 m

Mitigation action: None taken, animal far away, and no change in behavior observed.

Survey Sighting 4: 12:20 PM

Three Short-beaked Common Dolphins (*Delphinus delphis*) were observed following and dining on a school of fish approximately 80 m on the port side of the vessel at 12:20 PM. The dolphins were observed while operating a 400 and 900 kHz dual frequency side scan sonar. They appeared to be exhibiting normal behavior with no change in behavior observed. There were multiple brown pelicans diving on the same school of fish. All the dolphins were traveling southwest. No mitigation required or taken.

Direction of travel: SW - 240 degrees

Total animals: 3

Distance when first observed: 80 m

Closest distance to the vessel: 20 m

Mitigation action: None taken, animals far away when first spotted. No change in behavior observed.

Survey Sighting 5: 12:28 PM

Four Short-beaked Common Dolphins (*Delphinus delphis*) were observed swimming and paralleling our survey vessel approximately 30 m on the port side of the vessel at 12:28 PM. The dolphins were observed while operating a 400 and 900 kHz dual frequency side scan sonar. They appeared to be exhibiting normal behavior with no change in behavior observed. Because of the proximity of the dolphins to our survey vessel, our survey team turned off the sound source until the dolphins had passed and gone out of sight. One of the dolphins was as close as 15 m from our vessel while the side scan sonar was turned off. All the dolphins were traveling northwest, the same direction as our survey vessel at the time.

Direction of travel: NW - 300 degrees

Total animals: 4

Distance when first observed: 30 m

Closest distance to the vessel: 15 m

Mitigation action: Side Scan survey sound source turned off for approximately 5 minutes while the dolphins were close to the vessel. No change in dolphins behavior seen. Sound source turned off for cautionary reasons.

Survey Sighting 6: 14:02 PM

Two Short-beaked Common Dolphins (*Delphinus delphis*) were observed following and dining on a school of fish approximately 100 m on the starboard side of the vessel at 14:02 PM. The dolphins were observed while operating a 400 and 900 kHz dual frequency side scan sonar fish. They appeared to be exhibiting normal behavior with no change in behavior observed. All the dolphins were traveling southeast. No mitigation required or taken.

Direction of travel: SE - 130 degrees

Total animals: 2

Distance when first observed: 100 m

Closest distance to the vessel: 100 m

Mitigation action: None taken, animals far away when first spotted. No change in behavior observed.

Return to Dana Point Marina: 15:00 PM

In transit back to the Dana Point Harbor, six California sea lions (*Zalophus californianus*) were observed on or next to Permanent Buoy #2. Five of the sea lions were resting on the buoy with one resting in the water with one of its flippers extended out. No survey equipment was being operated therefore no mitigation was required or taken. No change in behavior was witnessed while our vessel was passing by.

End of survey was around 15:00 PM and our boat docked in the harbor at approximately 15:30 PM.

Summary

Over the course of the survey day, nine total marine mammal sightings were recorded. Six of these sightings occurred during the side scan sonar survey and three occurred while in transit to or from the survey site. On one occasion, the survey equipment was turned off for approximately 5 minutes while up to four Short-beaked Common Dolphins were swimming parallel to our vessel and less than 20 m away from our vessel. This mitigation action was taken as a cautionary measure as no change in behavior of the dolphins was observed.

Table A-1. Marine mammal sightings for 25 April 2019.

Sighting No.	Time (PDT)	Lat (N)	Long (W)	Species	Dist. From Vessel (m)	Closest Dist. To Vessel (m)	Direction of Travel	No. Observed	Sound Source	Behavior Observed
1	7:30	33° 27' 14.8"	117° 43' 6.3"	CA Sea Lion	20	20	Resting	1	None / In transit to survey area	Sea lion resting, one flipper in air, seen in harbor
2	7:40	33° 27' 2.0"	117° 40' 3.9"	CA Sea Lion	15	15	Resting	2	None / In transit to survey area	Sea lions resting on Permanent Buoy #2
3	8:45	33° 05' 49.8"	117° 39' 32.0"	Bottlenose Dolphin	100	80	300°	3	400 and 900 kHz - dual frequency	Following and dining on a school of fish, no change in behavior from survey
4	8:53	33° 05' 49.8"	117° 39' 32.0"	Bottlenose Dolphin	80	60	295°	6	400 and 900 kHz - dual frequency	Following and dining on a school of fish, no change in behavior from survey
5	11:40	33° 25' 4.3"	117° 37' 55.2"	CA Sea Lion	80	80	Stationary	1	400 and 900 kHz - dual frequency	Resting and playing with seagull, no change in behavior from survey
6	12:20	33° 26' 2.3"	117° 39' 32.7"	Common Dolphin	80	20	240°	3	400 and 900 kHz - dual frequency	Chasing school of fish, no change in behavior from survey
7	12:28	33° 26' 15.3"	117° 39' 57.3"	Common Dolphin	30	15	300°	4	400 and 900 kHz - dual frequency	Parallel swimming with survey vessel on Port side, no change in behavior from survey detected but sound source was cut off for 5 minutes just to be safe
8	14:02	33° 25' 6.7"	117° 37' 49.5"	Common Dolphin	100	100	130°	2	400 and 900 kHz - dual frequency	Feeding on school of fish, no change in behavior from survey
9	15:03	33° 27' 12.4"	117° 41' 17.1"	CA Sea Lion	30	20	Resting	6	None / In transit to Harbor	5 Sea lions resting on permanent Buoy #2, 1 Sea lion resting in water with one flipper out