MARINE BIOLOGICAL FIELD SURVEY RESULTS
FEBRUARY-MARCH 2007, OCTOBER-NOVEMBER 2007, AND JUNE 2010 SURVEYS

DANA POINT HARBOR MARINA IMPROVEMENT PROJECT
DANA POINT, ORANGE COUNTY, CALIFORNIA

Prepared for:
LSA Associates, Inc.
20 Executive Park, Suite 200, Irvine, California
Contact: Rob Balen
(949) 533-0666

Prepared by:

Coastal Resources Management, Inc.
PMB 327, 3334 E. Coast Highway, Corona del Mar, CA 92625
Contact: Rick Ware, Senior Marine Biologist
(949) 412-9446

January 13th, 2008
Revised June 17th, 2010

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 PROJECT PURPOSE

Coastal Resources Management, Inc. (CRM) conducted marine biological resource surveys in Dana Point Harbor during February/March 2007, October/November 2007, and June 2010. The purposes of the investigation were to (1) determine if eelgrass (*Zostera marina*) or invasive algae (*Caulerpa taxifolia or Undaria pinnatifida*) were present in regions of the Harbor where proposed waterside improvement are proposed, (2) collect data on the presence/absence of other sensitive and non-sensitive species present in the Harbor on soft-bottom, piling, rip-rap and reef habitats that might be affected by marina improvements and (3) assess the potential environmental effects of construction and long-term operation of the marina on sensitive marine resources.

This report presents the results of detailed marine biological field surveys conducted by CRM. An environmental evaluation of the potential effects of the Harbor Waterside Improvement Project on marine resources is assessed in Coastal Resources Management, Inc. (2010a).

1.2 PROJECT LOCATION

Dana Point Harbor, constructed between 1966 and 1970, is located in the City of Dana Point, Orange County, California about 40 miles south of Long Beach/Los Angeles Harbors (Figure 1). It lies in the lee (protected side) of Dana Point Headlands within Capistrano Bay and is also protected by a 1.7 mile long and 14 to 18 feet (ft) high breakwater. Harbor channel widths vary from 350 feet in the anchorage areas to 600 feet at the harbor entrance (Wiegel, 1993) The Harbor is subject to in-filling of sands that migrate through the quarry stone-breakwater requiring periodic maintenance dredging to maintain safe water depths.

The marina within Dana Point Harbor ("the Harbor") is divided into two basins, the East Basin and West Basin (Figure 2). Figure 2 also lists the areas under discussion within this report. Each basin operates as a separate marina, with a total capacity of about 2,500 shallow-draft vessels. The boat launch ramp at the northeast corner of the Harbor is newly upgraded as of July 2007. Other facilities within the Harbor include the Dana Point Marine Institute, a dry boat storage hoist, fishing pier, shipyard, marine fuel dock, three yacht clubs, and a commercial sports fishing operation. Swimming is allowed at the west end of the Harbor, at Baby Beach. (http://www.ocparks.com/danapointharbor/).

1.3 PROPOSED PROJECT COMPONENTS

Table 1 and Figure 3 describe and illustrate the proposed marina improvements, respectively. Waterside upgrades include (1) the renovation and re-orientation of the East and West marina basin dock systems by replacing old and deteriorating docks, slips and gangways with new facilities; (2) dock redesign and improvements for the Youth Sailing Center, the Harbor Patrol facilities, Commercial Fishing Dock, the Sport Fishing dock,

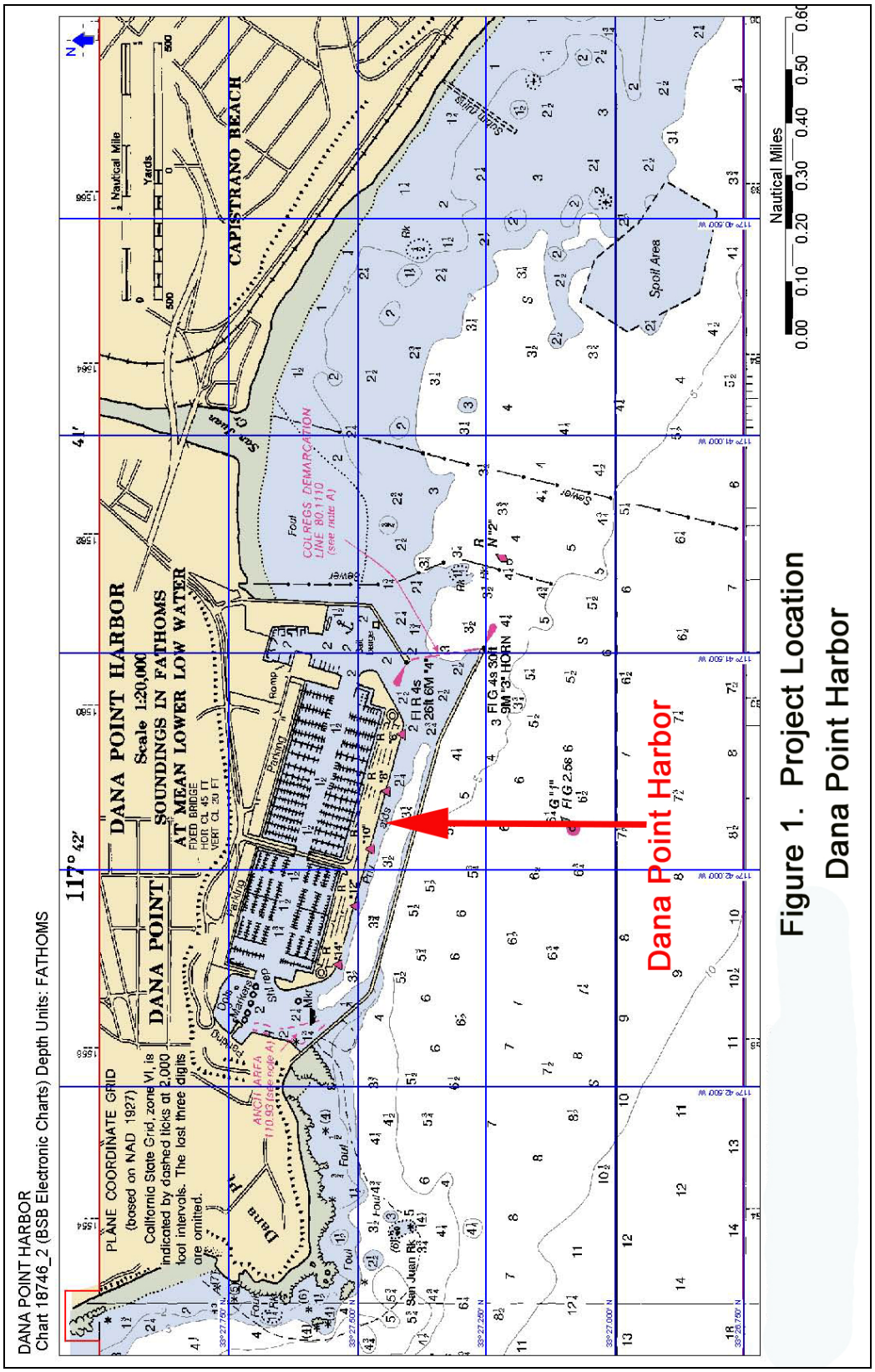
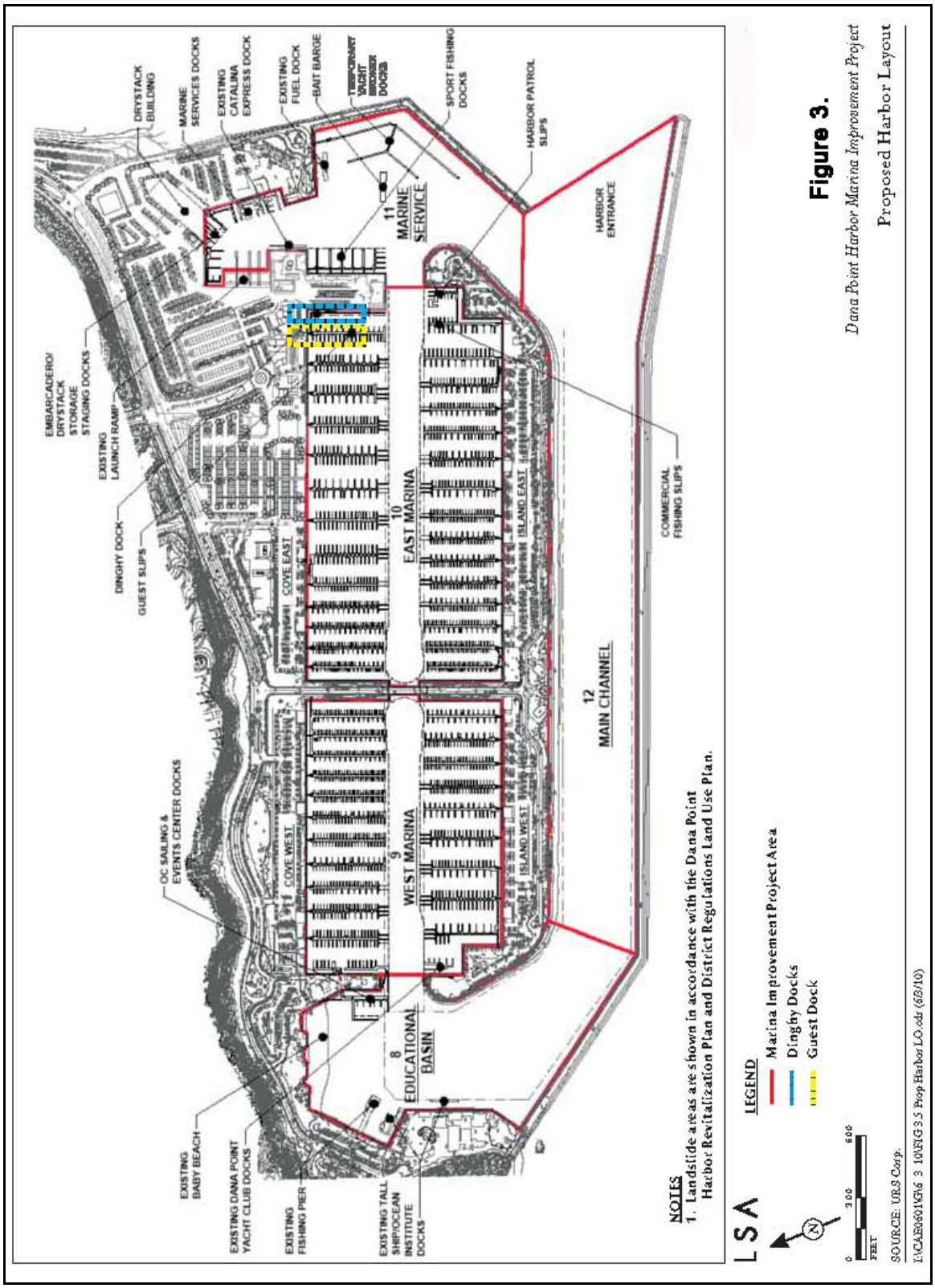


Figure 1. Project Location
Dana Point Harbor


FIGURE 2.
DANA POINT HARBOR STUDY LOCATIONS
COASTAL RESOURCES MANAGEMENT, INC.
BABY BEACH
YOUTH SAILING CENTER
WEST CHANNEL AND TURNING BASIN
COVE WEST MARINA
WEST BASIN
BRIDGE ABUTMENTS
COVE EAST MARINA
EAST BASIN
MAIN CHANNEL
WEST BREAKWATER
ENTRANCE CHANNEL
EAST BREAKWATER
EAST CHANNEL
SPORTFISHING DOCKS
COMM DOCKS
HARBOR PATROL DOCKS
MARINE SERVICES
DRY STACK STORAGE
Dana Point Harbor Dr
Puerto Pl
Street of Golden Lantern
Castile Pl
Dana Dr
Old Golden Lantern
Shore Lantern
Starboard Lantern
Cove Lantern
Eastern Lantern St
Lantern Bay
Green Lantern
Blue Lantern
Cove Rd
Amber Lantern
Santa Clara Ave
Violet Lantern St
El Camino Capistrano
Pointer lat 33.460258° lon -117.698844° elev 0 ft
1508 ft
© 2007 Navteq
Streaming 100%
©2006 Google
Eye alt 5218 ft

Table 1. Proposed Project Components. Source: LSA Associates, Inc.

Element	Existing Conditions	Proposed Project Improvements
Floating Docks(East/West Marinas and Satellite Areas)	Floating docks supported by 1,306 concrete filled steel pipe piles 2,409 boat slips Average slip length of 29.85 feet (ft). Majority of West Marina slips oriented west-east. East Marina slips oriented north-south Approximately 492,530 square feet (sf) of area covered by floating docks	Remove existing piles and replace with 969 piles 2,293 boat slips (loss of 116 slips) Average slip length not to exceed 32 ft West Marina slips to be reoriented to a north-south direction. East Marina slips to remain oriented north-south Approximately 459,540 sf[1] of area covered by floating docks
Access	52 existing gangways	59 gangways plus 9 ADA gangways, for a total of 68 gangways
Boat Services	3 sewage pump outs	4 upgraded sewage pump outs
Utilities	electrical service, water service, telephone and cable service Dock Boxes	Upgraded electrical service, water service, telephone and cable service New Dock Boxes
Embarcadero/Dry Stack Storage Staging Docks	766 linear feet (lf)	1,300 lf
Marine Services Docks	1,190 lf	896 lf
Sport Fishing Docks	1,350 lf	1,350 lf
Guest Slips	42 existing slips	46 proposed slips
Dinghy Dock	No existing dinghy dock	374 lf
Harbor Patrol Slips	8 existing slips plus 2 emergency side-ties	8 proposed slips plus 2 emergency side-ties
Commercial Fishing Slips	15 existing slips plus 1 end-tie for California Department of Fish and Game boat	15 proposed slips plus 1 end-tie for California Department of Fish and Game boat
OC Sailing and Events Center Docks	890 lf	893 lf
Temporary/Yacht Broker Docks	No existing temporary/yacht broker docks	1 dock located along the breakwater next to Doheny State Beach – approx. 2,590 lf


DRYSTACK BUILDING
MARINE SERVICES DOCKS
EXISTING CATALINA EXPRESS DOCK
EXISTING FUEL DOCK
BAIT BARGE
TRANSIENT YACHT HARBOR DOCKS
SPORT FISHING DOCKS
HARBOR PATROL SLIPS
HARBOR ENTRANCE
11 MARINE SERVICE
EMBARCADERO/ DRYSTACK STORAGE STAGING DOCKS
EXISTING LAUNCH RAMP
DINGHY DOCK
GUEST SLIPS
COVE EAST
10 EAST MARINA
ISLAND EAST
COMMERCIAL FISHING SLIPS
12 MAIN CHANNEL
OC SAILING & EVENTS CENTER DOCKS
COVE WEST
9 WEST MARINA
ISLAND WEST
8 EDUCATIONAL BASIN
EXISTING BABY BEACH
EXISTING DANA POINT YACHT CLUB DOCKS
EXISTING FISHING PIER
EXISTING TALL SHIP/OCEAN INSTITUTE DOCKS
NOTES
1. Landslide areas are shown in accordance with the Dana Point Harbor Revitalization Plan and District Regulations Land Use Plan.
LSA
LEGEND
Marina Improvement Project Area
Dinghy Docks
Guest Dock
0 300 600
FEET
SOURCE: URS Corp.
I:\CAD\601\Fig 3 10\EIG 3-5 Prop Harbor LO.cdr (6/8/10)
Figure 3.
Dana Point Harbor Marina Improvement Project
Proposed Harbor Layout

the Dry Stack facility, and the Shipyard docks; (3) the construction of for vessels that will be displaced during marina reconstruction.; (4) the addition of handicap access at locations where it currently is not available; (5) upgrading vessel pump out facilities; and (6) upgrading electrical service water service.

The number of boat slips within the Harbor will decrease from 2,409 to 2,223 (a loss of 116 slips) although the average slip length will increase from 29.85 ft to a length not to exceed 32 ft. A total of 1,306 existing piles will be removed and 969 new piles will be emplaced.

2.0 FIELD SURVEY METHODS

Underwater marine biological field surveys were conducted by CRM marine biologists Rick Ware, Stephen Whitaker, and Tom Gerlinger on February 20th, March 6th, March 16th, and November 2nd, 2007; October 31st and November 1st, 2007 (remote underwater video surveys to augment the diver-surveys, which allowed for larger areas of the bottom habitat to be covered); and June 7th and 8th, 2010. The surveys conducted in 2010 were conducted by Mr. Rick Ware and Mr. Mike Anghera, and focused on zones and depths in Dana Point Harbor that had the highest potential for the presence of eelgrass, *Zostera marina*. Surveys were conducted from the CRM vessels RV *Stacy-Ann*, RV *Macsam*, and a 14 ft Achilles inflatable vessel.

Underwater transect surveys were conducted using SCUBA. The surface support individual was in communication with the diving-biologists using an Ocean Technology Systems, Inc. (OTS) communication system due to the potential danger involved while conducting underwater surveys in the active vessel areas. Surveys were conducted in accordance with both the *Southern California Eelgrass Mitigation Policy* (National Marine Fisheries Service 1991 as amended) and the *Caulerpa Control Protocol* (National Marine Fisheries Service, Version 2.1, March 2006).

A total of 329 variable-length underwater transects (5 meters [m] to 258 m in length) were swam using SCUBA throughout Dana Point Harbor where waterside developments are planned (Figures 2 and 4) and in areas where eelgrass potentially can be found in shallow water habitat. Fourteen dock piles in the Cove East and the Island East marina basins were also surveyed to determine the types and relative abundances of marine organisms that might be affected by marina construction.

During the transect swims and the inspection of the dock support piles, divers recorded habitat types, common marine life, and the presence or absence of eelgrass and invasive algae. Depths were standardized to Mean Lower Low Water (ft, MLLW) based upon time of observation and tidal corrections for the NOAA San Clemente tidal survey station.

In addition to diver surveys, CRM also conducted Remote Underwater Video (RUV) surveys to determine the presence of eelgrass, invasive algae, other organisms, and habitat types due to the large area of harbor seafloor in the West Channel that needed to be surveyed. The camera system used for the surveys was an Ocean Systems, Inc. Deep Blue Professional Grade Underwater Video Camera ("Splash Cam") attached to a

military-grade umbilical cable (Photograph 1). The camera dimensions are 3" diameter wide and 3.5" long. The unit's resolution is 540 TV lines, the CCD is a 1/3" Sony Super HAD, and the focus is fixed 1 inch to focal infinity. The light sensitivity index is extremely low, 0.15. The lens is a 3.6 mm wide angle lens. It is designed to operate in super low light conditions.

Photograph 1. Deep Blue Splash Cam

Real-time observations of the Harbor benthos were collected by conducting a running series of variable-length underwater video transects ranging in length from 0.16 to 1.67 miles long at all sites except for the East and West Marina Basins (Figure 4).

The tow speed of the camera varied from 0.3 knots to 0.9 knots and the camera elevation about the bayfloor varied from approximately 1 to 3 ft above the bottom, with a slightly down-angle field of view. Real-time observations were observed on board the vessel using a color monitor, integrated with a GPSBox Plus GPS Video Overlay Unit. Vessel track lines were recorded with a Thales Mobile Mapper Differential GPS Unit.

When a potential eelgrass, algae, or other significant target was observed on the video monitor, the information was recorded, and a closer inspection of the target was made with the camera. Representative bottom conditions covered during the remote video survey were recorded on a Sony DVD player that provided a summary of bottom habitat conditions throughout the Dana Point Harbors study area. Track lines of the RUV survey are provided in Appendix 1.

Caulerpa Survey Protocols. Dana Point Harbor is considered a "non-infected" system and requires a "surveillance level" monitoring effort for the presence of *Caulerpa.* The following information is extracted from the National Marine Service *Caulerpa Control Protocol* in regards to the level of survey effort required. "*Surveillance Level* – General survey coverage providing a systematic sub-sampling of the entire APE during which at least 20% of the bottom is inspected and widespread occurrences of *Caulerpa* would be expected to be identified if present. Surveys may be accomplished using diver transects, remote cameras, and acoustic surveys with visual ground truthing. Other proposed

methodologies may be approved on a case-by-case basis by NOAA Fisheries and CDFG".

3.0 SURVEY RESULTS

3.1 PROJECT AREA

The surveys covered 6.28 acres of harbor bottom habitat (Table 1 and Figure 4). Overall, the bottom area surveyed by both diving biologists and remote video averaged 24.7% of the total bottom habitat within the project survey limits, ranging from 13.9% in the East and West Marina basins to over 100% coverage in the at the Youth Sailing Center and the Harbor Patrol basin. Baby Beach areal cover (by divers and video in 2007 and 2010) encompassed a minimum of 187% of the survey area, and reflected a survey effort concentrated in a region where there was a probability of locating eelgrass since a very small patch of eelgrass (three turions) was located there in April 2005 (Chambers Group, Inc., 2005).

The eelgrass survey area in 2010 was concentrated along the eastern one-third of Baby Beach from depths of -3 to -12 ft MLLW beginning immediately west of the existing Sailing Center Dock and all of the basins at the Embarcadero and Dry Stack/Staging Area s north of the launch ramp (Figure 4).

Table 2. Areas Surveyed in Dana Point Harbor*

Location	Bottom Habitat Survey Area (Acres)	Area of Potential Biological Impact (Acres)	% Total Area Covered*	Depth Range (ft, MLLW
Baby Beach	1.40	0.75	186.7	-3 to -10
Bridge Abutment Slopes	0.06	0.08	75.3	+3 to -10
Commercial Fishing Docks	0.12	0.58	20.3	+3 to -15.9
Dry stack/Shipyard Basins	0.30	0.36	83.5	-12.4
Harbor Patrol Basins	0.28	0.13	221.9	+3 to -15.9
Marina Basins	2.98	21.43	13.9	+3 to -11
Sport fishing Dock Basin (inner ½ to bulkhead) and immediately seaward of docks	0.35	0.36	97.6	+3 to -15.4
Temporary Dock Area, East Channel	0.88	2.04	43.0	+3 to -12
Youth Sailing Center	0.12	0.10	110.7	+3 to -12
Total	**6.28**	**25.28**	**24.7**	**+3 to -15.9**
Other Regions Surveyed				
West Jetty Channel Slope**	0.42	none**	**	-2 to -12
Main Channel**	1.9	none**	**	+3 to -20.4
*** Includes both biologist/diver and remote video survey coverage**				
**** Not in project area**				

3.2 PHYSICAL ENVIRONMENT

3.2.1 Survey Depths

The underwater field surveys were conducted throughout harbor at depth ranges between the +3 ft MLLW mid-intertidal (during high tides) to a maximum of -20.4 ft (MLLW) found in the Main Channel and the East Channel. Intertidal observations on bulkheads were at elevations between approximately +1 to +7 ft MLLW.

3.2.2 Substrate Types

Unconsolidated sediments. Surficial sediments within all the marina and harbor basins were fine sands to extremely fine silts although underlying sediments tend to be sandier (Geotechnical Inc., 2006). Unconsolidated sediments in the Turning Basin and the East Channel near the Youth Sailing Center were sandy silts but visually, increased in sand percentages closer to the Baby Beach shoreline. Sediments were coarsest in the West Basin near the Youth Sailing Center; and on the south side of the bait barge along the base of the East Breakwater (Temporary Dock area). In each of these areas, sediment sized decreased with depth. Significant amounts of trash and debris (cans, bottles, plastic bags, fishing lines, etc.) was also found on the bottom all along the base of the East Breakwater.

Hard substrate. Intertidal and subtidal rock quarry stone and smaller rip rap is present in many areas of Dana Point Harbor and serves as protection for bulkheads and shorelines. The breakwaters and the south side of the East and West Island marinas consist of larger quarry stone, whereas the rip rap that protects the bulkheads of the marinas in the vicinity of the Youth Sailing Center and the Sport Fishing Dock consist of small-to moderate-sized rip rap. Sloped, cement quay walls occur around the perimeter of the marina basins and at the bridge abutments. These cement slopes were covered by a light to moderate layer of fine sediments.

Pilings and docks are attachment surfaces for plants and invertebrates. This community of organisms is commonly referred to as the "biofouling community". These hard surfaces extend between the highest high tide line and the Harbor bottom depths, supporting both an intertidal and subtidal complex of organisms. This habitat type is common throughout the Harbor.

Exposed natural reef is present within many areas of the Harbor, a remnant of the extensive reef habitat that was present prior to the construction of the Harbor. Isolated rock habitat in the marina basin that was observed during the subtidal surveys included three, single rock outcrops in the Island West Basin and one moderate relief (1 meter high) rock outcrop in Cove West Basin. These outcrops were at depths between -8 and -10 ft MLLW. Other outcrops are likely present but not observed during the surveys. Outside of the marina basins, scattered low to medium relief (<1 to 2 meter high) reef outcrops and isolated boulders were located in the Turning Basin west of the Youth Sailing Center docks at depths between -3 and -8 ft MLLW; in the Main Channel and East Channel at depths between -8 and -20 ft MLLW; in the East Channel seaward of the Sport Fishing Docks; and in the

Anchorage Area at the north end of the proposed temporary dock (north of the existing bait barge) at depths of -12 ft MLLW.

3.2.3 Underwater Visibility and Water Temperature Conditions During The Surveys

Low underwater visibility conditions were encountered during the February and March 2007 survey and ranged between 1 and 3 ft within the marina basins and 1 to 4 ft in the vicinity of Baby Beach and the Youth Sailing Center. By comparison underwater visibility averaged about 3 ft near the boat launch ramp in August 2006 (Chambers Group, Inc 2006) and 8 feet at depths of 0.0 to -10 ft MLLW at Baby Beach in April 2005 (Chambers Group, Inc., 2005). During the October/November 2007 survey, underwater visibility was still limited within the marina basins, but was substantially better in the Main and West Channels where visibility approached 8 to 10 ft in the West Main Channel and in the East Channel on the south side of the bait barge in the vicinity of the proposed temporary docks. In June 2010, underwater visibility was approximately 2-3 feet near Baby Beach, 5-10 ft in the West Main Channel, and 2 feet in the East Channel near the bait barge and the dry stack storage area.

Water temperature ranged between 57 and 59 degrees Fahrenheit during the February/March 2007 survey; 62 and 66 degrees Fahrenheit survey during the October/November 2007 survey; and 65 and 67 degrees Fahrenheit during the June 2010 survey.

3.3 MARINE BIOLOGICAL RESOURCES

Eight-seven (88) taxa of marine plants, invertebrates, and fishes were observed during the field surveys (Table 2 and Appendix 2). Marine plants contributed the highest number of taxa (33.3% of the total). Mollusks (octopus, snails and clams) contributed the second highest number (22.7 % of the total), followed by fish (11.5%), annelid worms (8.0) and arthropods (5.7%).

3.3.1 Soft-Bottom Benthic Habitat

The soft-bottom epibenthic community (organisms that live on the sediment surface or protrude from the sediments) exhibited low species richness (10 species) throughout the Harbor (Table 3). Sediments within the East and West basins and other areas were lightly coated with a layer of benthic diatoms, and secondarily, spotty cover of the algae *Chaetomorpha aerea* and *Ulva intestinalis*. This was typical in areas of lower tidal current flows.

The most common occurring macro invertebrate on soft sediments was the predatory snail *Navanax inermis*, which was ubiquitous throughout the Harbor soft-bottom habitats. The burrowing anemone *Pachycerianthus fimbriatus* was common within the West Marina although found in many areas of both marina basins and in the Main Channel.

Table 3. Number of Marine Taxa Observed During the CRM Dive Surveys, Feb/Mar 07, Oct/Nov 07, and June 2010.

Taxonomic Group	Total Taxa	% Total
Algae	29	33.0
Seagrasses	1	1.1
Porifera	2	2.3
Cnidaria	6	6.8
Platyhelminthes	1	1.1
Annelida	7	8.0
Arthropoda	5	5.7
Mollusca	20	22.7
Bryozoa	3	3.4
Tunicata	4	4.5
Fish	10	11.4
Total	**88**	**100.0**

Table 4. Number of plants, invertebrate, and fish taxa in the Dana Point Harbor Survey Areas-Feb/Mar, Oct/Nov 2007, and June 2010

Region of Harbor	Total Number of Taxa
Island Way Bridge Abutment (north side)	12
Marina Pilings	36
Marina Quay Walls	18
Youth Sailing Center Rip Rap and Reefs, and Soft-benthos (epibiota)	41
All Areas Within East and West Marina Basins	**59**
Main Channel Reefs, Rip Rap, and Soft Epi- Benthos	49
Temporary Dock Area (Hard-bottom and Soft-bottom epi-benthos	28
Sport Fishing Docks (Hard-bottom)	25
All Soft-bottom Substrate in Survey Areas (epibiota)	11
All Hard Substrate in Survey Areas Outside West and East Marina Basins	68
All Hard Substrate in Survey Areas, Dana Point Harbor	81
All Soft and Hard Bottom Substrate in Survey Areas, Dana Point Harbor	**88**

The tube-building polychaete *Diopatra ornata* the bubble snail *Haminoea vesicula* were observed where sediments were sandier in the East Channel near the southern section of the proposed temporary dock area. Notably, no marine invertebrates or algae were observed on the soft substrates within the Dry Stack or the Ship Yard basins.

Very few sightings of fish were observed over sedimentary habitats, likely due to low visibility. Of the two species observed, only the round sting ray (*Urolophus halleri*) was common. Other, unidentified flat fish were seen, but could not be identified. However, there are several other species of fish that occur in other bays and harbors in southern California that are likely to be present in Dana Point Harbor. These include gobies (*Clevelandia ios*), and flatfish (California halibut, *Paralichthys californicus;* diamond turbot, *Hypsopsetta guttulata*).

Water-column species such as topsmelt (*Atherinops affinis*), northern anchovy (*Engraulis mordax*), black surfperch (*Embiotoca jacksoni*), shiner surfperch (*Cymatogaster aggregata*), walleye surfperch (*Hyperprosopon argenteum*), white croaker (*Genyonemus lineatus*), queenfish (*Seriphus politus*) and white surfperch (*Phanerodon furcatus*) are also common within southern California marinas and are also expected to be present in Dana Point Harbor.

3.3.2 Rocky Intertidal and Subtidal Habitat (Pier Pilings, Rock Rip Rap, Cement Bulkheads, and Natural Reefs)

Most plants and invertebrates were associated with harbor artificial hardscape and natural reef (81 of 88 taxa). Of the various hard-bottom habitat types, 59 were associated with East and West marina hard substrate, and 68 were present on hard substrate in the Main Channel, West Channel, and East Channel on larger quarry stones and natural reefs (Table 3). The most productive areas were reefs and quarry stone in the Main Channel (49), the hardscape of the Youth Sailing Center reefs (40), marina pilings (36), the hardscape of the East Breakwater quarry stone and isolated reefs near the temporary dock (25), and the hardscape of the Sport Fishing Dock bulkhead and rip rap (25).

East Marina Basin Piling Community. Thirty-six taxa were observed on 14 piles scattered throughout the East Marina (Table 3). While the cumulative number of taxa observed on pilings was 36 for all piles, the number of taxa on a single pile varied between five and 11. Species richness decreased with depth. The dominant organisms on the upper three feet of the pilings included a complex of green algae (*Ulva intestinalis*), a turf and filamentous red algae complex, brown algae (*Colpomenia perigrina*, *Dictyota flabellata*, and *Sargassum muticum),* hydroids (*Aglaophenia* sp.), serpulid polychaete worms, barnacles (*Balanus amphitrite* and *B. glandula*), and mussels *(Mytilus galloprovincialis*). The mid-depth piling community (-3 to -7 ft) was dominated by polychaete worms (serpulids and the calcareous tube-building *Dodecaceria fewksii*), mussels, solitary tunicates (*Styela plicata*), and ectoprocts (*Bugula neritina* and unid. encrusting ectoprocts). The bottom depth piling community (-7 to -10 ft MLLW) was dominated by tunicates, ectoprocts, and hydroids.

Marina Basin Quay Walls. The sloping, cement bulkhead around the perimeter of Cove East and West and Island East and West Basins (including the Harbor Patrol Basin) supported 18 species of algae and invertebrates. However, this habitat exhibited a low diversity of taxa and extremely low percent cover of marine life. The most conspicuous species was the calcareous, tube-building polychaete *Dodecaceria fewksii* that formed small colonies on most of the quay walls examined. Other common species included lined-shore crabs (*Pachygrapsus crassipes*), solitary ascidians, and scattered, juvenile mussels. A fine silt layer, approximately 1-2 cm deep, covered the substrate. Other than *Dodecaceria*, most of the flora and fauna were found in the depressions formed by the meeting of adjoining cement sections of quay wall.

Island Way Bridge Abutments. Twelve taxa were represented on the north bridge abutment at depths between +3 to -10 ft MLLW. This site consisted of a low-diversity assemblage of macrophytes and invertebrates due to a lack of sunlight and a coating of sediment over the concrete slope. Four macrophytes were observed-*Corallina pinnatifolia*, *Dictyota binghamiae, Dictyopteris undulata,* and *Colpomenia sinuosa*. The dominant invertebrates included acorn barnacles (*Balanus glandula, Chthamalus fissus/dalli*), bay mussels (*Mytilus galloprovincialis*), tunicates (*Styela plicata*), sponges (*Leucosolenia* sp.), and hydroids (*Aglaophenia* sp); hydroids exhibited the highest cover.

Breakwater Quarry Stone and Natural Reef, Main Channel

This area is located outside of any harbor improvements. Substrata at depths between the intertidal to -7 ft MLLW was primarily quarry stone rip-rap. Naturally occurring low-to moderate relief reefs were present throughout the area surveyed in the channel.

The most productive intertidal and subtidal habitats were those associated with large quarry stone and natural reef outcrops. These areas supported a diverse assemblage of macrophytes and invertebrates and fishes (49 taxa) characteristic of communities associated with a greater degree of wave exposure than protected marinas. The common red macrophytes include articulated corallines (*Corallina chilensis*, *C. pinnatifolia*, *Lithothrix aspergillum*, *Amphiroa zonata*, *Bossiella orbigniana*), coarsely branched red algae (*Gelidium purpurascens*), and crustose corallines (*Lithothamnion* spp.), while other less common red macrophytes included *Ceramium*/*Polysiphonia* spp., *Cryptopleura crispa*, and *Laurencia pacifica*. This habitat also supported a rich brown macrophyte community including Dictyotales (*Dictyota binghamiae, Dictyopteris undulata, Zonaria farlowii, Taonnia lennebackerae*), the Fucales (*Sargassum muticum, Halidrys dioica*), and one member from both the Laminariales (*Eisenia arborea*) and the Scytosiphonales (*Colpomenia sinuosa*). Giant kelp (*Macrocystis pyrifera*) was also present, in very low abundances. Many of the plants observed had only a few number of thin stipes, and were in poor condition.

The most conspicuous lower-intertidal and subtidal invertebrates included limpets (*Lottia limatula, L. gigantea, L. scabra*), barnacles (*Balanus glandula, Chthamalus fissus/dalli*), scaly tube snail (*Serpulorbis squamigerus*), and trochiid snails (*Tegula eiseni*). Larger, but less abundant invertebrates included lobsters (*Panulirus interruptus*), gorgonians (*Muricea californica*), warty sea cucumbers (*Parastichopus parvimensis*), rock scallops

(*Crassedoma giganteum*), festive murex snails (*Pteropurpura festiva*), and tunicates (*Styela plicata*). No sensitive or listed species of plants, invertebrates, or fishes were documented from this site.

Breakwater Quarry Stone and Isolated Reefs, East Basin Temporary Dock). Similar to the area surveyed in the Main and West Channel, hardscape in the Anchorage Area near the breakwater supported many plant and invertebrate form in response to adequate tidal exchange and tidal currents, and suitable substrate. The East Breakwater provided the most extensive hard-bottom habitat. Common red macrophytes present in the low intertidal and shallow subtidal zone included articulated corallines (*Corallina chilensis, C. pinnatifolia, Amphiroa zonata*), crustose algae (*Lithothamnion* spp., *Peyssonneliaceae/Hildenbrandiaceae*) and secondarily, *Ceramium*/*Polysiphonia* spp. and *Laurencia pacifica*. Several species of brown macrophytes were also present-*Dictyota binghamiae, Dictyopteris undulata, Zonaria farlowii, Taonnia lennebackerae*) *Sargassum muticum, Halidrys dioica, Eisenia arborea* and *Colpomenia sinuosa*.

A fauna similar to the West Channel quarry stone community was also found at this site and included limpets (*Lottia limatula, L. scabra, Crepidula onyx*), barnacles (*Balanus glandula, Chthamalus fissus/dalli*), and trochiid snails (*Tegula eiseni*). The snails *Pteropurpura festiva* and *Acanthina spirata* were also present, but were not as common.

North of the bait barge, a few moderate relief (1.5-2 m high) rocky reefs were located. These reefs supported few macrophytes and macro invertebrates than the East Breakwater. Species that were observed included the red algae complex *Ceramium*/*Polysiphonia* spp., and *Rhodymenia californica;* brown macrophytes (*Sargassum muticum*, *Dictyopteris undulata*); slipper limpets (*Crepidula onyx*); and gorgonians (*Muricea fruticosa*).

A significant amount of trash was observed while surveying the East Breakwater biological communities. This debris was concentrated at the base of the breakwater lodged in the rocks as well as on the sediments at the base of the breakwater rocks.

Youth Sailing Center Reefs and Rip Rap. Rip rap behind the docks and low relief natural reef in the Turning Basin in front of the Youth Sailing Center docks supported a large number of species-40 taxa of plants and invertebrates similar in nature to those occurring in the marina piling community and the quarry stone/natural reef habitats in the West Channel and Main Channel. Dominants included the southern sea palm algae (*Eisenia arborea*) the brown seaweed *Sargassum muticum*, coralline turf algae, and invertebrates such as sponges, colonial polychaete worms, lobsters (*Panilurus interruptus*, snails (*Kelletia kelletii*), limpets (*Lottia digitalis*), slipper limpets (*Crepidula onyx*), and mussels (*Mytilus galloprovincialis*).

On the south side of the Youth Sailing Center, rip rap lined the cement bulkhead. The most commonly red algal forms included articulated corallines (*Corallina pinnatifolia, Amphiroa zonata*), coarsely branched red algae (*Gelidium purpurascens*), and crustose corallines (*Lithothamnion* spp.). Small, red turf algae (*Ceramium* and *Polysiphonia* spp.) were less common but present. The dominant brown macrophytes were *Dictyota*

binghamiae, *Dictyopteris undulata*, and *Sargassum muticum*. Barnacles (*Balanus glandula, Chthamalus fissus/dalli*), lobster (*Panulirus interruptus*), slipper limpets (*Crepidula onyx*), and tunicates (*Styela plicata*) were the most common-occurring invertebrates.

Sport Fishing Dock Rip Rap. The variable-sized rip rap in front of the Sport Fishing Docks supported a moderately diverse community of intertidal and subtidal plants and invertebrates typical of both the inner marina and the outer channels of the Harbor. The most common types of plants were filamentous red algal taxa, coralline turf algae, and macrophytes, particularly *Sargassum muticum* and *Dicytota flabellata*. The most conspicuous macro invertebrates were limpets (*Lottia* spp.), mussels (*Mytilus galloprovincialis*, sea fans (*Muricea californiensis* and *M. fruticosa*), lobsters (*Panilurus interruptus*), and colonies of the cup coral *Astrangia lajollensis*.

Hard-Bottom Associated Fishes. Nine species of fish and one unidentified juvenile were observed in the vicinity of hard-bottom habitat during the dive and remote video surveys. The most common fishes observed included garibaldi (*Hypsypops rubicundus*), kelp bass (*Paralabrax clathratus*), opaleye (*Girella nigricans*), pile surfperch (*Damalichthys vacca*), blacksmith (*Chromis punctipinnus*), señorita (*Oxyjulis californica*), and kelpfish (*Heterostichus rostratus*). Most fish were seen in the vicinity of the Youth Sailing Center Docks, the Sport Fishing Docks, the West Channel, Main Channel, and East Channel.

3.4 EELGRASS

3.4.1 Importance of Eelgrass

Eelgrass (Figure 5) is a marine flowering plant that grows in soft sediments in coastal bays and estuaries, and occasionally offshore to depths of 50 feet (ft). Eelgrass canopy (consisting of shoots and leaves) enhances the abundance and the diversity of otherwise barren sediments. Many species of invertebrates (i.e., clams, crabs, and worms) live either on eelgrass or within the soft sediments that cover the root and rhizome mass system. Eelgrass is a nursery habitat for many juvenile fishes, including species of commercial and/or sports fish value (California halibut and barred sand bass). They are also foraging centers for seabirds such as the endangered California least tern that seek out juvenile topsmelt that are attracted to the eelgrass cover. Lastly, eelgrass is an important contributor to the detrital (decaying organic) food web of bays as the decaying plant material is consumed by many benthic invertebrates (such as polychaete worms) and reduced to primary nutrients by bacteria.

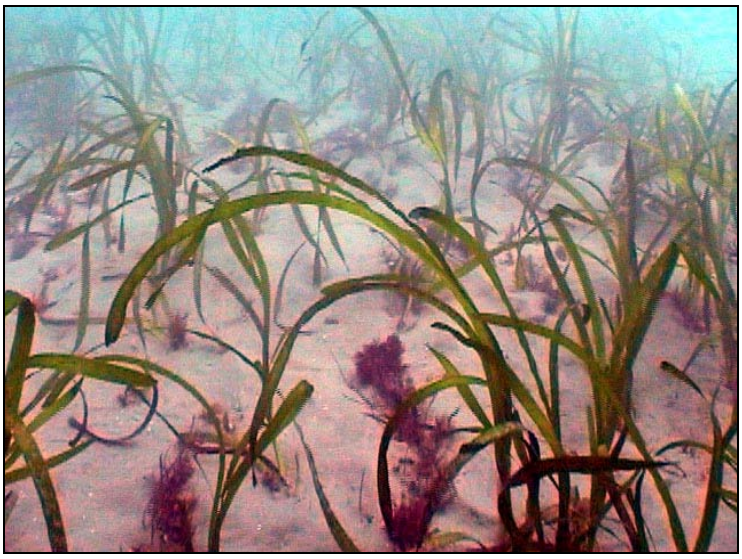


Figure 5. Eelgrass, *Zostera marina*. One "shoot" and the cluster of "blades" arising from the shoot is considered a "turion unit".

3.4.2 Results of Focused Eelgrass Field Surveys, 2005-2010

Studies conducted between 2005 and 2010 have documented the expansion of an eelgrass bed seaward of Baby Beach in the western section of Dana Point Harbor (Figure 6). Most recently, small-to-large patches of eelgrass were located 160 to 412 feet west of the existing bulkhead at the Youth Sailing Center (Figure 6) during surveys conducted by MBC Applied Environmental Sciences (2008 and 2009) and CRM (Coastal Resources Management, Inc. this document). The results of eelgrass surveys conducted to date in Dana Point Harbor are discussed below.

Chambers Group, Inc. located a single, three-turion plant at the eastern end of Baby Beach in 2005 (Chambers Group, Inc (2005) for the Dana Point Harbor Maintenance Dredging Project. MBC Applied Environmental Sciences conducted eelgrass and invasive algae surveys for the Dana Point Harbor Maintenance Dredging and Pipeline Corridor Project in August 2008 and February 2009 (MBC Applied Environmental Sciences, Inc. 2008) and 2009). A total of 14.5 square meters of eelgrass was located seaward of Baby Beach in 2008, and 70 square meters of eelgrass were located seaward of Baby Beach in 2009. Eelgrass turion density ranged between 48 and 56 turions per square meter during the 2009 survey. The locations of where MBC located eelgrass are shown in Figure 6. In addition to noting the presence of eelgrass at Baby Beach, MBC reported a small, 0.5 square meter patch of eelgrass northeast of the launch ramp in 2008 at the jet ski and kayak rental location.

Coastal Resources Management, Inc. did not located eelgrass within Dana Point Harbor during the February/March 2007 or the October/November 2007 surveys. On June 8th, 2010, CRM conducted diver transect surveys in the vicinity of the Youth Sailing Center Docks along the eastern one-third of Baby Beach at depths between -3 and -12 ft MLLW (Figure 6). A total of 457.3 square feet (42.5 square meters) of eelgrass was mapped by CRM within the survey area at depths between -2.5 and -4.5 ft MLLW in a mixture of silt

and scattered boulders (Figure 6). Eelgrass density was extremely low, ranging between 4 and 10 turions per square meter.

CRM could not relocate the eelgrass patch that MBC located in the Dry Stack Storage area docks during the 2010 survey. This location appeared to be located underneath jet ski platforms at the time of the survey.

3.5 INVASIVE ALGAE (*Caulerpa taxifolia*)

3.5.1 Importance

Invasive algae (Figure 7) has a potential to cause ecosystem-level impacts on California's bays and nearshore systems due to its extreme ability to out-compete other algae and seagrasses. *Caulerpa taxifolia* grows as a dense smothering blanket, covering and killing all native aquatic vegetation in its path when introduced in a non-native marine habitat. Fish, invertebrates, marine mammals, and sea birds that are dependent on native marine vegetation are displaced or die off from the areas where they once thrived. It is a tropical-subtropical species that is used in aquariums. It was introduced into southern California in 2000 (Agua Hedionda Lagoon and Huntington Harbour) by way of individuals likely dumping their aquaria waters into storm drains, or directly into the lagoons. While outbreaks have been contained, the Water Resources Board, through the National Marine Fisheries Service and the California Department of Fish and Game require that projects that have potential to spread this species through dredging, and bottom-disturbing activities conduct pre-construction surveys to determine if this species is present using standard agency-approved protocols and by National Marine Fisheries Service/California Department of Fish and Game Certified Field Surveyors.

3.5.2 Focused Survey for Invasive Algae

Caulerpa algae was not observed within the 6.7 acre survey area within the areas proposed for harbor revitalization (Table 1 and Figure 4) during surveys conducted in 2007 and 2010. The amount of habitat covered during the survey averaged 25.8%, ,ranging from 13.9% in the East and West marina basins to over 100% coverage at the Youth Sailing Center and the Harbor Patrol basin. Diver-specific surveys in the vicinity of Baby Beach covered between 58 and 65 % of the total bottom habitat; this effort reflected a concentrated survey effort in a region where there was a greater probability of locating either eelgrass or *Caulerpa*, since a very small patch of eelgrass (three turions) was located there in April 2005 (Chambers Group, Inc., 2005). However, *Caulerpa* was not present in Dana Point Harbor during previous surveys (Chambers Group, Inc. 2005, 2006; MBC Applied Environmental Sciences, 2008).


Figure 6. Location of Eelgrass in the Vicinity
Baby Beach and the Sailing Center. 2008-2010
Coastal Resources Management, Inc.
©2009 Google
CRM 2010 FIELD SURVEY LIMITS
APPOXIMATE SCALE: 120 FT
Scattered Reef
CRM 2010 1 sq m
CRM 2010 2 sq m
CRM 2010 3 sq m
CRM 2010 36.5 sq m
MBC 2009 8 sq m
MBC 2009 40 sq m
MBC 2009 12 sq m
MBC 2009 8 sq m
MBC 2009 6 sq m

Figure 7. The invasive algae, *Caulerpa taxifolia*. Source: NOAA/NMFS

The invasive algae reporting form, is provided in Appendix 3. Prior to marina construction, a pre-construction *Caulerpa* survey will need to be conducted that attains a minimum survey intensity level of 20% within each of the renovation areas to meet the standard of the Southern California Caulerpa Action Team (NMFS, 2008).

3.5.3 *Undaria pinnatifida*

Undaria pinnatifida (Figure 8) is a golden brown kelp native to the Japan Sea. It has been introduced in Australia, New Zealand, and Europe and has now spread to the California coastline. It has been found in several bodies of water including Santa Barbara Harbor, Long Beach Harbor, Anaheim Bay, San Diego Bay, and the waters surrounding Catalina Island.

In Japan it is known as wakame and is extensively cultivated as a fresh and dried food plant. However, it has the potential to become a major pest in our coastal waters. *Undaria* grows to between 3 to 7 feet (1 and 2 m) tall and is found in sheltered harbor waters on rocks, breakwaters, and marine debris from the low-tide mark to 50 feet (15 m). A mature plant has a distinctive, spiraled (frilly), spore-producing structure at its base. It also has an obvious central stem to 4 inches (10 cm) wide that extends for the length of the plant (Figure 8). The blade may be up to 3.1 feet (1 m) wide and extends from the tip of the plant for half the length of the plant.

Focused Survey for *Undaria*

Undaria was not observed during dive surveys or remote video surveys in Dana Point Harbor between 2007 and 2010.

Figure 8. *Undaria pinnatifida*

4.0 LITERATURE CITED

Chambers Group, Inc. 2005. Letter report to the County of Orange RDMD re: the completion of eelgrass surveys at Baby Beach in April 2005. 1 pp.

Chambers Group, Inc. 2006. Letter report to the Dana Point Harbor Department re: the completion of launch ramp Caulerpa taxifolia survey in August, 2006. 1 pp.

Geotechnical Inc., 2006. Appendix B. Particle size testing results. in: Kinnetic Laboratories, Inc. and Moffatt and Nichol, 2007. Dredge material evaluation. Dana Point Harbor maintenance dredging report. Prepared for the Dana Point Harbor Department and the County of Orange.

MBC Applied Environmental Sciences. 2008. Pre-construction eelgrass and Caulerpa surveys for the Dana Point Harbor Maintenance Dredging and Beach Nourishment Project. Prepared for the Dutra Group, San Rafael, California. August 2008. 7 pp. plus appendix

MBC Applied Environmental Sciences. 2009. Post-construction eelgrass and Caulerpa surveys for the Dana Point Harbor Maintenance Dredging and Beach Nourishment Project. Prepared for the Dutra Group, San Rafael, California. February 2009. 7 pp. plus appendix

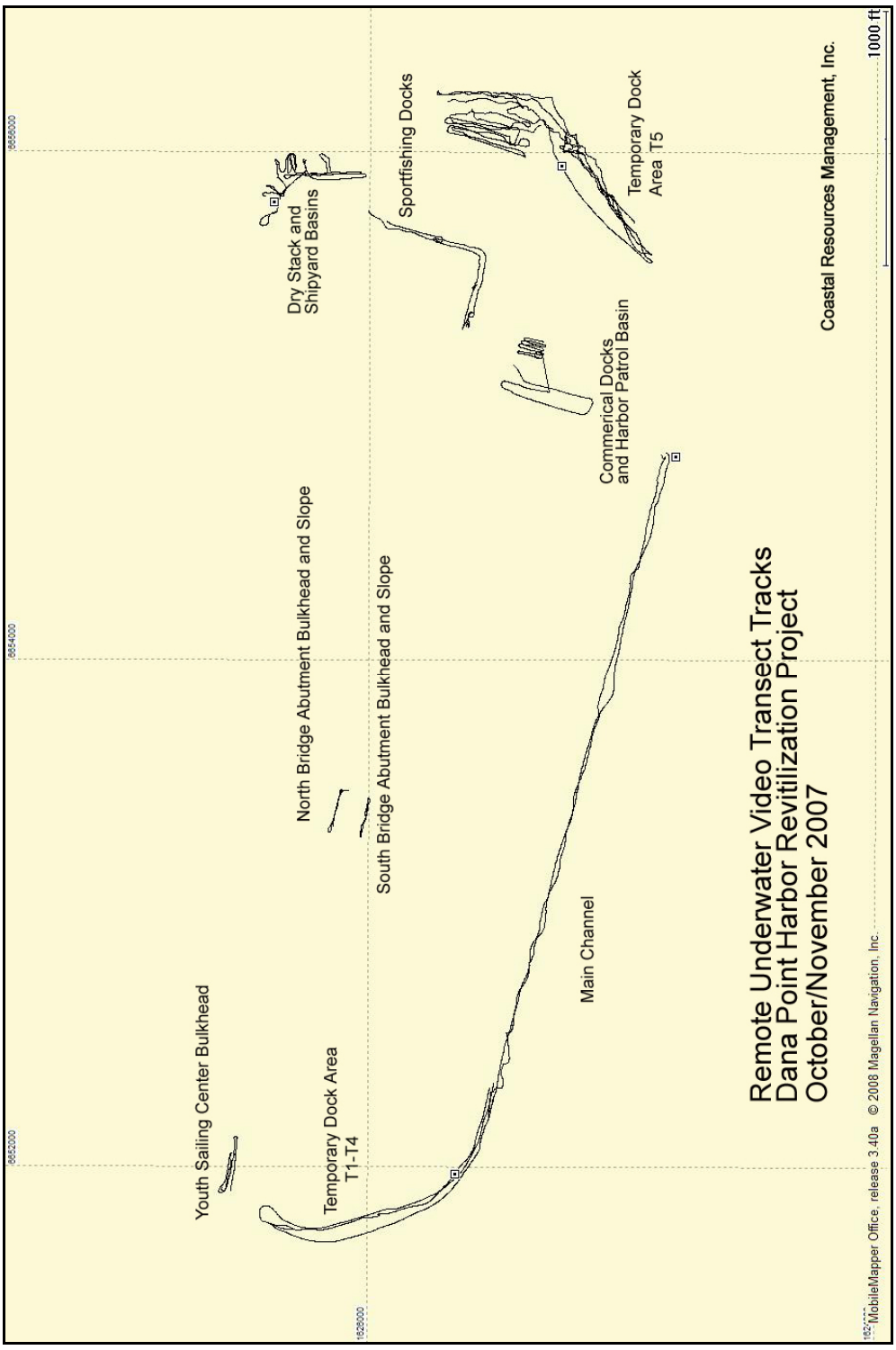
National Marine Fisheries Service. 1991 (as amended). *Southern California eelgrass mitigation policy*. 4 pp. Revision 11, 30 August, 2005.

National Marine Fisheries Service. 2006. *Caulerpa Control Protocol.* http://swr.nmfs.noaa.gov/hcd/caulerpa/ccp.pdf. 7 pp.

National Marine Fisheries Service. 2008. *Caulerpa* control protocol. Version 4, March 28th, 2008. National Marine Fisheries Service Southwest Region, Long Beach, CA. 7 pp.

Wiegel, Robert L. 1993. Dana Point Harbor, California. Shore and Beach 61 (3):37-55.

APPENDIX 1. REMOTE UNDERWATER VIDEO SURVEY TRACK LINES OCTOBER/NOVEMBER 2006 SURVEY



APPENDIX 2.

MARINE PLANTS AND ANIMALS OBSERVED DURING SURVEYS OF DANA POINT HARBOR

FEBRUARY/MARCH 2007
OCTOBER/NOVEMBER 2007
JUNE 2010

Common Name	Scientific Name	Epi Benthos	Baby Beach	Marina Hard Scape	Youth Sailing Center Reefs	West Jetty Shoal and Channel Slope	West Main Channel	Temp Dock (South of Bait Barge)	Temp Dock (North of Bait Barge	Youth Sailing Center Rip Rap	Bridge Bases	Harbor Patrol Basin*	Sportfishing Dock Rip Rap and Reef	Dry Stack and Shipyard Basins	All
diatom mat	Baccilariophyceae	x	x	x	x	x	x								x
green algae	*Chaetomorpha linea*	x		x											x
green algae	*Ulva intestinalis*	x	x	x	x								x		x
brown algae	*Colpomenia perigrinus*			x	x										x
brown algae	*Colpomenia sinuosa*					x	x		x		x				x
brown algae	*Dictyopteris undulata*			x			x	x	x	x	x		x		x
brown algae	*Dictyota flabellata*			x			x		x		x	x	x		x
brown algae	*Dictyoneura* sp..			x	x								x		x
brown algae	*Eisenia arborea*			x	x		x		x				x		x
brown algae	*Halidrys dioica*						x		x						x
brown algae	*Macrocystis pyrifera*						x								x
brown algae	*Sargassum muticum*			x	x		x	x	x	x		x	x		x
brown algae	*Taonia lennebackerae*						x		x				x		x
brown algae	*Zonaria farlowii*						x		x						x
red algae	*Amphiroa zonata*						x		x	x					x
red algae	*Bossiella orbigniana*						x								x
red algae	*Corallina chilensis*						x		x						x
red algae	*Corallina pinnatifolia*						x		x	x	x	x	x		x
red algae	*Corallina vancouverensis*			x	x										x
red algae	*Cryptopleura crispa*						x						x		x
red algae	Filamentous red algae			x	x		x						x		x
red algae	*Gelidium purpurascens*						x			x					x
red algae	*Laurencia pacifica*						x		x						x
red algae	*Lithothamnion sp.*						x								x
red algae	*Lithothrix aspergillum*						x								x
red algae	encrusting red, unid.								x						x
red algae	Polysiphonia sp.			x			x	x	x						x
red algae	*Rhodomenia californica*							x							x
red algae	red turf algae			x			x								x
seagrass	*Zostera marina*		x												x
sponge	*Leucosolenia* sp.										x				x

Common Name	Scientific Name	Epi Benthos	Baby Beach	Marina Hard Scape	Youth Sailing Center Reefs	West Jetty Shoal and Channel Slope	West Main Channel	Temp Dock (South of Bait Barge)	Temp Dock (North of Bait Barge	Youth Sailing Center Rip Rap	Bridge Bases	Harbor Patrol Basin*	Sportfishing Dock Rip Rap and Reef	Dry Stack and Shipyard Basins	All
sponge	Porifera, Unid.	x		x	x		x				x	x			x
anemone	*Anthopleura sola*			x			x						x		x
hard coral	*Astrangia lajollenis*												x		x
hydroid	*Aglaopheni* a sp.			x			x				x				x
gorgonian	*Muricea californica*						x						x		x
gorgonian	*Muricea fructicosa*			x	x			x					x		x
anemone	*Pachycerianthus fimbriatus*									x	x				x
polyclad flatworm	*Pseudoceros* sp.											x			x
polychaete	*Diopatra ornata*							x							x
polychaete	*Dodecaceria* sp.			x											x
polychaete	*Phragmatopoma californica*			x	x										x
polychaete	Sabelllidae, unid.			x											x
polychaete	Spionidae, unidl				x								x		x
polychaete	Serpulidae, unid.			x	x										x
polychaete	Spirorbidae, unid.			x	x										x
barnacle	*Cthamalus fissus/dalli*						x		x	x			x		x
barnacle	*Balanus amphitrite*			x	x										x
barnacle	*Balanus glandula*			x	x		x			x	x		x		x
lined shore crab	*Pachygrapsus crassipes*			x	x										x
lobster	*Panilurus interruptus*				x		x			x			x		x
snail	*Acanthina spirata*								x						x
limpet	*Collisella digitalis*														x
limpet	*Collisella scabra*				x		x		x				x		x
slipper shell	*Crepidula onxy*				x			x	x	x					x
Kellet's whelk	*Kelletia kelletii*				x										x
Gould's paper bubble	*Haminoea vesicula*							x							x
rock scallop	*Hinnites giganteus*			x			x								x
limpet	*Lottia gigantea*						x								x
limpet	*Lottia limatula*						x		x						x
bay mussel	*Mytilus edulis*										x				x
bay mussel	*Mytilus galloprovincialis*			x	x										x
sea slug	*Navanax inermis*	x					x	x	x	x		x			x
octopus	*Octopus* sp.	x													x
snail	*Roperia poulsoni*							x					x		x

Common Name	Scientific Name	Epi Benthos	Baby Beach	Marina Hard Scape	Youth Sailing Center Reefs	West Jetty Shoal and Channel Slope	West Main Channel	Temp Dock (South of Bait Barge)	Temp Dock (North of Bait Barge	Youth Sailing Center Rip Rap	Bridge Bases	Harbor Patrol Basin*	Sportfishing Dock Rip Rap and Reef	Dry Stack and Shipyard Basins	All
oyster	*Ostrea sp.*									x					x
sea cucumber	*Parastichopus parvimensis*					x	x								x
reverse chama	*Pseudochama exogyra*			x	x								x		x
festive murex snail	*Pteropurpura festiva*	x		x			x		x				x		x
scaled tube worm	*Serpulorbis squamigerus*						x								x
trochid snail	*Tegula eisenii*						x		x						x
soft ectorproct	*Anguinella palmata*			x											x
ectoproct	*Bugula neritina*			x											x
ectoproct	Encrusting ectoprocts			x			x								x
colonial tunicate	*Botryllus/Botrylloides*			x											x
colonial tunicate	colonial tunicates			x			x								x
solitary tunicate	Ascideacea, unid.			x	x		x						x		x
solitary tunicate	*Styela plicata*			x			x			x	x				x
opaleye perch	*Girella nigricans*				x		x		x	x	x		x		x
garibaldi	*Hypsypops rubicundus*				x		x		x						x
pile perch	*Damalichthys vacca*				x		x								x
blacksmith	*Chromis punctipinnis*				x		x								x
kelp bass	*Paralabrax clathratus*				x	x	x						x		x
unknown barred fish	juvenile, unid.				x		x			x					x
kelp fish	*Heterostrichus rostratus*								x						x
senorita	*Oxyjulis californica*				x		x								x
flatfish	unid. flatfish	x				x									x
round sting ray	*Urolophus halleri*	x													x
	Total	**9**	**3**	**36**	**31**	**5**	**49**	**10**	**25**	**15**	**12**	**6**	**25**	**0**	**88**

APPENDIX 3. *CAULERPA TAXIFOLIA* REPORTING FORM (PER NATIONAL MARINE FISHERIES SERVICE AND CALIFORNIA DEPARTMENT OF FISH AND GAME REQUIREMENTS)

Caulerpa taxifolia Survey Reporting Form

Dana Point Harbor Marina Renovation Project, Dana Point, CA

Prepared for:
LSA Associates, Inc.
20 Executive Park, Suite 200, Irvine, California
Contact: Rob Balen
(949) 533-0666

Prepared by:

Coastal Resources Management, Inc.
PMB 327, 3334 E. Coast Highway, Corona del Mar, CA 92625
Contact: Rick Ware, Senior Marine Biologist
(949) 412-9446

June 15th, 2007
Revised July 8th, 2010

This form is required to be submitted for any surveys conducted for the invasive exotic alga *Caulerpa taxifolia* that are required to be conducted under federal or state permits and authorizations issued by the U.S. Army Corps of Engineers or Regional Water Quality Control Boards (Regions 8 & 9). The form has been designed to assist in controlling the costs of reporting while ensuring that the required information necessary to identify and control any potential impacts of the authorized actions on the spread of *Caulerpa*. Surveys required to be conducted for this species are subject to modification through publication of revisions to the *Caulerpa* survey policy. It is incumbent upon the authorized permittee to ensure that survey work is following the latest protocols. For further information on these protocols, please contact: Robert Hoffman, National Marine Fisheries Service (NOAA Fisheries), (562) 980-4043, or William Paznokas, California Department of Fish & Game, (858) 467-4218).

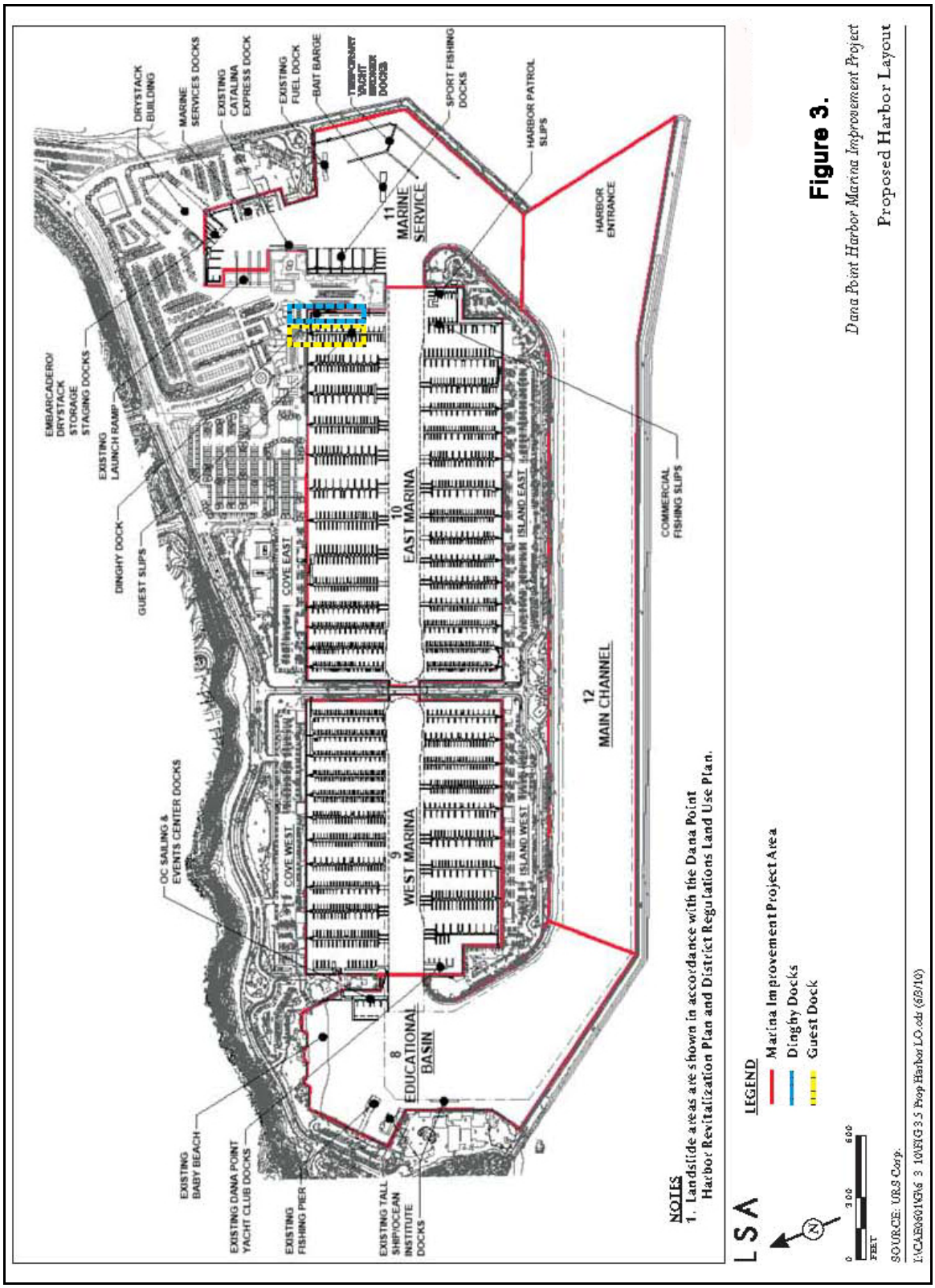
Report Date:	January 6th, 2007; Revised 8 July 2010
Name of bay, estuary, lagoon, or harbor:	Dana Point Harbor, Dana Point, Orange County, California. See Figure 1.
Specific Location Name:	Dana Point Marina Basins and the vicinity of Baby Beach/Youth Sailing Center. See Figures 2-4.
Site Coordinates: (UTM, Lat./Long., datum, accuracy level, and an electronic survey area map or hard copy of the map **must** be included).	Center of Marina Basins: 33.45983 ° N; 118.69817 ° W Accuracy: 1 m, WGS 84
Survey Contact: (name, phone, e-mail)	Rick Ware, Senior Marine Biologist, Coastal Resources Management, Inc. , (949) 412-9446, rware.crm@earthlink.net
Personnel Conducting Survey (if other than above): name, phone, email	Mr. Rick Ware (Certified Caulerpa Surveyor) Mr. Stephen Whitaker (Certified Caulerpa Surveyor) Mr. Tom Gerlinger (vessel skipper/dive tender)
Permit Reference: (ACOE Permit No., RWQCB Order or Cert. No.)	Pending.
Is this the first or second survey for this project?	Initial Survey for Dana Point Harbor Revitalization Project.
Was *Caulerpa* Detected?: (if *Caulerpa* is found, please immediately contact NOAA Fisheries or CDFG personnel identified above)	**X X** **No, *Caulerpa* was not found at this site.**

Description of Permitted Work: (describe briefly the work to be conducted at the site under the permits identified above)	Waterside upgrades are proposed for Dana Point Harbor and include (1) the renovation and re-orientation of the East and West marina basin dock systems by replacing old and deteriorating docks, slips and gangways with new facilities; (2) dock redesign and improvements for the Youth Sailing Center, the Harbor Patrol facilities, Commercial Fishing Dock, the Sport Fishing dock, the Dry Stack facility, and the Shipyard docks; (3) the construction of for vessels that will be displaced during marina reconstruction.; (4) the addition of handicap access at locations where it currently is not available; (5) upgrading vessel pump out facilities; and (6) upgrading electrical service water service. The number of boat slips within the Harbor will decrease from 2,409 to 2,223 (a loss of 116 slips) although the average slip length will increase from 29.85 ft to a length not to exceed 32 ft. A total of 1,306 existing piles will be removed and 969 new piles will be emplaced.	
Description of Site:	*Depth range:*	0.0 ft to -24.2 ft MLLW.
(describe the physical and biological conditions within the survey area at the time of the survey and provide insight into variability, if known. Please provide units for all numerical information).	*Substrate type:*	Silt sediments in most part of areas surveyed. Silty sand sediments west of basins near Baby Beach. Reef in the Main Channel, and scattered in the East Channel.
	Temperature:	57 (Feb 2007) to 67 degrees F (June 2010);
	Salinity:	25-35 ppt
	Dominant flora:	Twenty-nine algal taxa were recorded. Dominant algae species on the soft sediments included diatom mat, *Chaetomorpha aerea* and *Ulva intestinalis*. Common hard-substrate algal taxa associated with hard substrate on marina rip rap, pilings, docks, bulkheads, jetty quarry rock and natural reef habitats outside of the marina basins. included *Colpomenia sinuosa*, *Dictyopteris undulata*, *Dictyota flabellata*, *Eisenia arborea*, *Sargassum muticum*, *Corallina* spp., and filamentous red algae.
	Dominant fauna:	Fifty-six taxa of invertebrates, and fishes were observed during the surveys. Of this total, only six were observed by biologists on marina basin sediments. The most common species was *Navanax inermis*.

	Exotic species encountered (including any other Caulerpa species):	*Sargassum muticum*
	Other site description notes:	Eelgrass was located near Baby Beach during the June 2010 survey.
Description of Survey Effort:	*Survey date and time period:*	February 20th, March 6th, and March 16th, 2007; October 31st, November 1st, and November 2nd, 2007; and June 7th-8th, 2010
Description of Survey Effort: please describe the surveys conducted including type of survey (SCUBA, remote video, etc.) and survey methods employed, date of work, and survey density (estimated percentage of the bottom actually viewed.	*Horizontal visibility in water:*	Visibility was highly variable depending on the area of the harbor being surveyed and ranged between 1 and 10 feet on each side of the center line.
	Survey type and methods:	A total of 329 variable-length underwater transects (5 meters [m] to 258 m in length) were swam using SCUBA throughout Dana Point Harbor where waterside developments are planned and in areas where eelgrass potentially can be found in shallow water habitat. Fourteen dock piles in the Cove East and the Island East marina basins were also surveyed to determine the types and relative abundances of marine organisms that might be affected by marina construction. Remote Underwater Video (RUV) surveys were also conducted to determine the presence of eelgrass, invasive algae, other organisms, and habitat types. The camera system used for the surveys was an Ocean Systems, Inc. Deep Blue Professional Grade Underwater Video Camera ("Splash Cam") attached to a military-grade umbilical cable. Real-time observations of the harbor benthos were collected by conducting a running series of variable-length underwater video transects ranging in length from 0.16 to 1.67 miles long at all sites except for the East and West Marina Basins. The surveys covered 6.28 acres of harbor bottom habitat. Overall, the bottom area surveyed by both diving biologists and remote video averaged 24.7% of the total bottom habitat within the

		project survey limits, ranging from 13.9% in the East and West Marina basins to over 100% coverage in the at the Youth Sailing Center and the Harbor Patrol basin. Baby Beach areal cover (by divers and video in 2007 and 2010) encompassed a minimum of 187% of the survey area, and reflected a survey effort concentrated in a region where there was a probability of locating eelgrass since a very small patch of eelgrass (three turions) was located there in April 2005 (Chambers Group, Inc., 2005). The total area of open water habitat and water habitat underneath the docks (Area of Potential Effect) in the project area was 25.28 acres. Bottom types, common marine life, and the presence or absence of *Caulerpa taxifolia* and *Zostera marina* were noted. Depths were standardized to Mean Lower Low Water (MLLW) based upon time of observation and tidal corrections for the San Clemente Pier tidal survey station.
Describe any limitations encountered during the survey efforts.	*Survey personnel:*	Rick Ware, Steve Whitaker and Tom Gerlinger, Coastal Resources Management, Inc.
	Survey density:	Underwater Remote Video tracklines covered 7,899 meters of harbor seafloor (4.91 miles). For both survey methods, a total of 6.28 acres of bottom habitat out of a total APE of 25.28 acres were surveyed (24.7% of the total bottom habitat in the survey area).
	Survey limitations:	Vessel movement within the project area.
Other Information: (use this space to provide additional information or references to attached maps, reports, etc.)	Figure 1- Project Location, Regional Figure 2- Proposed Location Figure 3. Project Layout	


FIGURE 2.
DANA POINT HARBOR STUDY LOCATIONS
COASTAL RESOURCES MANAGEMENT, INC.
BABY BEACH
YOUTH SAILING CENTER
WEST CHANNEL AND TURNING BASIN
COVE WEST MARINA
WEST BASIN
BRIDGE ABUTMENTS
COVE EAST MARINA
EAST BASIN
DRY STACK STORAGE
MARINE SERVICES
SPORTFISHING DOCKS
COMM DOCKS
HARBOR PATROL DOCKS
EAST CHANNEL
EAST BREAKWATER
ENTRANCE CHANNEL
MAIN CHANNEL
WEST BREAKWATER
Dana Point Harbor Dr
Puerto Pl
Street of Golden Lantern
Castaways Pl
Dana Dr
El Camino Capistrano
Santa Clara Ave
Cove Rd
Blue Lantern St
Green Lantern St
Shore Lantern
Starboard Lantern
Cove Lantern
Eastern Lantern St
Violet Lantern St
Amber Lantern St
Old Golden Lantern
© 2007 Navteq
© 2006 Google
Streaming 100%
Eye alt 5218 ft
Pointer lat 33.460258° lon -117.698844° elev 0 ft
1508 ft


DRYSTACK BUILDING
MARINE SERVICES DOCKS
EXISTING CATALINA EXPRESS DOCK
EXISTING FUEL DOCK
BAIT BARGE
TRANSIENT YACHT HARBOR DOCKS
SPORT FISHING DOCKS
HARBOR PATROL SLIPS
11 MARINE SERVICE
HARBOR ENTRANCE
EMBARCADERO/ DRYSTACK STORAGE STAGING DOCKS
EXISTING LAUNCH RAMP
DINGHY DOCK
GUEST SLIPS
COVE EAST
10 EAST MARINA
ISLAND EAST
COMMERCIAL FISHING SLIPS
12 MAIN CHANNEL
OC SAILING & EVENTS CENTER DOCKS
COVE WEST
9 WEST MARINA
ISLAND WEST
8 EDUCATIONAL BASIN
EXISTING BABY BEACH
EXISTING DANA POINT YACHT CLUB DOCKS
EXISTING FISHING PIER
EXISTING TALL SHIP/OCEAN INSTITUTE DOCKS
NOTES
1. Landslide areas are shown in accordance with the Dana Point Harbor Revitalization Plan and District Regulations Land Use Plan.
LSA
LEGEND
Marina Improvement Project Area
Dinghy Docks
Guest Dock
0 300 600
FEET
SOURCE: URS Corp.
I:\CAD\601\Fig 3 10\EIG 3-5 Prop Harbor LO.cdr (6/8/10)
Figure 3.
Dana Point Harbor Marina Improvement Project
Proposed Harbor Layout