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STAFF RECOMMENDATION

ON CONSISTENCY DETERMINATION

Consistency Determination No.	**CD-029-11**
Staff:	MPD-SF
File Date:	6/17/11
60th Day:	8/16/11
75th Day:	8/31/11
Extended to:	9/9/11
Commission Meeting:	9/9/11

FEDERAL AGENCY: **U.S. Army Corps of Engineers**

PROJECT LOCATION: San Clemente State Beach and offshore of Del Mar Boat Basin, Orange and San Diego Counties (Exhibits 1-2)

PROJECT DESCRIPTION: San Clemente Shoreline Protection Project: 50-Year Beach nourishment program for San Clemente State Beach, consisting of initial nourishment on the beach in 2012 of approximately 251,000 cu. yds. of sand dredged from offshore the Del Mar Boat Basin, with periodic renourishment at approximately six year intervals (Exhibits 3-4)

SUBSTANTIVE FILE DOCUMENTS: See page 32.

Staff Recommendation: Conditional Concurrence. Motion is on page 5. Conditions are on pages 6-9.

List of Exhibits

Exhibits 1 & 2 – Location Map
Exhibit 3 – Borrow Site
Exhibit 4 – Beach Fill and Impact Area
Exhibit 5 – Staging Area
Exhibits 6 – 8 – Offshore Surfgrass and Kelp
Exhibit 9 – Mariposa Point

Exhibit 10 – Larger Beach Fill Alternative
Exhibit 11 – Draft Biological Monitoring Plan MMRP
Exhibit 12 – USFWS Coordination Act Report Recommendations
Exhibit 13 – SANDAG CDP 6-11-018 Permit Condition No. 8 (Grunions)
Exhibit 14 – San Clemente Opportunistic Sand Monitoring Report Conclusions
Exhibit 15 – Draft Surfing Monitoring Plan

EXECUTIVE SUMMARY

The U.S Army Corps of Engineers (Corps) has submitted a consistency determination for San Clemente Shoreline Protection Project, a 50-Year Beach nourishment program for San Clemente Beach, consisting of initial nourishment on the beach in 2012 of approximately 251,000 cu. yds. of sand dredged from offshore the Del Mar Boat Basin, with periodic renourishment. The beach disposal would be on the dry sandy beach, in a 3,412 ft. long area centered around the San Clemente Pier. Dredging would be by hopper dredge; after dredging the dredge vessel would be towed to a mooring offshore San Clemente and the material pumped onshore. The initial phase would be during the fall and winter season, in part to avoid effects on grunion spawning. When the beach erodes to its design width, the Corps would repeat the process, which it estimates would occur, on average, at six-year intervals.

The primary habitat and marine resource concerns raised by the project are potential effects on grunions, least terns, snowy plovers, reef habitats, surfgrass, and giant kelp. The dredging (offshore borrow site) and disposal (beach site) are not themselves environmentally sensitive habitat areas or areas of particularly valuable marine resources. Least terns and snowy plovers do not nest in the project area, and the project has been scheduled to avoid the grunion spawning season. The primary marine resources concerns raised by the project are the *indirect* effects of where and how much material will be transported by waves through the littoral system, where it has the potential to temporarily or permanently affect offshore sensitive marine habitats, which, in San Clemente, consist of offshore surfgrass, reef, and giant kelp habitats.

Unlike the SANDAG beach nourishment project[1] the Commission reviewed in June of this year, which had been previously implemented and studied, no history of large nourishment activities and how sand has moved downcoast is available for San Clemente's offshore area. The Corps has selected a project size that, based on its modeling, it expects to result in only temporary impacts, and it believes that the offshore habitats (particularly surfgrass, likely the most sensitive species potentially affected in this location) will recover from temporary sand cover as it moves downcoast. The Corps acknowledges uncertainties in its modeling and analysis and assumes some mitigation may be necessary. The Corps has committed to monitoring the offshore areas, and also committed, if impacts are found, to provide one acre of surfgrass mitigation and one acre of reef mitigation. The Corps also acknowledges that because surfgrass mitigation success is not currently a known science, and thus its success

[1] San Diego Association of Governments (SANDAG) coastal development permit 6-11-018.

cannot be guaranteed, if the monitoring shows the need for surfgrass mitigation, and the mitigation is attempted but not ultimately successful, it will then implement kelp mitigation (which is more predictable) to offset surfgrass effects.

The Corps has met with U.S. Fish and Wildlife Service, National Marine Fisheries Service, the California Dept. of Fish and Game, and the Environmental Protection Agency to discuss the habitat issues, and these agencies have expressed a number of concerns, including the need for: (1) more extensive monitoring and assurances of mitigation success; (2) inter-agency review and agreement before monitoring and mitigation plans are finalized; and (3) identification of backup funding mechanisms and commitments if currently committed funding levels are not sufficient. These agencies have also recommended initial implementation of smaller nourishment project (identified as a 10 meter beach width, as opposed to the proposed 15 meter beach width), until more is learned about the shoreline dynamics in San Clemente. These recommendations are summarized on pages 22-24.

The staff is recommending nine conditions to assure the monitoring and mitigation measures are effective, adequate to protect, and if impacts occur, mitigate, the project's effects on marine resources, and to enable the project to be found consistent with the marine resource policies of the Coastal Act. The recommended conditions would provide for: (1) implementing additional grunion monitoring and protection measures, in the event unforeseen circumstances delayed work into the grunion season; (2) Commission staff review of and concurrence with the final monitoring plans; (3) specification of success criteria to be included in the monitoring plans to assure they will adequately measure impacts; (4) increasing the mitigation ratio if out-of-kind mitigation is implemented (which is triggered if in-kind mitigation is unsuccessful); (5) lengthening the monitoring period from 2 to 5 years; (6) submitting all monitoring reports to the Commission staff; and (7) assuring that subsequent re-nourishments will not be implemented unless and until the Commission staff has reviewed the monitoring and mitigation and agrees the habitats have been adequately restored and/or that the permanent loss of habitat has been adequately mitigated. If the Corps were to agree to implement these conditions, the staff believes the proposed project could be found consistent with the marine resource and dredging and filling policies (Sections 30230, 30231, and 30233) of the Coastal Act.

In the long-term, the project will improve public access by increasing available public beach area and lessening the need for shoreline protection works such as seawalls or increasing size of the revetment that protects the rail line located inland of the beach. Public access and recreation impact issues include temporary effects blocking access to disposal areas during construction, and possible alteration of offshore bathymetry, which could temporarily affect surfing conditions until the sand moves downcoast. The project is being scheduled to avoid the peak recreation season, and the staging area would not interfere with public accessibility or parking. The Corps has agreed to monitoring effects on surfing. The staff believes additional details and specifications are needed to assure the effectiveness of the monitoring, and is recommending conditions providing for Commission staff review of the final staging and surfing monitoring plans, including several details needed to reduce effects and improve

monitoring validity. If the Corps were to agree to implement these conditions, the staff believes the proposed project could be found consistent with the public access and recreation and surfing policies (Sections 30210-30213, and 30220) of the Coastal Act.

Water quality issues include turbidity and practices addressing construction equipment on the beach. With conditions assuring Commission staff review (prior to project implementation) of turbidity monitoring and best management practices for construction activities, the staff believes the project would be consistent with the water quality policy (Section 30231) of the Coastal Act.

STAFF SUMMARY AND RECOMMENDATION

I. STAFF SUMMARY:

A. Project Description. The Corps is proposing a 50-year program to nourish San Clemente State Beach. The initial nourishment would consist of placing 251,000 cu. yds. of predominantly sandy sediment in a 50 ft. wide by 3,412 ft. long area of dry sandy beach (Exhibits 2 & 4). The material would be dredged by a hopper dredge from an offshore area, approximately one mile offshore of the Del Mar Boat Basin on Camp Pendleton, in northern San Diego County, just north of the City of Oceanside (Exhibit 3). The hopper dredge would be filled at the borrow site and transported 21 mi. north to San Clemente, where it would be attached to a moored floating section of pipeline (monobuoy) extending 1,500 ft. to the shoreline. The monobuoy would be anchored in water depths of at least 25 ft. The material would be re-suspended and discharged through the on-board pumping system to the receiver site, which is centered around the San Clemente Pier, and which extends from Linda Lane to the north, to T Street (Esplanade/T Street) to the south.

The material would be placed behind L-shaped beach berms, designed to allow dewatering. The dredge material would be mixed with seawater to form a slurry, which would be pumped onto the beach between the berm and toe of the berm. The berm reduces ocean water turbidity by allowing all the sand to settle inside the bermed area while the seawater is channeled along the berm until it reaches the open end where it drains into the ocean. Temporary dikes within the berm would allow sand to settle in designated areas. Once a 200 ft. section of berm is filled in with sand, another 200 ft. of berm would be created, the pipeline would be moved or extended on the dry beach only into the new berm area, and the process would begin again; the pipeline along the seafloor would not be moved. As the material is deposited behind the berm, the sand would be spread using two bulldozers and one front-end loader to direct the flow of the sand slurry and form a gradual slope to the existing beach elevation. The berm would be subject to the forces of the waves and weather, and would eventually settle down to a natural grade for the beach. The design berm elevation would be + 17 ft. MLLW (17 ft. above mean lower low water), and the design foreshore slope is 8:1 (8 ft. horizontal to 1 ft. vertical), both designed to match historic beach heights and slopes in the area.

For the equipment staging area, the Corps would use the open area on the inland edge of the beach adjacent to the Marine Safety Headquarters (Exhibit 5), which is north of the San Clemente Pier. Offshore equipment would be moored at Dana Point Harbor (5 mi. north) when not in use.

The construction period is approximately four months in duration and would occur from late August/early September, 2012, through March, 2013. It would be timed to avoid the peak recreation period and the least tern breeding and grunion spawning seasons. Dredging would be performed 24 hours/day, 7 days/week. Shore equipment would work 12 hours/day, 6 days/week.

The Corps proposes to conduct long-term monitoring of the shoreline, to determine when renourishment is needed, for the project duration, which the Corps has defined as a 50 year period. Renourishment efforts would occur when the shoreline reaches the base beach width (i.e., approximately 35 ft.) and would likely involve similar dredging and disposal amounts as the initial proposed nourishment.

B. Federal Agency's Consistency Determination. The Corps has determined the project consistent to the maximum extent practicable with the California Coastal Management Program (CCMP).

II. STAFF RECOMMENDATION:

The staff recommends that the Commission adopt the following motion:

MOTION: **I move that the Commission conditionally concur with consistency determination CD-029-11 and determine that, as conditioned, the project described therein is fully consistent, and thus is consistent to the maximum extent practicable, with the enforceable policies of the California Coastal Management Program (CCMP).**

STAFF RECOMMENDATION:

Staff recommends a **YES** vote on the motion. Passage of this motion will result in a conditional agreement with the determination and adoption of the following resolution and findings. An affirmative vote of a majority of the Commissioners present is required to pass the motion.

RESOLUTION TO CONDITIONALLY CONCUR WITH CONSISTENCY DETERMINATION:

The Commission hereby **conditionally concurs** with consistency determination CD-029-11 by the Corps on the grounds that the project would be fully consistent, and thus consistent to the maximum extent practicable, with the enforceable policies of the CCMP, provided the Corps agrees to modify the project consistent with the conditions specified below, as provided for in 15 CFR §930.4.

Conditions:

1. **Unanticipated delays resulting in disposal during grunion season.** If unanticipated delays result in a time extension of disposal into the grunion season (which is March through August), prior to any such disposal, the Corps will inform the Commission staff, and agree to implement and adhere to the same grunion monitoring measures, mitigation triggers, and mitigation requirements as those adopted by the Commission on June 15, 2011, in its review of the San Diego Association of Governments' (SANDAG's) coastal development permit 6-11-018, Condition No. 8 (Grunions). These measures are attached as Exhibit 13.

2. **Final Monitoring Plans.** Prior to commencement of construction, the Corps will provide to the Commission's Executive Director, for his review and concurrence, a copy of the final Preconstruction Engineering and Design (PED) phase surveys and the subsequent monitoring plans, including:

(a) the final biological (reef/surfgrass) Mitigation and Monitoring Plan (MMRP), including all surveys conducted in preparation of that plan;

(b) the surfing monitoring plan;

(c) the turbidity monitoring plan;

(d) the Stormwater Pollution Prevention Plan (SWPPP); and

(e) the Oil Spill Prevention and Response Plan (OSPRP).

3. **MMRP Details.** The final MMRP shall assure: (a) that biological monitoring of all offshore potential impact areas shall be for a minimum 5-year period (and not 2 years, as proposed); (b) that monitoring and analytical methods are adequate to identify and accurately measure all short- and long-term impacts from the beach nourishment effort; (c) that appropriate mitigation sites are available to address potential impacts; and (d) that the success criteria and analytical methods used are adequate to demonstrate a difference between impact/mitigation site and control sites and shall include the following:

(i) clear and specific identification of the potential impact areas that will be monitored before, during and after the beach nourishment efforts, including the intertidal reef at Mariposa Point; and change criteria that will be used to establish thresholds of impacts for mitigation;

(ii) schedule and frequency of monitoring efforts and monitoring reports;

(iii) discussion of the monitoring and analytical methods that will be used to evaluation the sites based on the change criteria for both short- and long-term impacts;

(iv) delineation and characterization of the potential mitigation sites that will be used if short- or long-term impacts are identified that meet the threshold for mitigation

(v) clear and specific criteria for identifying impacts and for evaluating the success of any necessary mitigation. If statistical tests are proposed, then the plan must specify biologically meaningful effect sizes (i.e., a difference between the control and the impact site, or between the control and the mitigation site) and specify alpha and beta, with alpha equal to beta. The field sampling plan must include sufficient replication to provide a statistical test with at least 80% statistical power (beta=0.2) to detect an effect of the stated size with alpha = 0.2. The proposed replication must be based on preliminary sampling data and a statistical power analysis. Smaller alpha and beta may be used.

(vi) Identification of the control or reference sites that will be used and the results of a preliminary field sample at both control and potential impact sites demonstrating that the control sites are appropriate.

Construction shall not commence until the Corps has received written concurrence from the Executive Director that the MMRP satisfies all these criteria.

4. **Surfing Monitoring Details.** The Corps will revise its Surfing Monitoring Plan (Exhibit 15) to include and implement the following features:

(a) adequate baseline data collection, including, if feasible, a full year of pre-construction monitoring to determine the baseline condition. If this is infeasible, then another local surf site should be monitored as a control (e.g. Lower Trestles, which is already monitored daily and shown on the website: www.surfline.com). (A control site would also assist in examining and understanding long-term trends.)

(b) identification of locations to be monitored, the length of the pre-project monitoring, and interest groups to be involved in establishing the monitoring effort to

identify surfing or surf quality changes that might be attributable to the nourishment project, including identifying criteria for a determination of what constitutes a significant alteration or impact.

(c) supplementing the "wave observation" component of the surf monitoring with observations about the surfing activities, including user counts of surfers in the water, both morning and mid-day, and describing the average and maximum ride lengths.

(d) given that video recordings are included, if observer counts are too difficult for one observer, video may be used to augment observer counts.

(e) when collecting user data, the analysis should be disaggregated into weekday and weekend data.

(f) for mid-day observations on days when surfers are kept out of the water by lifeguards, these should be recorded as restricted use days (not zero use days).

(g) establishing mechanisms for informing the local community about the project, and encouraging public comments on surfing quality (or other recreational concerns), including but not limited to: (i) a web site, (ii) pre-construction notifications to the public; and (iii) signs.

Construction shall not commence until the Corps has received written concurrence from the Executive Director that the monitoring plan satisfies all of these criteria.

5. **Staging Plan Details.** The staging plans will assure: (a) that staging will not be permitted on public beaches, within public beach parking lots, or in any other location that would otherwise restrict public access to the beach; and (b) that the minimum number of public parking spaces (on and off-street) that are required for the staging of equipment, machinery and employee parking and that are otherwise necessary to implement the project will be used.

6. **Water Quality Plan Details.** The SWPPP will assure that: (a) the contractor will not store any construction materials or waste where it will be or could potentially be subject to wave erosion and dispersion; (b) no machinery will be placed, stored or otherwise located in the intertidal zone at any time, except for the minimum necessary to implement the project; (c) construction equipment will not be washed on the beach; (d) where practicable, the contractor will use biodegradable (e.g., vegetable oil-based) lubricants and hydraulic fluids, and/or electric or natural gas powered equipment; and (e) immediately upon completion of construction and/or when the staging site is no longer needed, the site shall be returned to its preconstruction state.

7. **On-going Monitoring Reports.** The Corps will provide to the Executive Director all monitoring reports, including biological monitoring (including biological mitigation monitoring), surfing monitoring, turbidity, and spill prevention and response monitoring, long-term shoreline monitoring, and cultural resource surveys.

8. **In-Kind Mitigation**. For any mitigation shown necessary by the monitoring, the Corps will not proceed to implement out-of-kind mitigations (e.g., using kelp habitat to mitigate surfgrass impacts, or providing mid-water habitat to mitigate for shallow-water habitat impacts) without showing to the satisfaction of the Executive Director that in-kind mitigation is infeasible. In addition, if out-of-kind mitigation is agreed to and impelemented, the mitigation ratio shall be 4:1 (i.e., 4 acres of mitigation for one acre of impact), and the area measured as the impact area shall be the entire seafloor area (and not, e.g., the acreage of scattered boulders alone).

9. **Renourishment.** The Corps will notify the Executive Director prior to any reinitation (after the first phase) of nourishment, and the Corps shall not implement any such renourishment until the Exective Director has received all of the monitoring reports required by that time, reviewed them, and agreed that the biological impacts have been mitigated and affected habitat restored to pre-project conditions.

III. APPLICABLE LEGAL AUTHORITIES.

A. Standard of Review. The federal Coastal Zone Management Act ("CZMA"), 16 U.S.C. § 1451-1464, requires that federal agency activities affecting coastal resources be "carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." Id. at § 1456(c)(1)(A). The implementing regulations for the CZMA ("federal consistency regulations"), at 15 C.F.R. § 930.32(a)(1), define the phrase "consistent to the maximum extent practicable" to mean:

> *… fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the Federal agency.*

This standard allows a federal activity that is not fully consistent with California's Coastal Management Program ("CCMP") to proceed, if full compliance with the CCMP would be "prohibited by existing law." The Corps, in its consistency determination, did not argue that full consistency is prohibited by existing law or provide any documentation to support a maximum extent practicable argument. Therefore, there is no basis to conclude that existing law applicable to the Federal agency prohibits full consistency. Since the Corps has raised no issue of practicability, as so defined, the standard before the Commission is full consistency with the enforceable policies of the CCMP, which are the policies of Chapter 3 of the Coastal Act (Cal. Pub. Res. Code §§ 30200-30265.5).

B. Conditional Concurrences. The federal consistency regulations (15 CFR § 930.4) provide for conditional concurrences, as follows:

> *(a) Federal agencies, … should cooperate with State agencies to develop conditions that, if agreed to during the State agency's consistency review period and included in a Federal agency's final decision under Subpart C … would allow the State agency to concur with the federal action. If instead a State agency issues a conditional concurrence:*
>
> *(1) The State agency shall include in its concurrence letter the conditions which must be satisfied, an explanation of why the conditions are necessary to ensure consistency with specific enforceable policies of the management program, and an identification of the specific enforceable policies. The State agency's concurrence letter shall also inform the parties that if the requirements of paragraphs (a)(1) through (3) of the section are not met, then all parties shall treat the State agency's conditional concurrence letter as an objection pursuant to the applicable Subpart . . . ; and*
>
> *(2) The Federal agency (for Subpart C) … shall modify the applicable plan* [or] *project proposal, … pursuant to the State agency's conditions. The Federal agency … shall immediately notify the State agency if the State agency's conditions are not acceptable; and*
>
> *…*
>
> *(b) If the requirements of paragraphs (a)(1) through (3) of this section are not met, then all parties shall treat the State agency's conditional concurrence as an objection pursuant to the applicable Subpart.*

IV. FINDINGS AND DECLARATIONS.

The Commission finds and declares as follows:

A. Marine Resources/Beach Nourishment/Dredging and Filling. Sections 30230 and 30231 of the Coastal Act require the protection of marine resources and biological productivity. These sections provide:

> *Section 30230. 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.*

> *Section 30231. The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface water flow,*

Section 30233(a) of the Coastal Act applies to dredging and filling activities; this section provides in relevant part:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following: …*
>
> > *(5) Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas. …*

Section 30233(b) encourages beach replenishment and requires disposal to occur in a manner protecting sensitive habitat; this section provides:

> *(b) Dredging and spoils disposal shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. Dredge spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches or into suitable long shore current systems.*

Under the above policies, the project needs to be an allowable use for dredging and filling, the project needs to be the least environmentally damaging feasible alternative, marine resources need to be protected, and adverse impacts need to be mitigated.

1. Allowable Use. The Commission has historically found beach nourishment to be an allowable use under Section 30233(a)(5), which allows dredging and filling for mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas. Moreover, Section 30233(b) encourages beach nourishment whenever dredge material is suitable, and material being dredged for the sole purpose of replenishing beaches is inherently suitable for use (assuming, as is the case here, it tests free of contaminants and is predominantly sand sized material). The project site is not an environmentally sensitive area. The borrow site offshore the Del Mar Boat Basin is not an environmentally sensitive area. The disposal site, San Clemente Beach, is also not an environmentally sensitive area, as it does not contain snowy plover

or least tern nesting. In addition, the project is being scheduled to avoid effects on grunion spawning. The Commission therefore finds the project is an allowable use under Section 30233 for dredging and filling.

2. <u>Alternatives</u>. Alternatives considered by the Corps included:

(1) No Action, which the Corps states would lead to continued loss of recreational and economic benefits, and may induce the Southern California Regional Rail Authority (SCRRA), which maintains the rail line that runs along the inland side of San Clemente Beach, to expand its existing revetment and/or build larger seawalls;

(2) Managed Retreat, which the Corps concludes is not a viable non-structural alternative in this situation, in part due to the cost of relocating the rail line;

(3) Beach Nourishment (proposed), which the Corps concludes is the most socially and environmentally appropriate alternative; and

(4) "Hard" Structural Measures, including onshore revetments and seawalls, offshore reefs and breakwaters, and perpendicular groins, all of which, the Corps notes (and the Commission agrees) raise a number of more problematic Coastal Act and coastal resource concerns.

In terms of alternatives *within* the category of beach nourishment, the Corps considered various beach width alternatives in five meter increments and looked at beach widths of between 10 and 60 meters. The proposed alternative is a 15-meter (50 ft.) beach width. In its Environmental Impact Statement prepared for the project, the Corps narrowed the focus its analysis on two of these: the 15- and 35-meter beach widths. A 35-meter beach width would involve initial placement of 586,000 cy. yds. of sand on the beach. The Corps rejected this alternative as the EIS concluded it would have significant adverse long-term and possibly irreversible impacts on the offshore biological resources (reef habitat, surfgrass, and kelp). In its EIS and consistency determination the Corps concluded that the proposed 15-meter (50 ft.) beach width nourishment would avoid these significant adverse effects, and is therefore the preferred alternative.

As will be discussed below, several agencies reviewing the proposal have recommended a 10 meter beach width, and they believe it may reduce offshore biological effects while still being a feasible alternative. Because this area has not been nourished in the past at a magnitude approaching the proposed project (i.e., only much smaller nourishment has occurred here), unlike the SANDAG project (i.e., the San Diego County beach nourishment) discussed elsewhere in this report, where prior nourishment efforts had improved the knowledge of how material would move downcoast and affect offshore sensitive habitats, it is not clear the extent to which sand will be mobilized and temporarily cover offshore sensitive habitats. Thus, future monitoring will be needed to assess the littoral and habitat dynamics and impacts in this location, and there is

insufficient data, at this point, to require the reduction in width of the project from 15 meters to 10. Also, maintaining a narrower beach width could lead to more frequent nourishment events, which could offset the benefits of a reduced project size. If unmitigable or unanticipated effects occur, future re-nourishment events may need to be reduced in scope. However, given the information and analysis included in this consistency determination (and accompanying EIS), and based on the information currently available, the Commission finds that the proposed beach width proposal would represent the least environmentally damaging feasible alternative. This finding is contingent on the assumption that the Corps will agree to Condition 9, which provides that the will not implement follow-up renourishment until the Exective Director reviews the monitoring reports and agrees that the biological effects have been adequately mitigated, and affected habitat restored.

3. <u>Mitigation</u>. The primary habitat and marine resource concerns raised by the project are potential effects on grunions, least terns, snowy plovers, reef habitats, surfgrass, giant kelp, and various birds and intertidal organisms. The dredging (offshore borrow site) and disposal (beach site) are not themselves environmentally sensitive habitat areas or areas of particularly valuable marine resources. Least terns and snowy plovers do not nest in the project area, and the project has been scheduled to avoid the grunion spawning season. The primary marine resources concerns raised by the project are the *indirect* effects of where and how much material will be transported by waves through the littoral system, where it has the potential to temporarily or permanently affect offshore sensitive marine habitats.

In its past reviews of beach nourishment projects using offshore borrow sites, the Commission has generally considered as minimal the temporary turbidity, burial and resuspension of material and organisms; these areas are generally recolonized within relatively short timeframes. SANDAG has surveyed the offshore borrow site being proposed by the Corps in its studies of beach nourishment borrow site options.[2] No kelp beds are present, and the SANDAG surveys do not show environmentally sensitive in this area at the depths proposed. The sensitive marine areas for the proposed project are the areas offshore where sand will migrate through, after initial placement. The Corps' consistency determination notes the particular significance of the offshore surfgrass, reef, and giant kelp marine habitats in San Clemente; the consistency determination states:

> *Surfgrass (Phyllospadix torreyi and P. Scouleri) and giant kelp (Macrocystis pyrifera) are considered to be particularly valuable marine habitats by the resource agencies because they provide shelter for fishes and invertebrates, attachment sites for sessile invertebrates, and form the basis of many marine food chains, both as living material and detritus. Surfgrass and giant kelp beds occur in limited areas along the southern California coast, usually on hard bottom substrate, compared to much more common soft bottom habitat.*

[2] Appendix D to the SANDAG Regional Beach Sand Project EIR/EA.

The Corps reviewed existing habitat studies and conducted surveys for surfgrass, reef, kelp, and other offshore habitats in the project vicinity. The Corps states:

> ***Marine Shoreline and Offshore Habitats***
> *The predominant intertidal habitat along San Clemente's shoreline is sandy beach, although some rocky outcrops that extend from mid-beach to the low intertidal are present at Mariposa Point, north of San Clemente Pier. Beyond the surf zone, the seafloor is a mosaic of sand and low-to-high relief patch reef. Some pinnacles of the reef are visible in the nearshore zone at low tide while two prominent offshore pinnacles break the surface offshore of Mariposa Point and south of the San Clemente Pier. Other reef habitats are located south of the Pier offshore of T-Street that extends west, and then north around the end of the San Clemente Pier.*

Exhibits 6-9 show the location of the offshore reef, kelp, and surfgrass areas. The consistency determination notes that kelp canopy has fluctuated considerably during the past decade. Concerning surfgrass, the consistency determination states:

> *Surfgrass (Phyllospadix torreyi), an important species that enhances the biological value of nearshore habitat, is present in the low intertidal beginning approximately 300 ft (91 m) offshore of the sand beach. Surfgrass serves as a nursery for California spiny lobster (Panulirus interruptus) and provides shelter for a variety of juvenile and adult fishes. Surfgrass is present throughout the low intertidal platform of Mariposa Point, which is upcoast outside of the project area. Surfgrass off Mariposa Point occurs a minimum of three feet above the sand line with no more than one inch of sand covering the surface of the rocks. Surfgrass blades in this area are 1 to 2 ft (0.3 to 0.6 m) in length.*

In the area north of the Pier, the surveys identified scattered patches of surfgrass on the upper surfaces of one foot high boulders. Surfgrass blades were generally 2-3 ft. long. South of the Pier, the survey found surfgrass meadows were observed, particularly on the T Street Reef, in water depths of -4 to -13 ft. MLLW (Exhibits 6 & 7). The consistency determination describes the subtidal reef south of the Pier as follows:

> *The subtidal reef habitat south of the Pier is extensive and angles around the tip of San Clemente Pier. This reef formation is shown on Figure 4-6. Larger macrophytes observed on the reef include giant kelp, feather boa kelp (Endarchne binghamiae) and bladder chain kelp (Cystoseira/ Halidrys) (CRM 2000). A small patch of giant kelp consisting of 12 plants was observed 650 ft (197 m) south of the Pier at a depth of 16 ft (5 m) in October 1999, but was not observed in June 2000. Kelp canopy was observed on the entire reef in July 2009.*

The consistency determination also notes that the:

> *California spiny lobster (Panulirus interruptus) is common in the subtidal reef habitat in the project area. Commercial lobster fishermen set traps in the area during the lobster fishing season of October through mid-March and lobster also are fished in the area by SCUBA divers.*

The Corps also notes that California grunion (*Leuresthes tenuis*) spawning, which was a significant concern during the Commission recent review of the SANDAG beach nourishment proposal in San Diego County, occurs in the intertidal area in the vicinity of San Clemente Pier; however the project scheduling (late August/early September through March) is intended to avoid the disposal during the grunion season.

Concerning sensitive bird species, least tern and snowy plover breeding and nesting have not been observed in the project area; the beach is too narrow for plover nesting, and least terns breed further south on Camp Pendleton (primarily at the Santa Margarita River mouth). The proposed offshore borrow site is within the range of the foraging area for least terns; however the project scheduling would avoid the least tern breeding season.

The project would avoid direct effects on sensitive beach, intertidal, and marine habitats. The consistency determination states:

> ***Figure 3-7*** [Exhibit 6] *shows the construction and equilibrium footprints for the Project in relationship to surfgrass and kelp in the Project area. The sand placement footprint does not include any kelp beds, surfgrass, or rocky intertidal areas. Therefore, no direct impacts to sensitive habitats would occur from the placement of sand on the beach. In addition, the proposed Project would not place anchors for the mono buoy, where the hopper dredge will moor while it discharges sand to the beach, or place the sinker pipeline that will pump the sediment to shore from the hopper dredge on any sensitive habitat. The construction contractor shall avoid placement of anchors or the submerged pipeline onto reef habitat, which could crush attached organisms. The construction contractor shall also avoid side to side movement of the anchors or pipeline as they are placed, which could abrade surfgrass, algae, or attached invertebrates. If a substantial amount of surfgrass or kelp were affected by placement and removal of anchors and pipelines, the impact would be considered significant. These impacts would be avoided and minimized by performing a pre-construction survey to identify anchor and pipeline locations that would avoid sensitive resources. Because most of the surfgrass in the Project area grows on T-Street reef, it is possible to avoid surfgrass by avoiding the reef when laying the pipeline.*

Thus, as stated above, the habitat concerns raised are over where and how the sand moves after its initial placement. The Corps indicates primary littoral drift direction to be southward, which, if it does occur in this manner, should protect the important reef to the north (Mariposa Point (Exhibit 9)). The Corps states:

> *The net movement of beach sands in the Project area is expected to be southerly, but some northerly movement may occasionally occur. Based on monitoring of the SANDAG beach fill project at Oceanside, most sand movement is expected to be toward the south (Appendix D). Therefore, it is unlikely that significant quantities of sand will be transported to the north to the rocky intertidal habitat at Mariposa Point. The equilibrium footprint for the 50 ft Beach Width Alternative indicates that sand will not extend as far upcoast as Mariposa Point (Figure 3-2). Therefore, the proposed action would not be expected to result in the net loss of habitat value of sensitive rocky intertidal habitat, and impacts to rocky intertidal habitat would not be significant.*

The Corps used modeling to predict an equilibrium footprint, and states that the available evidence suggests that surfgrass could withstand temporary burial of up to 2/3 of its blade length. Surfgrass blade lengths average 2-3 ft. The Corps notes:

> *Therefore, the equilibrium footprint of the Project likely would result in a range of impacts between no burial of surfgrass on the larger rocks and partial burial on the smaller boulders. Burial of surfgrass on the outer portions of T-street reef would be minimal. Surfgrass is adapted to partial sand burial, routinely survives seasonal sand burial of part of its blades, and can recover quickly via regrowth if the root system is intact; however, the degree of sand burial surfgrass can withstand is not well documented (SANDAG 2000).*

For a similar large fill project proposed (but not implemented) in the area, which was a 175,000 cu. yd. disposal in San Clemente, the consultants (Coastal Resources Management, June 26, 2000 (CRM 2000)) predicted such a fill would result in a maximum 1 ft. of cover of surfgrass for a 6 month period, which would not exceed 2/3 of blade length. That study predicted:

> *Based on observation of burial of existing offshore surfgrass in the area, CRM (2000) proposed a criterion of sand burial of no more than 2/3 of the blade length for six months or less as a level that surfgrass can withstand, and concluded that burial of less than half the blade lengths for less than six months would not be expected to result in long-term damage (CRM 2000).*

Looking at a more recent laboratory study, the consistency determination acknowledges some burial can cause mortality. The consistency determination states:

> *A recent laboratory study of Phyllospadix scouoleri suggested that short term sand burial may result in shoot mortality, decreased shoot counts, and reduced growth of surfgrass (Craig et al. 2008). The study found that shoot density decreased compared to controls for a burial depth of 0.8 feet (25 cm), but not shallower burial depths. Mean shoot growth rate decreased in all burial treatments. Therefore, the Project may result in some degradation of the shallower portion of the surfgrass habitat, but would not result in a significant loss of surfgrass. For the Project, the sand from the beach fill is predicted to move out of the equilibrium footprint within 6 years.*

Concerning effects on lobsters, the Corps' consistency determination states:

> *In addition to partial burial of surfgrass, offshore movement of sediment may result in filling in some holes and crevices in the shallow subtidal that are used by lobsters. These shallow subtidal reef areas are periodically covered and uncovered by sand naturally (i.e., in the absence of a beach nourishment project). The beach fill from this alternative would have only minimal effects on the considerable reef area near the end of San Clemente Pier and would not degrade that habitat for lobsters. Temporary degradation of a limited amount of inshore lobster habitat would not be significant.*

Concerning future effects from periodic renourishment, the Corps states:

> *Periodic renourishment at San Clemente would occur approximately every 6 years. The impacts of renourishment to sensitive habitats would be similar to those of initial placement. Effects, if any, are expected to be transitory and within natural variation. Because observations of other beach fill projects have documented that observed effects on sensitive habitats last between six months and two years, maintenance renourishment at a frequency of every 6 years would not be expected to result in permanent degradation of sensitive habitats. Sensitive habitats should be monitored to document any effects that may occur from beach renourishment. If impacts to surfgrass are observed, subsequent nourishment activities will be modified. If long-term impacts still are observed after modifying renourishment, then renourishment would not occur again until impacted surfgrass has recovered or mitigation is implemented.*

Because extensive beach nourishment has occurred, and offshore impacts studied, in San Diego County, in its EIS the Corps also looked at, for comparison purposes, SANDAG's beach nourishment monitoring (further described on pages 31-32 of this report.) The Corps' EIS states:

> *Biological monitoring of sensitive habitats, including rocky intertidal, shallow subtidal reefs, and kelp forests, was conducted following implementation of the SANDAG Regional Beach Sand project, which placed sand on several beaches in*

San Diego County (AMEC 2005). Beach profile and biological monitoring data indicated a great deal of spatial and temporal variability in sediment transport.
…

Of 18 shallow subtidal reef locations monitored to assess potential impacts of the SANDAG project, only three showed an increase in sediment cover that may have been a result of the project (AMEC 2005). A monitoring site near Batiquitos Lagoon showed increased sedimentation two years following the SANDAG beach fill, suggesting a cause and effect relationship, but the increased sand levels were within variation observed during monitoring of the site before the beach fill. The increase in sediment cover at this site did not appear to have any biological effects because the cover and abundance of indicator species did not change. A monitoring site in North Carlsbad showed an increase in cover following the SANDAG beach fill and an associated decrease in surfgrass cover. However, there were multiple sources of sediment near this site and it is unclear to what extent the observed effects were related to the SANDAG project. The third site that showed a significant increase in sedimentation following the SANDAG beach fill was at Solana Beach. The SANDAG project was the only apparent source of sediment at this site. The increased sedimentation did not appear to affect surfgrass cover, but shoot density declined, possibly in response to the increased sedimentation.

Of the kelp bed sites monitored as part of the SANDAG program, some showed relatively constant sand cover, and some showed an increase in sediment cover following the SANDAG beach fill (AMEC 2005). The sand cover observed at the sites with increased sedimentation was within levels observed during pre-project monitoring, suggesting natural variation. The increases in sand cover did not appear to affect the distribution and abundance pattern of kelp bed indicator species. Giant kelp recruitment and persistence either increased or remained stable during the period following the SANDAG Regional Beach Sand project.

The EIS concludes:

Summary of Significant Unavoidable Impacts:

If a substantial amount of surfgrass were lost, impacts may remain significant even with mitigation. Although the beach fill sand would be expected to move out of the equilibrium footprint within 6 years, because models are not precise, it is not clear if surfgrass would recover. If adverse significant impacts to surfgrass are observed from the monitoring, subsequent nourishment activities will be modified to avoid or minimize these impacts as part of adaptive management. If adverse significant impacts still are observed after all reasonable attempts to avoid or minimize impacts have been exhausted, additional renourishment would not occur until impacted surfgrass has recovered or and compensatory mitigation is completed. A consistently

> *successful method to transplant surfgrass has not yet been devised, although recent experiments may provide new options. Potential mitigation, if necessary, is described in the Mitigation Monitoring and Reporting Plan (Appendix B).*

Thus, the Corps accepts the need for continued monitoring to assess impacts, to use adaptive management and modify the project if impacts to surfgrass are observed, and most importantly, that renourishment would not occur until affected surfgrass has recovered or mitigation is implemented. The Corps' monitoring and mitigation measures include:

(1) pre-construction kelp and surfgrass surveys before finalizing anchor, pipeline, and mooring placement;

(2) more detailed monitoring of surfgrass prior to construction to provide baseline for post-construction surveys;

(3) if post-construction surveys cause adverse effects, adaptive management in consultation with resource agencies will be implemented to avoid or minimize effects during future nourishment events;

(4) if rocky reef impacts occur, creation of 1:1 mitigation of rocky reef habitat; and

(5) if surfgrass impacts occur, experimental surfgrass mitigation, and since surfgrass mitigation is not able to be assured, additional kelp reef mitigation in the event the surfgrass mitigation does not succeed.

The EIS notes that the project's mitigation budget is sufficient to cover what it considers a worst case scenario – 1 acre of surfgrass impacts and 1 acre of reef impacts. The T-street reef is 5 acres in size, and the Corps' "best professional judgment" is that 20% of it could be affected. The EIS states:

> *The Project has a mitigation budget that accommodates 1 acre of impacts to surfgrass plus 1 acre of impacts to reef, for a total potential impact to 2 acres of resources as a worst-case scenario. Initial modeling by the Corps shows that there is potential to impact 20 percent of the inshore edge of T-Street reef; and 5 acres of the T-Street reef. Twenty percent of the inshore edge is a reasonably foreseeable estimate of impacts based on a best professional judgment functional habitat evaluation assessment and the coastal engineering model. Both the BPJ FA* [Best Professional Judgment/Functional Assessment] *and the coastal engineering model considered the potential depth in addition to area; however that detail is not in inches, but in feet. A greater impact area would be unlikely, but an additional acre of potential impacts was included in the contingency mitigation budget to account for an unlikely worst-case scenario.*

The Corps' biological monitoring plan (Mitigation and Monitoring Plan (MMRP)) is attached as Exhibit 11. This plan is preliminary; the Corps indicates it will finalize it after conducting more intense pre-construction surveys during the Preconstruction Engineering and Design (PED) phase of the project. The Corps states:

> *The final monitoring plan will be prepared during the pre-construction engineering design (PED) phase of the project. The details of these plans will be finalized in conference with knowledgeable, experienced, and qualified marine ecologists. The monitoring shall be performed by knowledgeable, experienced, and qualified marine biologists. These knowledgeable, experienced, and qualified marine ecologists may come from a variety of various agencies, organizations, institutions, or community centers of practice and expertise, such as academia - University of California, Corps Engineer Research and Development Center (ERDC), NOAA National Marine Fisheries Southwest Fisheries Sciences Center, U.S. Geological Survey (USGS) Western Ecological Research Center, other federal and state agencies, as well as consulting marine ecologists. CDFG, FWS, and NMFS regulatory resources agency staff will also be involved with the review process.*

The current MMRP outlines:

> *1) a post-construction monitoring program for rocky reef/surfgrass habitat in the San Clemente Pier area to determine if project mitigation would be necessary;*
>
> *2) a preliminary mitigation implementation plan, if mitigation is determined to be necessary; and*
>
> *3) a preliminary mitigation monitoring plan, if mitigation is determined to be necessary.*

The MMRP acknowledges that the Corps has assessed potential impacts based primarily on modeling, and that:

> *Due to the uncertain nature of this modeling because of the multiple variables in the natural environment itself, impacts and mitigation requirements are expected to be unlikely, but currently are unknown. A post construction monitoring plan has been developed to determine if project impacts require mitigation based on comparisons to pre-construction conditions.*

The MMRP suggests triggers for mitigation, but the Corps notes that these too have not been finalized; the Corps states:

> *The following criteria are suggested as potential triggers for mitigation. Actual triggers would be determined in coordination with the resource agencies prior to initiation of post-construction monitoring activities.*

1) For random transects: a persistent decrease in surfgrass cover or surfgrass density and an increase in sand cover and/or depth that is statistically significantly different than the controls and the baseline at the 0.05 confidence level (i.e., p-value = 0.05).

2) For permanent transects: a persistent 20% decrease in surfgrass cover or surfgrass density coupled with a 20% increase in sand depth and/or cover.

The MMRP proposes baseline and post-construction monitoring, with the post construction monitoring transects taken annually, for 2 years after completion (four times in the first year, and two times in the second year).

Also, in response to one of the comments below concerning potential overlap between Corps nourishment and City of San Clemente Opportunistic nourishment, the Corps states that no such overlap will occur.

In developing its proposal, the Corps has met with the "resource" agencies (the U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Dept. of Fish and Game, and Environmental Protection Agency) to discuss the Corps' habitat analysis methodology, monitoring, and mitigation components. The resource agencies have expressed a number of concerns during these meetings, in DEIS comments, and through email communications. A July 13, 2011, email communication from the Fish and Wildlife Service summarizes these concerns as follows:

(1) the adequacy of baseline transect surveys and assumption of a worse case impact of up to only 0.81 hectares (ha) [2 acres (ac)] of surfgrass/reef impacts based on these surveys and the fact that the entire 5-ac T-Street Reef could be in the equilibrium footprint in which cross shore sand movement is expected to occur;

(2) the use of only a 1 to 1 mitigation ratio for surf grass impacts given temporal loss and uncertainty of surfgrass restoration;

(3) modifying the project to 10 meter (33 feet) beach width to help minimize potential impacts to surfgrass and reef, and mitigation risks/costs due to the uncertainty regarding surfgrass restoration;

(4) resource agency role in determining the criteria for triggering mitigation;

(5) the adequacy of the proposed $3 million mitigation fund when mitigation costs are estimated to be up to $3.5 million;

(6) potential cumulative impacts from the City's opportunistic beach replenishment program;

(7) potential impacts to the intertidal reef at Mariposa Point and use of Mariposa Point as a control in light of these potential impacts and from the City's opportunistic beach replenishment program;

(8) allowing subsequent beach replenishment before any previous impacts are successfully mitigated.

(9) the provision for only 2 years of monitoring for any necessary reef mitigation, instead of 5 years as for surfgrass mitigation;

(10) the provision for out-of-kind kelp mitigation for surfgrass impacts that could lead to continual loss of surfgrass from subsequent beach replenishment; and

(11) lack of requirement to do surfgrass restoration research in the event of mitigation failure.

On July 26, 2011, the Fish and Wildlife Service sent the Corps its Final Fish and Wildlife Coordination Act Report (CAR), concluding its consultation with the Corps for the project. This report: (1) reiterated the above concerns; (2) agreed with the Corps that least terns and snowy plovers would not be affected; (3) indicated that the resource agencies would continue to be involved in the development of the final monitoring plan and the determination as to the levels and significance of impacts observed by the monitoring; (4) stated that the Corps' current monitoring plan does not fully address the above summarized resource agencies' concerns; and (5) made the following comments and recommendations to address these concerns (a full text of the recommendations can be found in Exhibit 12):

RECOMMENDATIONS

1) Due to "a great deal of uncertainty regarding the ability to mitigate impacts to surfgrass inkind," combined with the fact that the Corps has indicated that a 10-m (33-ft) beach width would "achieve the project purpose of storm damage protection and yield an acceptable benefit-cost ratio for the project," the Corps should limit the project to a 10-m (33-ft) beach width "to help ensure that significant long-term impacts to surfgrass do not occur and to minimize potential mitigation risks/costs."

2) Due to a limited number of baseline survey transects taken, combined with the fact that the entire 5 acres of T-street reef are in the equilibrium footprint, "the MMRP should be revised to assume at least 5 acres of surfgrass/reef impacts to help ensure that adequate funds are budgeted for potential mitigation costs."

3) Rather than only 2 years of monitoring for surfgrass/reef mitigation, "the MMRP should be revised to include at least 5 years of monitoring of surfgrass/ reef mitigation."

4) “The MMRP proposes to mitigate impacts to shallow reef with deep water reef, without sufficient justification as to why it is not feasible to restore shallow reef. … the MMRP should be revised to require impacts to shallow reef be mitigated in-kind, unless the resource agencies concur that this is not feasible and that potential cumulative loss of shallow reef is expected to be minimal.”

5) The MMRP “should be revised to require impacts to surfgrass be only mitigated in-kind, unless the resource agencies concur that sufficient research and testing has shown that this is not feasible and potential cumulative loss of surfgrass is expected to be minimal.”

6) While the intertidal reef at Mariposa Point is north of the beach replenishment site, and littoral sand movement generally southward, it “is not far enough north of the project site to assume that no impacts will occur.” The MMRP “should be revised to include monitoring of the intertidal reef at Mariposa Point and mitigation for any significant long term impacts.”

7) Since Mariposa Point itself could be affected, it should not be the only control site. The MMRP “should be revised to include multiple control sites approved by the resource agencies.”

8) Mitigation measures should be planned and provided for up-front (prior to or concurrent with project impacts) and supplemented as needed. “This is especially important for surfgrass because of the uncertainties of surfgrass restoration and at least a 2- to 5-year temporal loss of functions between time of impact and restoration success.” If not, the MMRP should be revised to include adequate compensation to address temporal losses as agreed to by the resource agencies.”

9) The Corps should monitor turbidity at the borrow and disposal site throughout the duration of the project, with up-front resource agency agreement with the turbidity monitoring plan, and with weekly reports submitted to the resource agencies.

10) Subsequent dredging/disposal should not occur if significant impacts to surfgrass/reef resources are documented, “until the resource agencies concur that mitigation for those impacts is successfully completed, or impacted surfgrass or reef has recovered.”

11) “After the comprehensive PED phase biological surveys, the Corps should revise the MMRP and receive written concurrence from the resource agencies that it fully addresses mitigation of impacts, criteria for triggering mitigation, success criteria, and monitoring and reporting requirements.”

12) The Corps should include adequate budgeted funding to cover mitigation costs as recommended by the resource agencies, and the Corps and City should identify and assure backup contingency funding mechanisms, such as "a letter of credit, endowment account, or other legal mechanism approved by the resource agencies sufficient to guarantee mitigation will be implemented to offset adverse impacts of the project."

The Commission agrees with the resource agency concerns expressed over several uncertainties which make it difficult to predict the project's impacts, including:

(1) the fact that the impact analysis is based on primarily on modeling;
(2) the fact that the wave climate and littoral system in San Clemente is different than in areas where beach nourishment has been studied in San Diego County; and
(3) the acknowledged difficulty in successfully mitigating surfgrass impacts.

Due to these uncertainties, the Commission finds that several measures are needed to assure the project's effects are minimized, adequate monitored, and if impacts occur, adequately mitigated. Compliance with the conditions on pages 6-9 above is needed to assure the monitoring and mitigation measures are adequate to protect, and where impacts occur, mitigate, the project's effects on marine resources, before it can be found consistent with the marine resource policies of the Coastal Act. The recommended conditions would provide for: (1) implementing additional grunion monitoring and protection measures, in the event unforeseen circumstances delayed work into the grunion season; (2) Commission staff review of and concurrence with the final monitoring plans; (3) specification of success criteria to be included in the monitoring plans to assure they will adequately measure impacts; (4) increasing the mitigation ratio if out-of-kind mitigation is implemented (which is triggered if in-kind mitigation is unsuccessful); (5) lengthening the monitoring period from 2 to 5 years; (6) submitting all monitoring reports to the Commission staff; and (7) assuring that subsequent re-nourishments will not be implemented unless and until the Commission staff has reviewed the monitoring and mitigation and agrees the habitats have been adequately restored and/or that the permanent loss of habitat has been adequately mitigated. If, and only if, the Corps were to agree to implement these conditions, the Commission finds that the proposed project could be found consistent with the marine resources, beach nourishment, and dredging and filling policies (Sections 30230, 30231, and 30233) of the Coastal Act.

B. <u>Public Access and Recreation</u>. The Coastal Act provides:

<u>Section 30210</u>. In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.

Section 30211. Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.

Section 30212

(a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where: (l) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources, (2) adequate access exists nearby...

Section 30213. Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred....

Section 30220. Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

San Clemente City and State Beaches rank at the top of California's beaches in terms of both popularity and extent of visitor use (approximately 2 million visitors per year, according to the Corps). In many ways these beaches and surf zones represent quintessential coastal resources. The Corps' statement of Purpose and Need in its consistency determination aligns closely with the goals and objectives of the above Coastal Act policies; the Corps states:

The public interest related to the establishment of planning objectives and planning constraints are:

1. To reduce the potential for storm damages to the LOSSAN Rail Corridor facilities and operations, located along the beaches of the City of San Clemente;
2. To reduce the potential for storm damages to public beach facilities;
3. To restore the recreation beach along the Pacific Coast of the City of San Clemente;
4. To preserve the nearshore ecosystem that supports commercial lobster, fisherman, and snorkeling activities;
5. To preserve and enhance opportunities for surfing along the San Clemente coast;
6. To improve public access and safety to the recreation beach areas of the City of San Clemente; and
7. To improve public access and safety to the recreation beach areas of the City of San Clemente.

The consistency determination notes that while relatively stable in recent historical time, the City's beaches have been eroding since the 1990s, which has caused concern both over loss of recreational beach areas, and the need to protect the heavily travelled rail corridor located on the east side of the beach (i.e., the Southern California Regional Rail Authority (SCRRA)) tracks and trackbed. This rail line is both vital for national defense and serves as an important public access and transportation corridor.

While clearly intended to protect and preserve public access and recreation opportunities, the project has the potential for temporary construction period adverse effects such as reduction of recreational quality from noise, turbidity, and air emissions, reduction of public parking from equipment staging, direct blocking of access by pipelines and disposal/beach moving equipment, and modifications to popular surf breaks that could affect surfing. The Corps' consistency determination notes that at any one time, 300 ft. of beach would be inaccessible due to the discharge pipeline and berms, and 350 ft. intermittent access restrictions would be put in place on either side of the discharge zone, to allow maneuvering heavy equipment. The consistency determination states:

> *Only portions of the beach would be closed during construction. As portions of the beach are completed, the construction zone would be moved down the beach. Construction is typically performed in sections. Each section is closed off with no horizontal (alongshore) access through the area. Vertical (cross shore) access is allowed along the section boundaries. To the maximum extent practicable, USACE specifies the public access in the pre-construction, engineering and design (PED) Phase.* ***At each access point, only a small fraction of that entry point would be closed or pedestrian traffic detoured around the construction. Access to the San Clemente Pier would not be closed.*** *If necessary, USACE can specify additional access be provided, nonetheless it would have to coordinated with the City of San Clemente. Given the short-term period of construction (up to four months), impacts would be considered temporary and not significant.* [Emphasis in original]

The Commission agrees that the short-term temporary impacts to public access would be minor and would be offset by the long term benefits to access and recreation from beach widening.

Concerning effects on surfing, the consistency determination states:

> *Some of the sand placed on San Clemente Beach to widen the beach by 50 ft would be carried offshore. The T-Street surfing location is within the alongshore extent of the proposed beach nourishment. The reef at T-Street is a seabed perturbation such that its elevation, shape, and orientation to incoming waves are a unique combination that tends to shoal waves to a peak with a resulting plunging "left" (from the surfer's perspective, wave breaks from right to left) and "right" (from the surfer's perspective, wave breaks from left to right), which*

results in a variety of waves and favorable surfing characteristics. The configuration and orientation of the reef to incoming waves create consistent surfing waves, making T-Street a popular break in the south Orange County coastal area. High steepness waves result in plunging breakers, which are associated with beaches with steeper gradients. Plunging breakers descend very quickly and with substantial force; noted for a "lip," or shoreward facing edge, at the top of the wave. With the proper set of conditions, the plunging lip can create a "tube" or barrel." The consistent steepness of the wave coupled with the structure of the lip enables surfers to consistently reach higher speeds and perform more maneuvers. The surfing extends from the beach to about 600 ft (200 m) offshore and typically is in water depths less than 15 ft (5 m). The surfing area is closer to the beach than the actual reef location, as incoming waves require time and space to be transformed by the reef bathymetry.

*Most of the sand from the Project would settle in the inshore portion of the reef and would not affect the refractive abilities of the reef or the characteristics of the "take-off." However, as the wave encounters the straightened bathymetry inshore, it may "close-out," resulting in a shorter ride in the realm of seconds. This condition would be temporary and would lessen as the sand moves off the reef steadily over the course of 6 years at a long-term erosion rate of 13 ft (4 m) per year. Although impacts due to the wider beach may occur, an aerial photographs of San Clemente Beach at the Pier (**Figure 4-4**) indicates that the beach width in 1994 was approximately 55 ft (17 m) wide and no records have been found that indicate surfing ceased within the Project area during that time.*

Because the shorter rides are a temporary condition, impacts to surfing would not be significant. The wider beach would improve the recreational experience for sunbathers, walkers/joggers, and picnickers. More beach area would be available for these activities construction areas, including the beach and nearshore zone. The effects on public safety while the beach fill Project is reaching equilibrium would be a significant, but temporary, impact.

The Corps has agreed to monitoring for impacts to surfing. This monitoring would include direct surveys of the beach and seabed morphology to determine changes in beach and seabed morphology, define the sediment transport patterns at the shoreline, and ultimately identify the short term and long term beach erosion processes. The survey methods would consist of topographic measurements, bathymetric measurements, surf quality observations, and video stereo photogrammetric methods. Monitoring would begin one year before construction (for the surf quality observations) and continue for the 50- year period of the project. The monitoring would measure beach widths, topography and bathymetry, surf quality (surfability). The Corps summarizes this last effort as follows (further described in full in Exhibit 15):

> *Surfing and high quality surfable waves are an increasingly valuable resource. An innovative method pioneered by the Los Angeles District has been developed to quantify surf quality (surfability). A trained observer visually estimates the breaking wave climate at the shoreline twice daily, typically at first light and at 1300; the times are approximate. Wave characteristics measured included height, period, and direction. Wave heights from the crest to the trough are visually estimated to the nearest 1 foot. Waves are observed for a period of 5-10 minutes and the minimum, average, and maximum wave heights are estimated. Wave period is based on an average of 30 waves over the 5-10 minute observation period and is reported to the nearest 1 second. Wave directions are reported relative to the beach normal and estimated to the nearest 5 degrees. Wave directions are recorded as normal (0-10 degrees); slightly from the left (or right) (10-25 degrees); significantly from the left (or right) (greater than 25 degrees). Surf quality is also expressed in common surf language by the observer. Visual observations are supplemented with video recordings.*

The Commission finds that several conditions are needed to minimize, and assure adequate monitoring of, the project's public access and recreation impacts. The conditions (pages 6-9) providing for Commission staff review of the final staging and surfing monitoring plans, including several details needed to reduce effects and improve monitoring validity (Conditions 4 and 5). The Commission concludes that if the Corps agrees to modify the project consistent with these conditions, the project could be found consistent with the public access and recreation and surfing policies (Sections 30210-30213, and 30220) of the Coastal Act.

C. <u>Water Quality</u>. The Coastal Act provides:

<u>Section 30230</u>. *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.*

<u>Section 30231</u>. *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

Water quality impacts can occur at either the offshore borrow site or the onshore replenishment, due to fuel spill and contaminant releases, or excessive turbidity from dredging or disposal. The Corps proposes to minimize these effects through adherence to a Stormwater Pollution Prevention Plan (SWPPP) and an Oil Spill Prevention and Response Plan (OSPRP).

The Commission has generally considered open ocean turbidity from beach nourishment projects, with their predominantly large grain sizes, to be minor. In its recent SANDAG findings, the Commission noted:

> *Monitoring data from previous California beach nourishment projects have found concentrations within the plumes to be no higher than that which occurs naturally in nearshore waters under higher wave or storm conditions. Plumes from dredging and sand placement of this project are not expected to have a significant impact.*

To address fuel and other equipment spill concerns, and turbidity concerns, the Corps proposes the following monitoring and mitigation measures to protect water quality:

> ***MM-WR-50-1.1:*** *A SWPPP and an OSPRP shall be prepared for all construction activities. These plans shall specify specific measures that shall be taken during dredging and beach construction to avoid introducing contaminants to the ocean via leaks and spills. All measures shall be adhered to during Project construction.*
>
> ***MM-WR-50-1.2:*** *Turbidity shall be monitored during dredging. If a visible turbidity plume is observed beyond the immediate dredging area, dredging activities shall be modified (e.g., decrease the rate of dredging, move to a new dredge location) until the turbidity plume disperses. Turbidity also shall be monitored during beach fill operations. If significant turbidity (i.e., a visible turbidity plume beyond the surf zone or rip current area) is observed, beach fill operations shall be modified (e.g., by slowing the rate of fill) until the turbidity plume disperses.*

Construction equipment used for the project has the potential to contaminate the beach area from minor spills and leaks from equipment. The Commission's Water Quality Unit reviewed the proposed measures. The Commission is adopting Conditions 2, 6, and 7 (pages 6-9) to address the need for the above plans to be submitted for review by the Executive Director, and to assure that water quality impacts are minimized through, among other means, prohibiting the storage of construction material in the surf zone, washing vehicles on the beach, or refueling or fuel storage on the beach, and where practicable, providing for contractor use of biodegradable (e.g., vegetable oil-based) lubricants and hydraulic fluids, and/or electric or natural gas powered equipment. Thus, if the Corps were to agree to implement the conditions, the Commission concludes that the project would be consistent with the water quality policy (Section 30231) of the Coastal Act.

D. <u>Related Commission Action</u>. In Consistency Certification CC-033-03 (Southern California Regional Rail Authority ((SCRRA)), the Rail Authority was proposing the replacement of rocks forming the existing railroad bed for the rail line traversing the inland edge of San Clemente Beach, in four areas where erosion was threatening the tracks. The Commission found it was necessary to protect the trackbed; however the Commission urged the rail authority, in looking at long term needs, to "Participate in studies currently underway by the Army Corps of Engineers to evaluate sand replenishment and other potential methods for future protection of public and private properties within San Clemente." In concurring with SCRRA's consistency certification, in June 2003, the Commission found:

> *The Commission suspects that an adequately engineered structure would have substantially less maintenance requirements and provide better protection for the railroad tracks. Alternatively, it may be feasible to replace the riprap with sand, as part of a regional beach nourishment project.*
>
> *The Commission notes that the U.S. Army Corps of Engineers is investigating shoreline erosion issues in San Clemente. It is working with the SCRRA, the City of San Clemente, and Orange County to analyze the erosion problem and various solutions. The Commission believes that the Corps is considering beach replenishment as one of its alternatives to the erosion problem in this area. However, the Corps is in the early stages of its investigation and has not determined if there is a federal interest for a project or if it is feasible.*
>
> …
>
> *In addition, the SCRRA has agreed to investigate long-term projects such as beach nourishment or engineered revetment as methods to address erosion problems in this area while reducing the maintenance needs of the existing structure. With these modifications, the SCRRA will reduce the long-term cumulative impacts on sand supply from its regular maintenance activities.*
>
> *In conclusion, the Commission finds that the proposed project is necessary to protect an existing structure threatened by erosion. Additionally, the Commission finds that the applicant will mitigate for impacts to sand supply by developing a short-term and long-term plan to address cumulative impacts associated with repeated maintenance activities. Therefore, the Commission finds that the project, as modified, is consistent with the shoreline structure policy of the CCMP, specifically Section 30235 of the Coastal Act.*

In reviewing the City of San Clemente's CDP application for its Opportunistic Nourishment Program (CDP No. 5-042-142), in December 2004 the Commission approved a 5-year permit for opportunistic beach replenishment at four receiver sites. The Commission's permit conditions required:

1) local public hearings for every sand replenishment project,
2) preliminary pre-construction monitoring of surfgrass resources,
3) a prohibition on construction during summer holiday weekends, and a limit on the number of beaches at which work can occur simultaneously to two,
4) a requirement that an on-site debris manager be present at all nourishment projects,
5) water quality BMPs to be incorporated into every project,
6) affirmative approval of the Executive Director for any future beach nourishment projects approved under this permit, evidence of Army Corps of Engineers approval, and assumption of risk,
7) monitoring of recreational and access impacts associated with individual beach replenishment projects, and
8) a requirement that any biological impacts be mitigated.

To date, the permit has only been used once; this use consisted of a 5,000 cu. yd. disposal of sand taken from the Santa Ana River and placed at North Beach (at the north end of San Clemente, seaward of Avenida Pico and El Camino Real). The only adverse effect documented by the post-construction monitoring report was "dissatisfaction of sand quality by volleyball players." Offshore biological effects (effects on reef habitat, surfgrass, and kelp) were minor; the monitoring report states: … sediments did not bury any reef habitat, nor appeared to adversely affect the cover of marine plants and organisms." The fill occurred in the summer; however grunions, although present in the area, were not adversely affected. A longer term (one year post-construction) monitoring report confirmed a lack of significant biological effects, although it must be noted that one of the reasons cited for the lack of reef and surfgrass effects was the small size of the project (5000 cu. yds.) and its location. The report concluded, among other things (Exhibit 14):

A lack of sediment-related effects may also be a function of the volume of beach fill that actually eroded off the shoreline. The sand was placed above the Man Higher High Water (MHHW) line to avoid impacting grunion eggs that had been recently spawned, and thus was located above the majority of wave action. It is therefore unlikely that a large portion of the beach fill would have been entrained into the longshore current within the time frame of the post-nourishment subtidal marine biological surveys ….

In 2009 the Commission approved a subsequent immaterial amendment to the CDP to extend this permit for an additional five years (CDP 5-02-142-A1).

Initially in 2000, and subsequently in 2011, the Commission has twice approved the countywide San Diego County beach nourishment program conducted by the San Diego Association of Governments (SANDAG Regional Beach Sand Project (RBSP) I and II - CDPs 6-00-038 (with several amendments) and 6-11-018). The permit conditions for

both projects required, among other things, monitoring of recreational (including surfing) and biological impacts monitoring. Under the first of these permits, SANDAG placed approximately two million cu. yds. of sand on 12 San Diego County Beaches (RBSP I), completed in the Spring and Summer of 2001. The Commission's findings on RBSP II noted:

> *Extensive monitoring was completed in association with RBSP I and found no significant impacts to biological resources. The Commission also did not receive any adverse comments in regard to public access during or following construction of RBSP I.*

The second of these permits (RBSP II) involved placing 2.3 million cu. yds. on 10 San Diego County Beaches. During the Commission's review of this permit the paramount issue of concern appeared to be grunion protection and monitoring, and the Commission adopted an extensive set of conditions and criteria to monitor and protect grunions. The Commission also adopted conditions requiring beach sand monitoring, biological monitoring, surf break monitoring, Executive Director review and approval of the Final Monitoring Plan, and of final Staging Plans, Lagoon monitoring and mitigation, and applicant assumption of risk. The permit condition addressing grunion monitoring is attached as Exhibit 13.

V. SUBSTANTIVE FILE DOCUMENTS:

1. U.S. Army Corps of Engineers Consistency Determination, June 7, 2011.
2. U.S. Fish and Wildlife Service, Final Fish and Wildlife Coordination Act Report (CAR), July 26, 2011.
3. Project EIS/EIR: Joint Environmental Impact Statement/Environmental Impact Report, San Clemente Shoreline Protection Project, San Clemente, CA, Draft EIS/R, July 2010, Volumes I & II, Portions of Final EIS/EIR – Response to Comments, and revised Chapter 5.4 (Biological Resources), May 2011.
4. EIS/EIR Appendix - Coastal Engineering Appendix.
5. Updated Monitoring, Mitigation, and Reporting Plan (MMRP) .
6. Consistency Certification CC-033-03 Southern California Regional Rail Authority (SCRRA) (Replacement of rock to protect railroad).
7. CCC CDPs 6-11-018 and 6-00-038 (and amendments A1 to A3) (SANDAG Beach Nourishment).
8. CCC CDP 5-042-142 (City of and San Clemente, Opportunistic Beach Nourishment Program).
9. San Clemente Opportunistic Beach Nourishment Program, Monitoring report for Project Number One at North Beach, 30 Days Post Construction, Mofffat & Nichol, Summer 2005.

10. Appendix D to the SANDAG Regional Beach Sand Project EIR/EA, Evaluation of Impacts to Marine Resources and Water Quality from Dredging of Sands from Offshore Borrow Sites and Beach Replenishment at Oceanside, Carlsbad, Leucadia, Encinitas, Cardiff, Solana Beach, Del Mar, Torrey Pines, Mission Beach, and Imperial Beach, CA, March 2000.

Figure 1.1-1 Vicinity Map

Exhibit 1
CD-029-11

Figure 1.1-2 Location Map

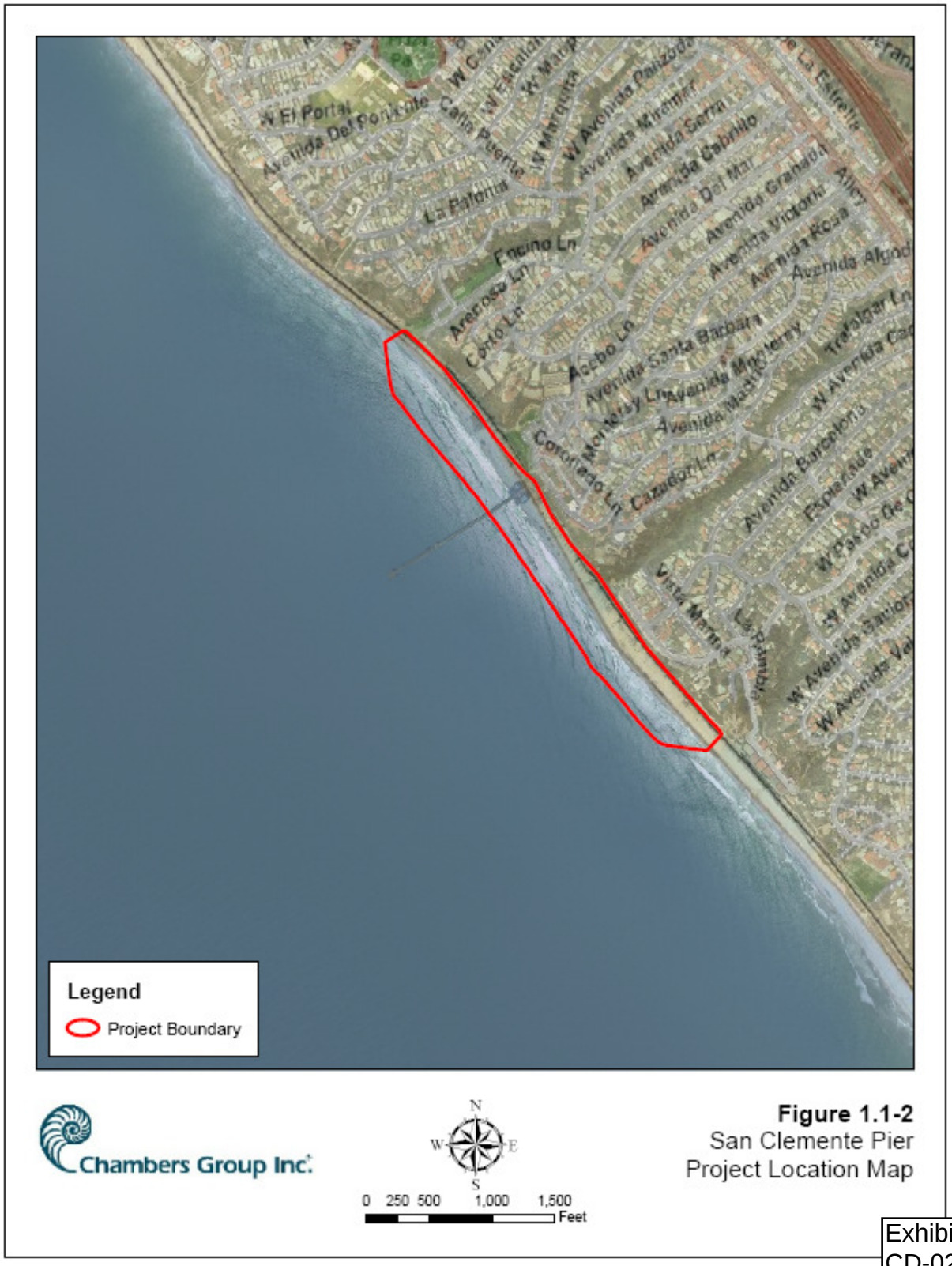

Exhibit 2
CD-029-11

Figure 3.4-1 – Oceanside Borrow Site

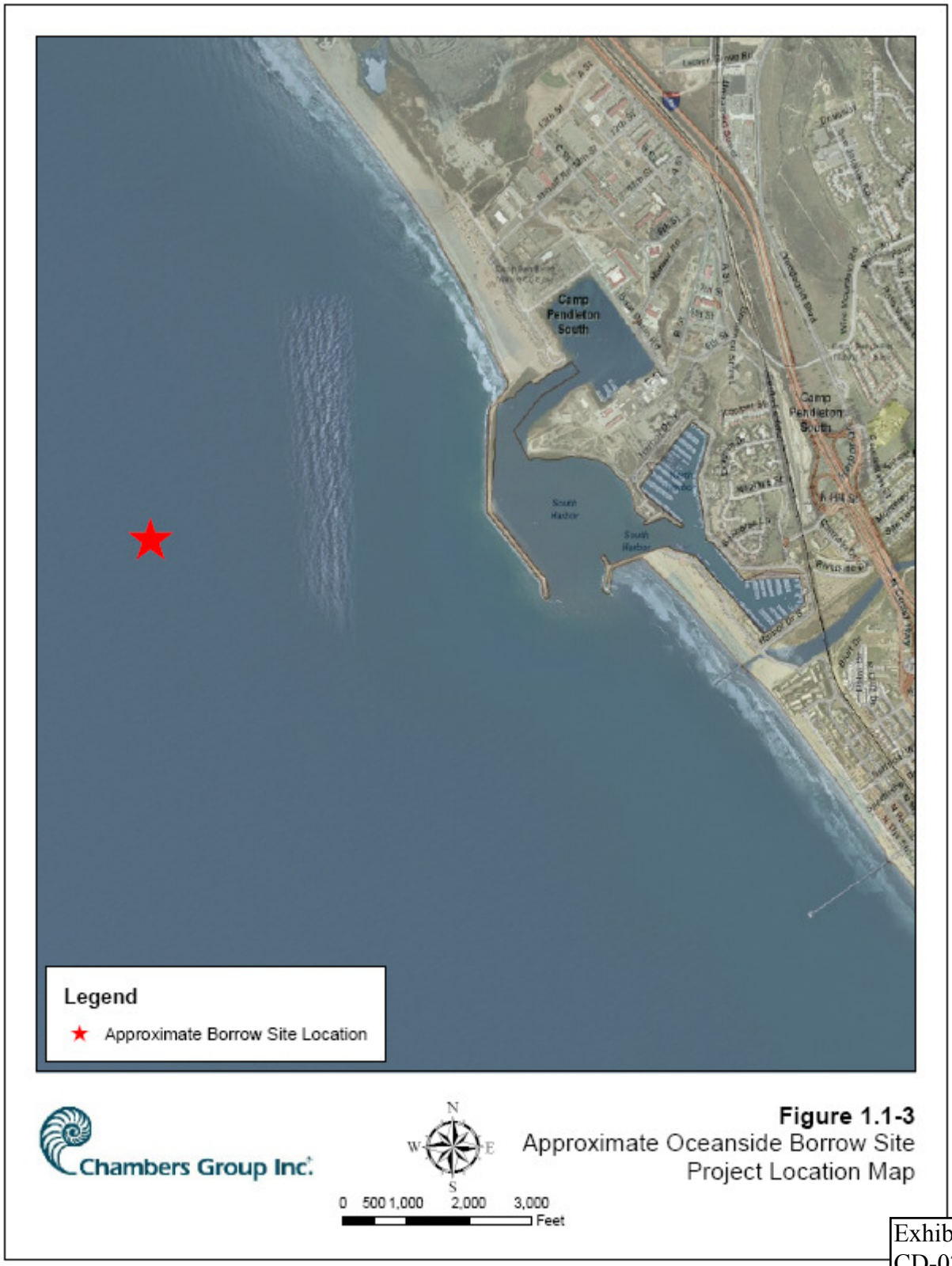

Exhibit 3
CD-029-11

Figure 3.4-2 Plan View of 50 ft (15 m) Beach Width Alternative

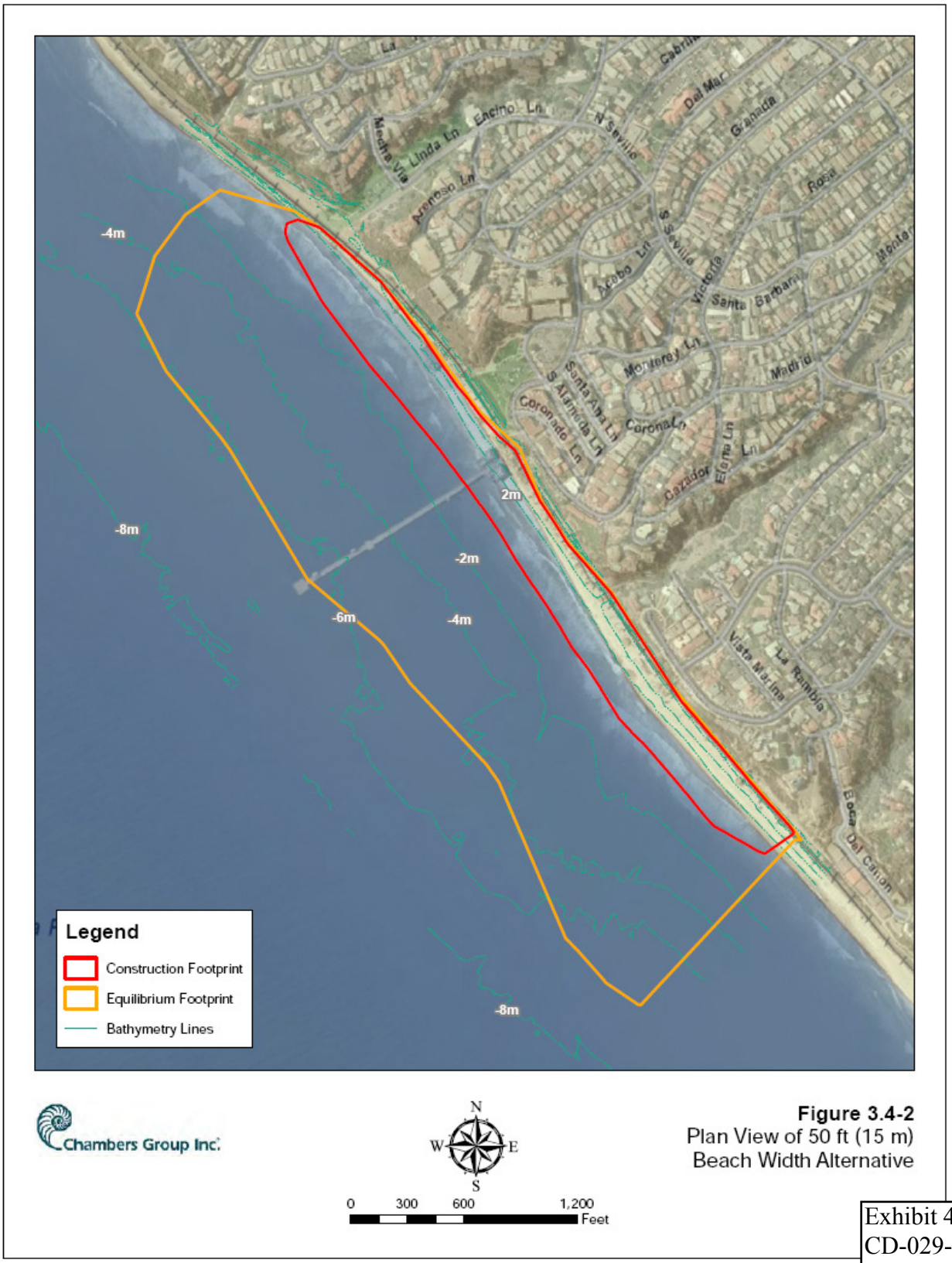

Exhibit 4
CD-029-11

Figure 3.4-4 Beach Access and Staging Areas

3.4.2.4 Public Access

For the beach fill operation, up to 300 ft (91 m) of beach would be inaccessible to the public around the discharge pipeline and berms. In addition, there would be intermittent restrictions on public access for approximately 350 ft (107 m) on either side of this discharge zone. This space would be needed for maneuvering heavy equipment during construction of the temporary berms.

3.4.2.5 Future Project Beach Profile Monitoring

Long-term shoreline erosional processes create damages through long-term profile translation landward and the increasing potential for wave related damages. The landward advancing shoreline reduces the beach width available for storm damage protection thereby increasing the probability of wave related damages to facilities and structures. Long-term beach erosion also results in the gradual reduction of the beach surface area available for recreation. The peak erosion rate is –0.7 ft/yr (–0.21 m/yr), the maximum erosion rate is -1.5 ft/yr (–0.46 m/yr), and the maximum accretion rate is +1.24 ft/yr (+0.38 m/yr).

The purpose of this monitoring is to allow the timing and the detailed design of the periodic nourishment to be optimized. Surveying of the beach and seabed morphology is paramount to the monitoring efforts. Changes in beach and seabed morphology will define the sediment transport patterns at the shoreline and ultimately the short term and long term beach erosion processes. Alongshore transects will be crucial to determine the effects, if any, of the proposed Project on updrift and/or downdrift shorelines. The monitoring period will be for the 50-year

Exhibit 6
CD-029-11

Figure 4.4-2 Surfgrass Survey

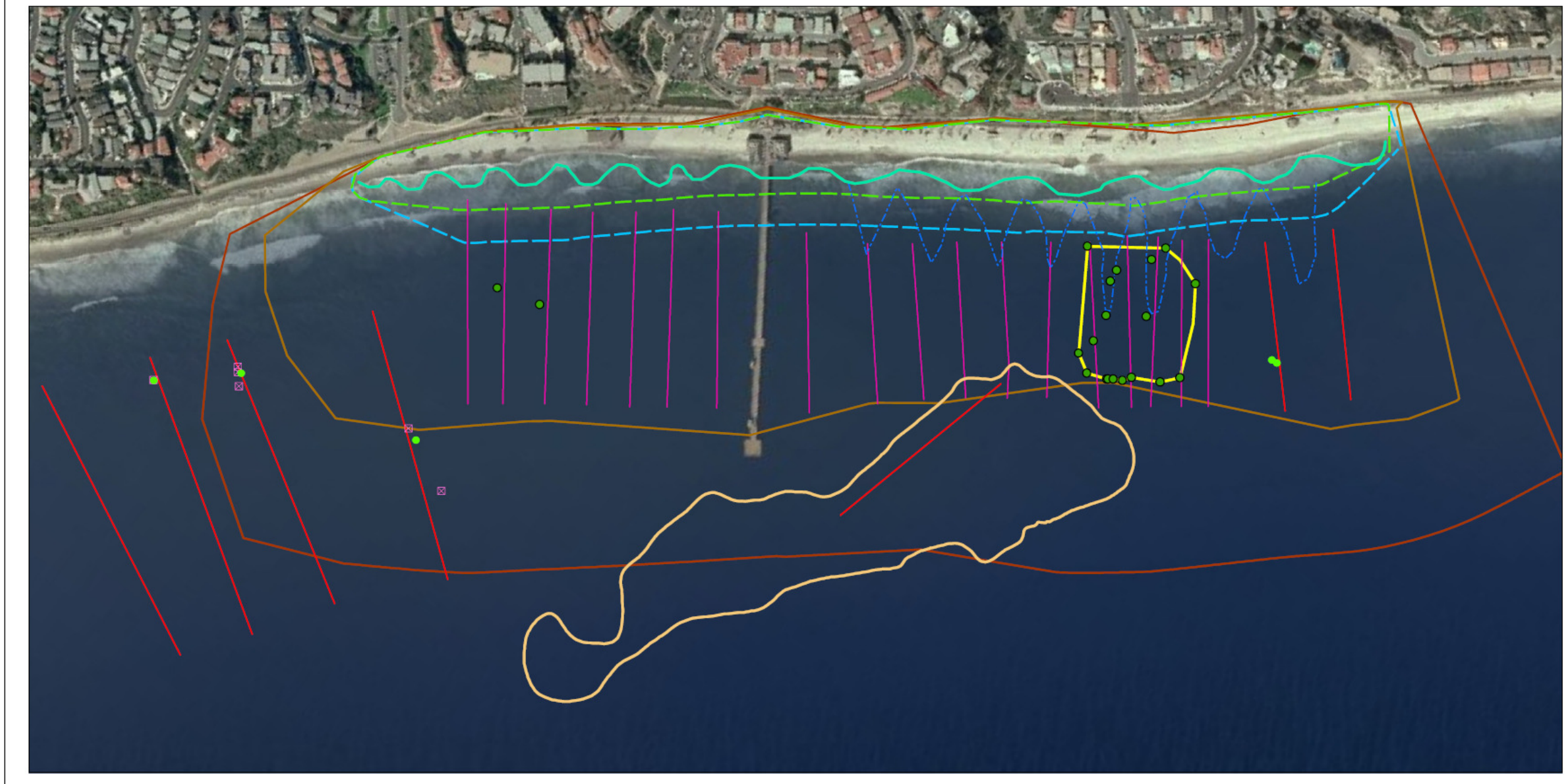

Figure 4.4-2
Surfgrass Survey

Chambers Group Inc.

Image Source: Aerials Express San Diego, April 2007

Exhibit 7
CD-029-11

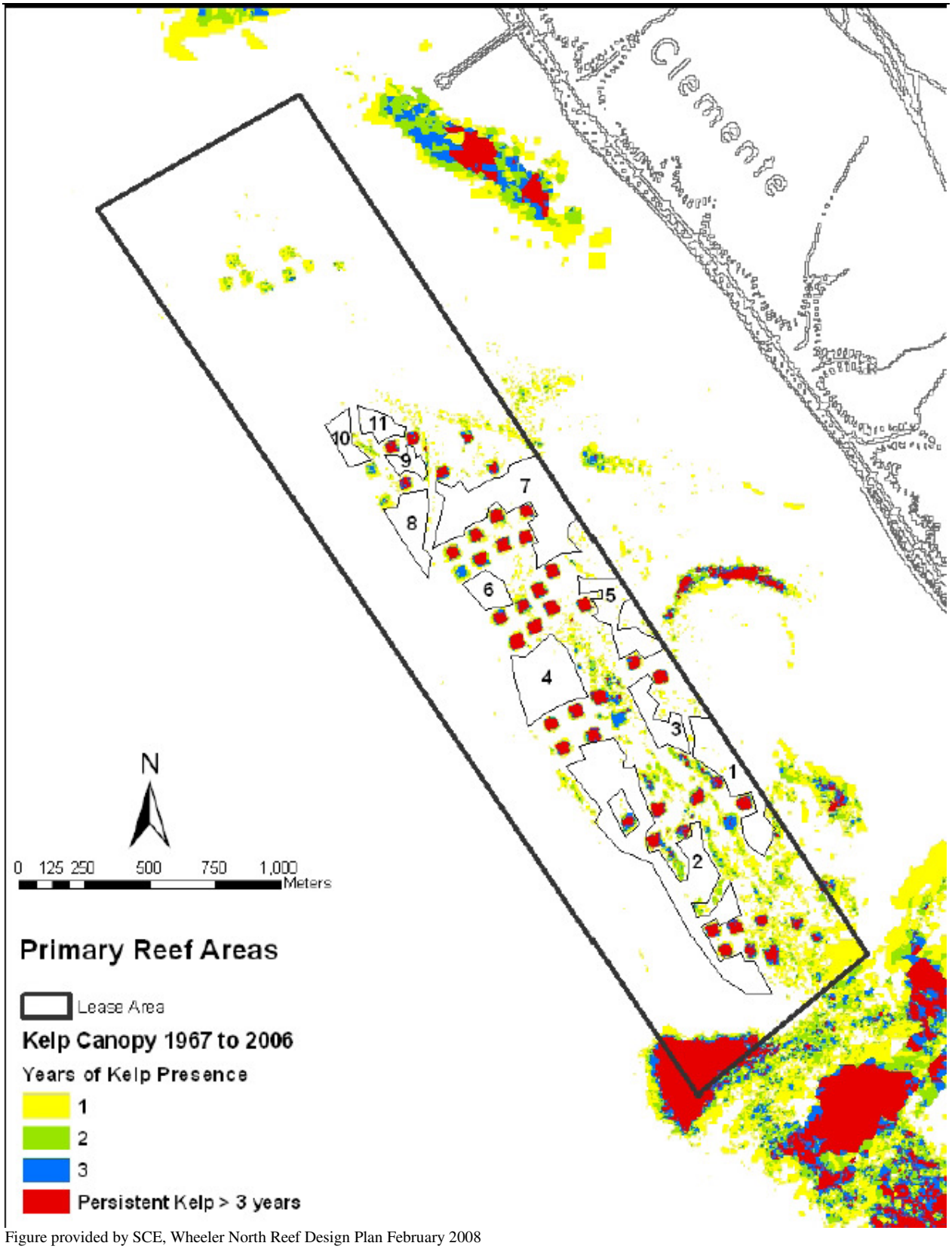

Figure provided by SCE, Wheeler North Reef Design Plan February 2008

Figure 4.4-1 Historic Kelp Canopy and Reef Map

Exhibit 8
CD-029-11

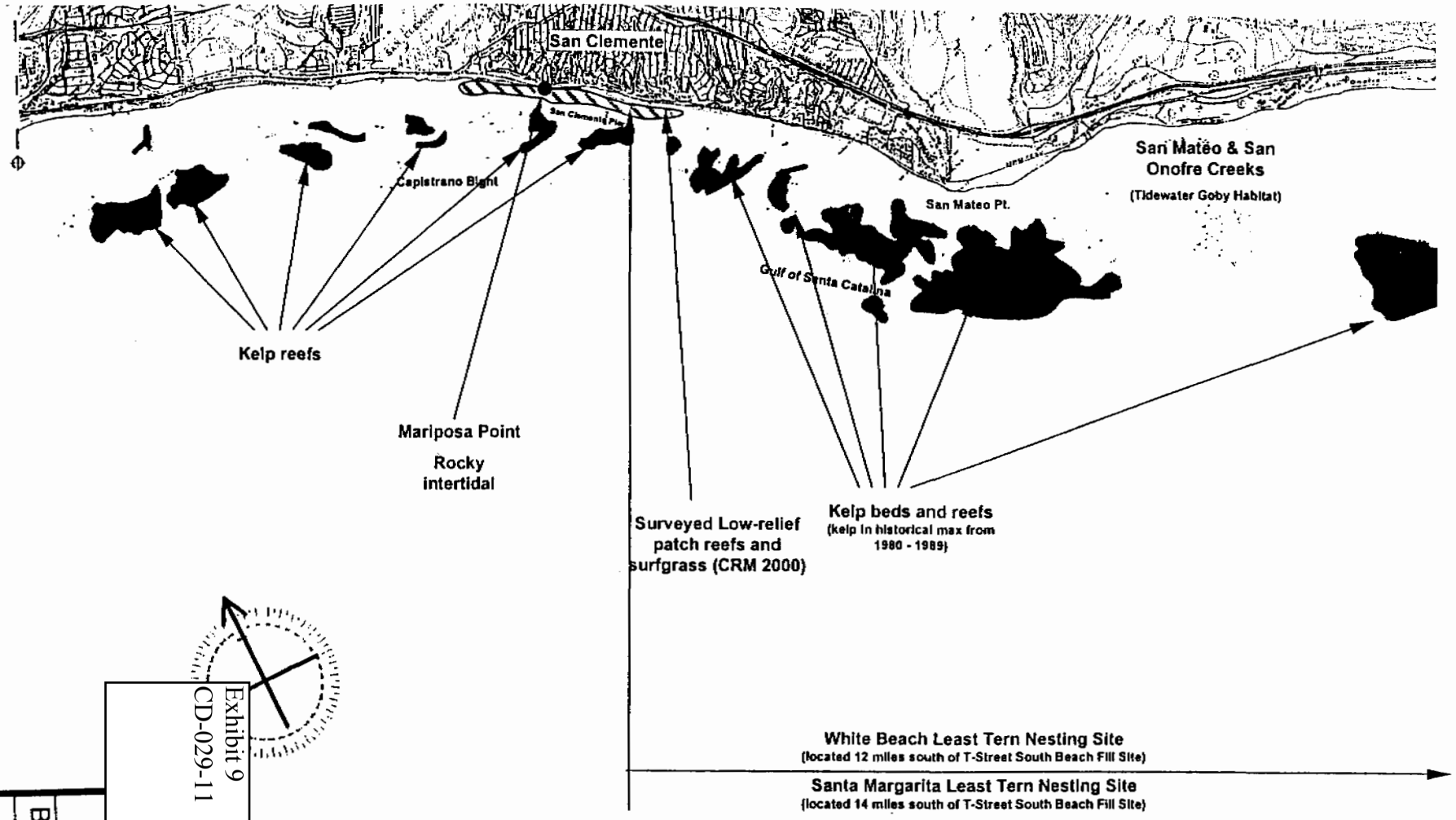

Exhibit 9
CD-029-11

5-02-142

Biological Resources Map

California Coastal Commission

ch Replenishment Program

Biological Resources Map

Figure 2

Figure 3.4-3 Plan View of 115 ft (35 m) Beach Width Alternative

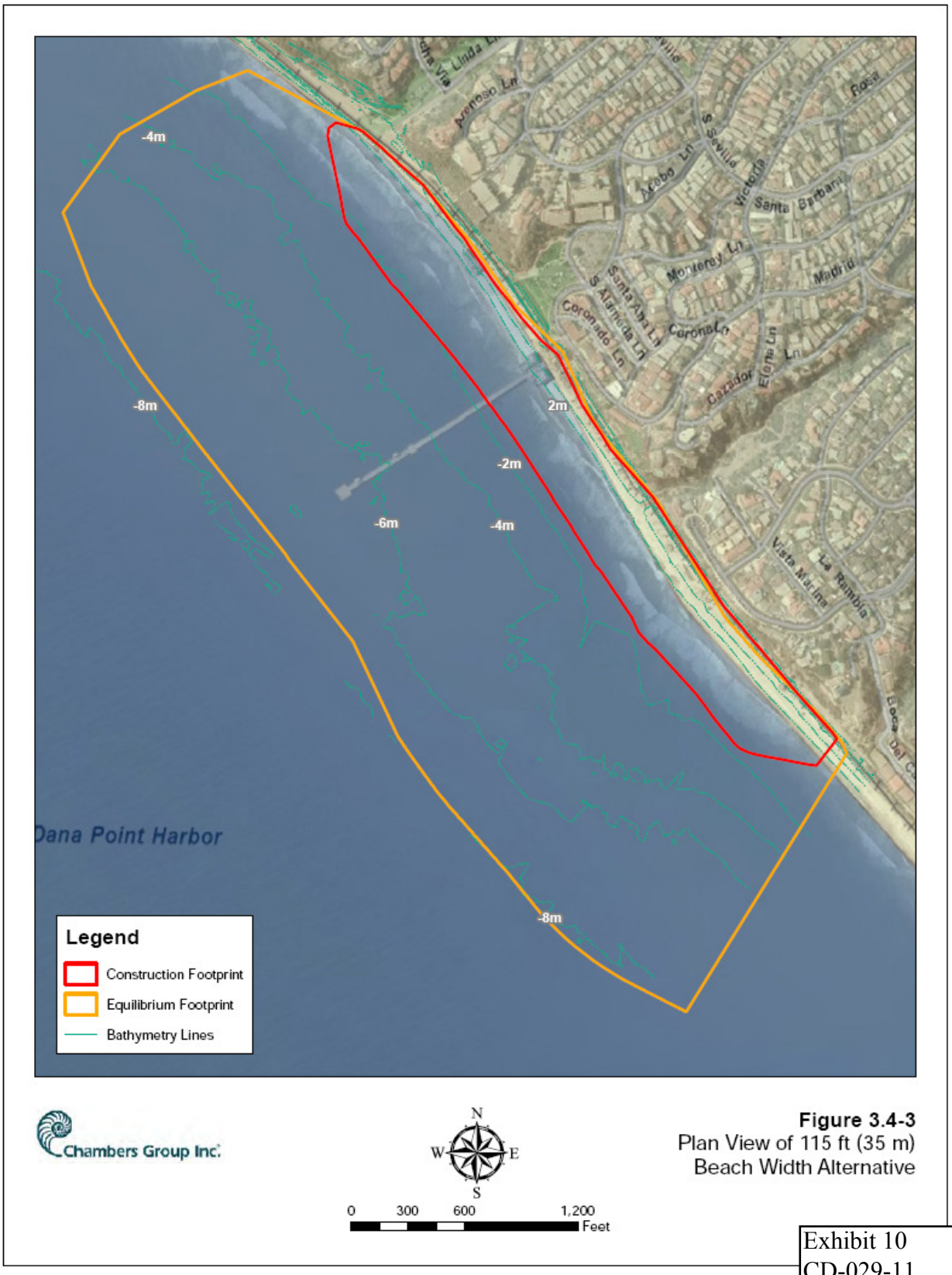

Exhibit 10
CD-029-11

Biological Resources Monitoring Plan

Rocky Reef/Surfgrass Habitat

This appendix outlines 1) a post-construction monitoring program for rocky reef/surfgrass habitat in the San Clemente Pier area to determine if project mitigation would be necessary; 2) a preliminary mitigation implementation plan, if mitigation is determined to be necessary; and 3) a preliminary mitigation monitoring plan, if mitigation is determined to be necessary. The details of these plans will be finalized when a contractor has been selected to perform the monitoring and mitigation. The monitoring shall be performed by qualified marine biologists.

Pre- and Post-Construction Monitoring Plan

The Proposed Project has been designed to avoid or minimize impacts to sensitive biological resources to the maximum extent practicable. Currently, potential project impacts have been identified using a conservative coastal engineering model. Due to the uncertain nature of this modeling because of the multiple variables in the natural environment itself, impacts and mitigation requirements are expected to be unlikely, but currently are unknown. A post-construction monitoring plan has been developed to determine if project impacts require mitigation based on comparisons to pre-construction conditions.

Mitigation would be triggered only if certain conditions occur during the monitoring period and persist through the two year post-construction monitoring period, as there may be transitory effects and subsequent recovery that would not be apparent in a shorter period of time.
The following criteria are suggested as potential triggers for mitigation. Actual triggers would be determined in coordination with the resource agencies prior to initiation of post-construction monitoring activities.

1) For random transects: a persistent decrease in surfgrass cover or surfgrass density and an increase in sand cover and/or depth that is statistically significantly different than the controls and the baseline at the 0.05 confidence level (i.e., p-value = 0.05).
2) For permanent transects: a persistent 20% decrease in surfgrass cover or surfgrass density coupled with a 20% increase in sand depth and/or cover.

Proposed Pre- and Post-Construction Monitoring Activities

Transects shall be established in the rocky reef area containing the surfgrass bed on T-street (Project area) and in a control area of similar depth upcoast of the beach fill near Mariposa Point. The transects may be either permanent transects, random transects, or a combination of both. For random transects, a sufficient number should be conducted to detect a statistically significant difference in the parameters being measured. Transects should cover, at a minimum, the inshore portion, middle, and offshore portion of the reef. The same number of transects should be established in the control area as in the T-street reef area and the transects should be at similar depths. On each transect, the following parameters should be monitored at a minimum: 1) surfgrass density (i.e., number of shoots per square meter), 2) percent cover of surfgrass, sand,

and rock, and 3) sand depth. The line intercept method is recommended for measuring percent cover and sand depth.

Transects should be monitored at the following intervals:

Pre-project monitoring (two years previous to beach nourishment):

- Once within winter/spring
- Once within summer/fall

Pre-project baseline monitoring (one year previous to beach nourishment):

- within one month prior to completion
- 3 months prior to completion
- 6 months prior to completion
- 1 year prior to completion

Post-construction:

Year One

- within one month after completion
- 3 months after completion
- 6 months after completion
- 1 year after completion

Year Two

- Once within winter/spring
- Once within summer/fall

Biological resources within the project area identified as potentially being impacted include surfgrass patches and rocky reef habitat at T-Street. Because a survey was not conducted to delineate T-Street reef, the general area of the T-Street reef was based on the outer extent of mapped surfgrass locations (approximately 5 acres). Actual delineation of the T-Street reef will need to be identified during the pre-construction survey. Potential project impacts to these resources were based on modeling that indicates sand movement may extend to the offshore edge of the reef; however, sand at the offshore edge of the reef would be thin and not significant. Potential burial of the inshore edge of T-Street reef is uncertain, but if it were to occur, it would be expected to occur in the approximately 20 percent inshore edge of the general T-Street reef area. If significant impacts to these biological resources are observed, renourishment events would be modified to avoid or minimize impacts to the extent practicable. If impacts to surfgrass and reef habitat still persist and are determined to be caused by the Project, compensatory mitigation shall be implemented.

Pre- and Post-Construction Monitoring Costs

1. Pre-construction Monitoring

This cost assumes that permanent transects will be established. One day is allotted to install the markers and two days to conduct the survey. This survey is assumed to occur within one year prior to construction activities.

a. Pre-construction Monitoring:
(two years prior to beach nourishment):
- Once within winter/spring; Once within summer/fall: $25,500

b. Pre-construction Baseline Monitoring:
(one year prior to beach nourishment):
- 4 events (one month, 3 months, 6 months, 1 year) $60,000

c. Pre-construction Report (2 years prior and 1 years prior) $ 5,000
Subtotal ***$90,500***

2. Post-Construction Monitoring

This cost assumes that permanent transects will be established. One day is allotted to install or re-install the markers and two days to conduct the survey.

a. Year One
- 4 events (one month, 3 months, 6 months, 1 year): $ 60,000

b. Year Two
- Once within winter/spring; Once within summer/fall: $ 30,000

c. Post-construction Report (Years One and Two) $ 5,000
Subtotal ***$ 95,000***

Compensatory Mitigation

If compensatory mitigation were required based on results of the post-construction monitoring, it would consist of construction of a shallow rocky reef in conjunction with surfgrass transplant, as described below. Compensatory mitigation would be implemented in the Project area at a site to be determined in coordination with NOAA Fisheries and CDFG. The rocky reef will be functionally replaced with equivalent amounts of rocky reef habitat.

Although several studies currently are being conducted to successfully transplant surfgrass and may show potential for success, to date success rates have not been consistent and studies are on-going. Due to the absence of an established, successful method for mitigation of loss of surfgrass itself, proposed mitigation currently is focused upon restoration of the rocky reef that surfgrass currently uses as habitat. However, as previously described, if it is determined that surfgrass has been affected by the Project and a change is shown not to be due to natural variation, a one-time experimental surfgrass transplant shall be implemented in addition to the construction of a shallow rocky reef. Currently, surfgrass transplant success is much higher for subtidal than for intertidal conditions and, therefore, surfgrass mitigation efforts will focus on subtidal transplants only. A portion of the mitigation reef would have to be built shallow enough to accommodate surfgrass. Transplanting sprigs or plants require a donor bed for plant material. Studies have shown that surfgrass is sensitive to losses from harvesting plants for transplant purposes. To avoid harvesting effects to the subject surfgrass bed, donor material will be taken from a larger area of surfgrass and harvests will be taken from the interior of the bed to avoid edge effects.

The information gathered from this one-time experimental surfgrass transplant will provide information towards achieving successful surfgrass restoration. As stated previously, this mitigation effort will be based on the results of monitoring conducted before and after sand placement. The Corps will coordinate these efforts with the resource agencies.

Mitigation Installation/Implementation Costs

Implementation of a rocky reef currently is estimated at $1.8 million.

Mitigation Monitoring Program

Similar to the Post-Construction Monitoring Program, transects shall be established in the rocky reef area containing the surfgrass bed on the mitigation reef and in a reference site (control area) of similar depth upcoast near Mariposa Point. The transects may either be permanent transects, random transects, or a combination of both. For random transects, a sufficient number should be conducted to detect a statistically significant difference in the parameters being measured. Transects should cover, at a minimum, the inshore portion, middle, and offshore portion of the reef. The same number of transects should be established in the control area as in the T-street reef area and transects should be at similar depths. On each transect, the following parameters should be monitored at a minimum: 1) surfgrass density (i.e., number of shoots per square meter), 2) percent cover of surfgrass, sand, and rock, 3) sand depth, and 4) identification and quantity of flora and fauna. The line intercept method is recommended for measuring percent cover and sand depth.

Transects should be monitored at the following intervals:

Post-mitigation implementation:

Year One
- within one month after completion
- 3 months after completion
- 6 months after completion
- 1 year after completion

Year Two
- Once within winter/spring
- Once within summer/fall

Success Criteria

Due to the inconsistent success rates of surfgrass restoration efforts, for the purposes of this surfgrass mitigation effort, any survival of surfgrass transplanted onto the mitigation reef would be considered successful. However, as indicated above, this surfgrass mitigation effort is a one-time experimental surfgrass transplant only. Performance will be monitored based on the parameters listed above and the data then will be used to identify where the transplant method could be modified to improve success. No additional transplant efforts will be conducted.

Success criteria for the mitigation reef itself would include no complete permanent burial of the reef. Because of the predominantly sandy bottom environment in the project area, placement of the rocky reef would be considered successful if a characteristic invertebrate and fish community were to become established. Due to the nature of the mitigation proposed, no adaptive management is required.

Mitigation Monitoring Costs

1. Mitigation Monitoring (Only if rocky reef is implemented)	
a. Year One	$60,000
○ after implementation - 4 events (one month, 3 months, 6 months, 1 year)	
b. Year Two	$30,000
○ 2 events (once within winter/spring; once within summer/fall)	
c. Annual Report Years One and Two	$5,000
Subtotal	***$95,000***
Total Pre- and Post-Construction, and Mitigation Monitoring Costs	***$280,500***

July 26, 2011, U.S. Fish and Wildlife Service, Final Fish and Wildlife Coordination Act Report (CAR) recommendations:

RECOMMENDATIONS

The FWCA states that "...wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development projects through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation...." (16 U.S.C. 661). The revised MMRP above does not fully address the resource agencies' comments and concerns. Incorporation of the following recommendations would address the resource agencies' comments and concerns to avoid, minimize, and compensate for impacts to fish and wildlife resources associated with the San Clemente Shoreline Protection Project:

1) There is a great deal of uncertainty regarding the ability to mitigate impacts to surfgrass inkind. In addition, the Corps has indicated that a 10-m (33-ft) beach width would achieve the project purpose of storm damage protection and yield an acceptable benefit-cost ratio for the project. Therefore, the Corps should limit the project to a 10-m (33-ft) beach width to help ensure that significant long-term impacts to surfgrass do not occur and to minimize potential mitigation risks/costs.

2) Only baseline surveys with transects approximately 70 m (230 ft) apart have been completed, which likely did not capture all of the surfgrass/reef resources in the projected equilibrium footprint in which sand movement and burial is expected to occur. In addition, the entire 2-ha (5-ac) T-Street Reef is projected to be in the equilibrium footprint. Therefore, the MMRP assumption of up to only 0.81 ha (2 ac) of surfgrass/reef impacts may significantly underestimate project impacts, and the MMRP should be revised to assume at least 2 ha (5 ac) of surfgrass/reef impacts to help ensure that adequate funds are budgeted for potential mitigation costs.

3) The MMRP proposes to monitor surfgrass/reef mitigation for only 2 years, while it proposes 5 years of monitoring for kelp mitigation. There is no justification for this discrepancy, especially given the uncertainties of surfgrass restoration. Therefore, the MMRP should be revised to include at least 5 years of monitoring of surfgrass/ reef mitigation.

4) The MMRP proposes to mitigate impacts to shallow reef with deep water reef, without sufficient justification as to why it is not feasible to restore shallow reef. This could lead to significant cumulative loss of shallow reef. Therefore, the MMRP should be revised to require impacts to shallow reef be mitigated in-kind, unless the resource agencies concur that this is not feasible and that potential cumulative loss of shallow reef is expected to be minimal.

5) The MMRP proposes to allow impacts to surfgrass to be mitigated with kelp restoration if initial test surfgrass restoration plots fail, which could lead to significant cumulative loss of surfgrass. Therefore, the MMRP should be revised to require impacts

Exhibit 12
CD-029-11

to surfgrass be only mitigated in-kind, unless the resource agencies concur that sufficient research and testing has shown that this is not feasible and potential cumulative loss of surfgrass is expected to be minimal.

6) The MMRP does not address potential impacts to the intertidal reef at Mariposa Point north of the beach replenishment site. Although net sand transport in the vicinity of the beach replenishment site is expected to be to the south, Mariposa Point is not far enough north of the project site to assume that no impacts will occur to the intertidal reef there. Therefore, the MMRP should be revised to include monitoring of the intertidal reef at Mariposa Point and mitigation for any significant long term impacts.

7) The MMRP proposes to use Mariposa Point as the only control site assessing impacts from Corps beach replenishment project. However, Mariposa Point could be impacted by the Corps beach replenishment project as well as by the City's opportunistic beach replenishment program. In addition, the use of only one control may not be able to distinguish impacts from beach replenishment from natural variability. Therefore, the MMRP should be revised to include multiple control sites approved by the resource agencies.

8) Mitigation measures should be planned and provided for prior to or concurrent with project impacts and supplemented as needed to offset any additional, significant long-term adverse impacts documented by the monitoring program. This is especially important for surfgrass because of the uncertainties of surfgrass restoration and at least a 2- to 5-year temporal loss of functions between time of impact and restoration success. If mitigation is not provided in advance of project impacts, the MMRP should be revised to include adequate compensation to address temporal losses as agreed to by the resource agencies.

9) The Corps should monitor the extent of turbidity plumes at the dredge and beach replenishment site throughout the duration of dredging and sand placement activities, or until such point that the resource agencies concur that monitoring is no longer necessary. The MMRP should be revised to include a plan to monitor and report the extent of turbidity plumes and establish acceptable levels and thresholds, which could potentially trigger additional measures. Weekly reports should be submitted to the resource agencies.

10) The MMRP should be revised to include the provision that if significant impacts to surfgrass/reef resources are documented, subsequent modified beach re-nourishment will not occur until the resource agencies concur that mitigation for those impacts is successfully completed, or impacted surfgrass or reef has recovered.

11) After the comprehensive PED phase biological surveys, the Corps should revise the MMRP and receive written concurrence from the resource agencies that it fully addresses mitigation of impacts, criteria for triggering mitigation, success criteria, and monitoring and reporting requirements.

12) The Corps should include the costs of mitigation recommended by the resource agencies in any project budget submitted to Congress for approval. Prior to project implementation, the Corps and City should identify a funding mechanism to guarantee that future funding will be available to implement the mitigation program in the event that mitigation costs exceed the funds appropriated by Congress. For example, funds could be secured by the City through a letter of credit, endowment account, or other legal mechanism approved by the resource agencies sufficient to guarantee mitigation will be implemented to offset adverse impacts of the project.

Grunion Condition, Permit Application No.: 6-11-018
SANDAG

8. **Grunion. PRIOR TO THE ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT,** the applicant shall submit to the Executive Director for review and written approval, a program of elements to be utilized in developing a revised, final construction schedule. The applicant shall adhere to the following provisions in order to avoid impacts to mature grunion and to grunion eggs during a spawning event to the extent feasible. The annually published California Department of Fish and Game (CDFG) expected grunion runs shall be used to determine possible grunion spawning periods. At this time, the 2012 CDFG expected grunion run information is not available. The program and revised construction schedule shall incorporate the following:

a. During the grunion spawning period of March through August, all proposed receiver sites shall be monitored for grunion runs concurrently (excluding the Batiquitos receiver site), unless the beach consists of 100 % cobble (i.e. there is no sand on the beach). In addition, prior to issuance of the permit, the applicant shall develop additional criteria to determine the viability of a deposition site for a spawning event and if the deposition site can be eliminated from the monitoring requirement. The criteria shall include, but are not limited to, predicted monthly high tides, current beach profiles and historic grunion runs. The criteria shall be subject to approval of the Executive Director in consultation with CDFG, NMFS, USACE. Monitoring need not continue at a given site after sand replenishment has been completed at that site.

b. Grunion monitoring shall be conducted by qualified biologists for 30 minutes prior to and two hours following the predicted start of each spawning event. Sufficient personnel shall be utilized to insure that the entire receiver site is monitored during the specified period. For the purpose of determining the magnitude and extent of a grunion spawning event, the Walker Scale shall be applied to each 100 yard segment of the receiving beach.

c. If a grunion run consisting of 0 to 100 fish (Walker Scale of 0 or 1) is reported within two weeks prior to or during construction/beach replenishment, the applicant does not need to take any avoidance action for grunion eggs. No mature grunion shall be buried or harmed as a result of construction/beach replenishment.

d. If a grunion run consisting of more than 100 fish (Walker Scale of 2, 3, 4, or 5) is reported within two weeks prior to the start of construction, the applicant shall avoid mobilization on those beach segments and no grunion eggs shall be buried or disturbed at the receiver site. The applicant shall alter the construction/beach replenishment schedule to replenish a beach segment that has not had such a grunion spawning event within two weeks prior to the start of construction. However, after June 15, the applicant may also place sand at sites if a grunion run of hundreds of fish spawning at different times or at once in several areas of beach (Walker Scale of 2 or 3) is reported within two weeks prior to construction, with the implementation of feasible avoidance and minimization

measures pursuant to subsection (g) below. No mature grunion shall be buried or harmed as a result of construction/beach replenishment.

e. If construction/beach replenishment has already begun when a grunion run consisting of hundreds of fish spawning at different times or at once in several areas of beach (Walker Scale of 2 or 3) is reported, impacts to grunion eggs may occur if avoidance is not feasible. The applicant shall first attempt to minimize impacts to grunion eggs through measures pursuant to subsection (g) below. No mature grunion shall be buried or harmed as a result of construction/beach replenishment.

f. If construction/beach replenishment has already begun when a grunion run consisting of thousands of fish together, with little sand visible between fish (Walker Scale 4 or 5) is reported, no impact to grunion eggs shall occur within that portion of the receiver site experiencing that density of fish. The applicant shall avoid impacts to grunion eggs in that portion of the receiver site through alteration of the discharge point, sand spreading and/or shifting receiver site boundaries. Ceasing of construction/beach replenishment activities at this location shall occur if avoidance measures are not feasible. No mature grunion shall be buried or harmed as a result of construction/beach replenishment.

g. The applicant shall develop a list of feasible measures for each deposition site, subject to approval of the Executive Director in consultation with CDFG, NMFS and ACOE, taking into consideration the size of the deposition site, stage of mobilization, construction constraints, etc., that may be utilized to allow work to continue but also minimize and/or avoid impacts to eggs and disruption within the two week spawning period.

5.0 CONCLUSIONS

The North Beach Project was monitored for possible effects, both beneficial and adverse. This report presents the results of the project as measured one year after construction. Monitoring was performed for beach profiles and biology as required by permits. The following conclusions pertain:

1. The project served as a critical first attempt at performing opportunistic beach fill. As such, it is deemed a success because delivery of the material to the beach did not cause impacts of traffic congestion, to the safety of pedestrians, to surfing, or beach users.
2. The beach width measurements indicate that approximately two-thirds of the beach fill material may have dispersed from the placement site to other areas of the beach and profile.
3. Observations of North Beach one year after construction indicates that more sand exists at the mean sea level elevation than existed in 2005, suggesting dispersion of the beach fill along the downcoast beach and tangible benefits. Cobble also existed both before and after the project and appears to reflect typical conditions for this beach.
4. The project resulted in no discernible adverse impacts to biology. The biological monitoring did not detect any changes in sensitive resources that are correlated with beach nourishment activities. Sand depths and cover did not increase in the project vicinity based on the total of two biological surveys done before and after the project.
5. Beach nourishment generally benefited North Beach but a fraction of coarse material (cobbles and rocks) caused some user discomfort. Improvement can be achieved by sieving the material for particles larger than those on the receiving beach during future projects for any material obtained from a river or upland deposit. The proportion of large particles delivered in the beach fill should be no more than that at the receiving beach prior to construction.
6. Coordination with the volleyball club user-group should be improved for future efforts that affect the volleyball courts through written notification.

Due to the presence of cobbles and rock in the fill, future beach nourishment projects at San Clemente using upland material should be screened to reduce the number of larger particles. Screening should target materials larger than that existing at the receiver beach prior to construction. If pebbles and small cobbles exist on the beach prior to construction, they should be able to pass through and be included in the beach nourishment material if their proportion is no greater than the proportion of pebbles/cobbles at the existing beach. Only sandy material should be used to fill the volleyball courts.

The contractors' dredge and vessels will require off-site mooring and berthing space. There is no mooring area available within the City of San Clemente. The nearest suitable mooring area is Dana Point Harbor, a small craft harbor approximately 8 km (5 mi) north.

6.5 *Operation and Maintenance Costs*

Operation and Maintenance (O&M) costs associated with the tentatively recommended plan are expected to consist primarily with routine grooming, shaping, and cleaning of the beach. The tentatively recommended plan does not include any utilities or typical structural improvements associated with beaches such as public access walkways or other such walkover structures. Typical O&M activities are expected to consist of grooming and shaping the beach after storms to smooth out localized sediment accumulations/depletions, and debris cleanup along the beach and at storm drain outlets. These O&M activities are considered non-Federal responsibilities. However, these activities are usual and customary for beaches, and the tentatively recommended plan is not expected to cause an increase in these efforts.

6.6 *Monitoring Plan*

Continuing construction monitoring will be required in support of the continuing construction (nourishment) of the project. The purpose of this monitoring is to allow the timing and the detailed design of the periodic nourishment to be optimized.

Continuing construction monitoring efforts are expected to consist of direct surveys of the beach and seabed morphology. Surveying of the beach and seabed morphology is paramount to the monitoring efforts. Changes in beach and seabed morphology will define the sediment transport patterns at the shoreline and ultimately the short term and long term beach erosion processes. Alongshore transects will be crucial to determine the effects, if any, the proposed project has on updrift and/or downdrift shorelines.

Survey methods will consist of topographic measurements, bathymetric measurements, surf quality observations, and video stereo photogrammetric methods. The monitoring period will begin one year before construction (for the surf quality observations) and continue for the 50-year period of Federal involvement. However, not all aspects of the monitoring plan will be conducted each year. A description of the monitoring features is described below and a summary of the monitoring costs is shown in **Table 6-3**.

Exhibit 15
CD-029-11
Surfing Monitoring

Table 6-3 Monitoring Costs

Year	Fill	Profiles	Install	Maint	Report	Width	Surfing	Sum
-1							$6,000	$6,000
0							$6,000	$6,000
1	*	$30,000	$40,000	$35,000	$32,000	$8,000	$6,000	$151,000
2		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
3		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
4		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
5		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
6	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
7		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
8		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
9		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
10		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
11	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
12		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
13		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
14		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
15		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
16	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
17		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
18		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
19		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
20		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
21	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
22		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
23		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
24		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
25		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
26	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
27		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
28		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
29		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
30		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
31	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
32		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
33		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
34		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
35		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
36	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
37		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
38		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
39		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
40		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
41	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
42		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000

43		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
44		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
45		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
46	*	$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
47		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
48		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
49		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000
50		$30,000		$35,000	$32,000	$8,000	$6,000	$111,000

6.6.1 Beach Width

Beach width measurements shall be obtained of the sub-aerial portion of the beach. The beach width is a simple linear measurement from a fixed point on the backshore to the foreshore berm crest. This method provides a systematic record of shoreline response and can be used to yield a good approximation of long-term gains or losses of sediment from a given reach of shoreline. These measurements will yield a highly useful time series of shoreline change. Experience has shown that monthly measurements are the optimal frequency to demonstrate long-term shoreline change. This type of measurement system has been successfully employed by the Los Angeles District for several decades and has repeatedly demonstrated its utility and value. Measurements shall be taken monthly at 9 locations corresponding to historical locations. Measurements shall be taken by the City of San Clemente.

This method requires a very low level effort with an attendant low cost. Each monthly survey can be accomplished in 2-3 hours. The annual cost of monthly beach width measurements is $8,000, based on recent similar costs provided by the City of San Clemente.

6.6.2 Topography / Bathymetry

Conventional topographic measurements will be obtained of the sub-aerial portion of the beach and bathymetric measurements of the surf zone and seabed morphology will be obtained using conventional acoustic sonar methods. Measurements will be obtained along pre-determined transects that coincide with historical transect locations, and mass points to develop a well-defined terrain model of the littoral system. These measurements are planned for twice annually, typically in early spring after the winter erosion season, and in late fall after the summer accretion season.

The cost of each conventional transect survey is $15,000, based on recent similar surveys conducted for the City of San Clemente.

6.6.3 Surf Quality (Surfability)

Surfing and high quality surfable waves are an increasingly valuable resource. An innovative method pioneered by the Los Angeles District has been developed to quantify surf quality (surfability). A trained observer visually estimates the breaking wave climate at the shoreline twice daily, typically at first light and at 1300; the times are approximate. Wave characteristics measured included height, period, and direction. Wave heights from the crest to the trough are visually estimated to the nearest 1 foot. Waves are observed for a period of 5-10 minutes and the minimum, average, and maximum wave heights are estimated. Wave period is based on an

average of 30 waves over the 5-10 minute observation period and is reported to the nearest 1 second. Wave directions are reported relative to the beach normal and estimated to the nearest 5 degrees. Wave directions are recorded as normal (0-10 degrees); slightly from the left (or right) (10-25 degrees); significantly from the left (or right) (greater than 25 degrees). Surf quality is also expressed in common surf language by the observer. Visual observations are supplemented with video recordings.

This method requires a very low level effort with an attendant low cost. The annual cost of twice daily observations is $6,000, based on recent similar efforts conducted in the City of Imperial Beach. The cost of video recording is captured within the video based photogrammetry discussed hereinafter.

6.6.4 Video Based Photogrammetry

Argus Beach Monitoring System is a state-of-the-art video-based stereo photogrammetric method which utilizes multiple video cameras and the principles of stereo photogrammetry to obtain topographic measurements. Multiple video cameras are typically mounted viewing the longshore area of interest and the video cameras obtain continuous imagery of the beach. Data analysis software provides detailed topographic mapping data of the sub-aerial portion of the beach. The beach topography can be sampled such that a nearly continuous time series of the beach can be obtained. It is assumed that this system will be installed initially and maintained annually.

The purchase and install cost of the Argus Beach Monitoring System is $40,000. The annual operating cost is $35,000; this cost includes all routine maintenance and as well as replacement of the system components as they become obsolete. Analysis and reporting equals $32,000 annually. There is a large suite of available analysis products; this value represents a moderate number of analysis products. These costs are based on discussions with Northwest Research Associates, vendors of the Argus system (Northwest Research Associates, 2007).