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**PRELIMINARY**
**STAFF REPORT ON CONSISTENCY DETERMINATION**

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| Consistency Determination No. | CD-061-01 |
| Staff: | LS/LE/JD/AW-SF |
| File Date: | 6/28/2001 |
| 60th Day: | 8/27/2001 |
| 75th Day: | extended through 10/31/2001 |
| Commission Meeting: | 8/9/2001 |

**FEDERAL AGENCY:** **U.S. Fish and Wildlife Service**

**PROJECT LOCATION:** Bolsa Chica Lowlands, Orange County (**Exhibits 1-3**).

**PROJECT DESCRIPTION:** Construction of wetland restoration project. Approximately 366.5 acres would be restored to full tidal influence, 200 acres would receive muted tidal influence via culverts to the full tidal area, 120 acres would be left unchanged as seasonal pond habitat, and 252 acres would be reserved as a future full tidal area once oil field operations terminate in 15-20 years. Project includes buying out and abandoning oil wells located on a portion of the acquired Lowlands property and on the adjacent State Ecological Reserve, dredging 2.7 million cu.yds. of material to create a tidal basin, constructing an earthen berm around the perimeter of the basin except where adjacent to the flood control channel levee, constructing an ocean inlet to the basin, constructing a Pacific Coast Highway bridge (including pedestrian and bicycle lanes separate from vehicle traffic lanes) over the ocean inlet, constructing a French drain between project wetlands and existing residential development, and disposing dredged materials to create the basin berm, PCH bridge approaches, bird nesting islands, and to pre-nourish the beach and offshore ebb bar. Construction would take approximately three years. The project includes provisions for operation, maintenance, monitoring, and remediation of the restored wetlands.

**Staff Note:**

The staff is providing a preliminary staff report at this time (and not a proposed recommendation and findings) on CD-061-01 due to the complexity of the proposed wetland restoration project, the complex history behind the development of the current proposal, the unprecedented scope of and benefits arising from the project, the potential for significant adverse effects generated by several project features, and the belief that more than one Commission hearing will be necessary in order for all project elements, Coastal Act issues, and public comments to be fully examined and considered by the Commission. The U.S. Fish and Wildlife Service extended the statutory time deadline for Commission action on the consistency determination from September 11 to October 31 so that a vote on the consistency determination would not be required at the August 9 hearing.

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## EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (Service) has submitted a consistency determination for the restoration of the Bolsa Chica Lowlands, located inland of Pacific Coast Highway on the northern Orange County coastline. The subject consistency determination represents the second phase of a two-phase federal consistency process that began with the submittal in 1996 of a consistency determination by the U.S. Fish and Wildlife Service (Service) for wetland restoration activities at Bolsa Chica. On October 6, 1996, the Commission concurred with CD-115-96 (the Bolsa Chica Lowland Acquisition and Conceptual Wetland Restoration Plan).

That conceptual plan called for the California State Lands Commission (SLC) to purchase 880 acres of wetland habitat, for the Service to restore 385 acres to full tidal wetlands and 220 acres to managed tidal wetlands, and for the retention of 275 acres of the lowlands as an active oil production field (and designated as a future full tidal area). The conceptual plan concurred with by the Commission included construction of an ocean inlet at the southern end of the lowlands for improved tidal circulation, preliminary fish and wildlife habitat restoration objectives, and elements regarding public access and recreation, oilfield operations, and long term maintenance, operation, and monitoring of the restoration project. Acquisition and wetland restoration was funded primarily from a $78.75 million contribution from the Ports of Los Angeles and Long Beach in exchange for 524 acres of mitigation credits for port landfill construction. The SLC completed the Bolsa Chica acquisition on February 14, 1997, and mitigation credits were released to the ports for landfill projects.

The proposed project includes creation of approximately 366 acres of full tidal and 200 acres of muted tidal wetland habitat, retention of 120 acres of existing seasonal pond habitat, designation of 252 acres as a future full tidal area, construction of an ocean inlet and jetties across Bolsa Chica State Beach, construction of a new Pacific Coast Highway bridge (vehicle traffic and bicycle/ pedestrian lanes) over the ocean inlet, dredging 2.7 million cu.yds. to create a tidal basin in the Lowlands, disposal of dredged materials to create a basin berm, nesting islands, and an ebb bar offshore of the ocean inlet, pre-nourishing beaches adjacent to the ocean inlet, construction of a French drain between the restoration project and adjacent housing development, and other construction and mitigation components.

This preliminary staff report provides a review of the history and background of the current restoration project. Next, additional details on project elements, benefits and impacts, long-term management of the restored wetland, and the status of the oilfield cleanup project are provided. The proposed project is then evaluated using the dredging and filling, shoreline structures and coastal processes, public access and recreation, water quality, and environmentally sensitive habitat policies of the Coastal Act. As a part of this evaluation, subject areas are identified where additional information and/or analysis of potential project impacts on coastal resources are needed in order to determine project consistency with the Coastal Act.

## I. Project Description.

A. **Site Location and Description.** The consistency determination describes the wetland restoration project site as follows (**Exhibits 1 and 2**):

> *The Bolsa Chica Project area consists of 1,247 acres of the Bolsa Chica Lowlands in the Bolsa Gap between Bolsa Chica Mesa on the northwest and Huntington Mesa on the southeast, in an unincorporated area of northwestern Orange County. The site is bordered by Warner Avenue on the northwest, residential areas of Huntington Beach on the east, Pacific Coast Highway (PCH) and Bolsa Chica State Beach on the west.*
>
> *A century ago, Bolsa Chica was part of an extensive tidal marsh, including a mosaic of vegetated salt and brackish marsh, with associated tidal embayments, sloughs, mudflats and a direct connection to the ocean. In 1899, Bolsa Chica was diked to prevent tidal exchange in order to manage the resultant ponds as a waterfowl hunting club. Subsequently, the site was further altered by filling, oil extraction activities, flood control facilities, and surface and subsurface hydrologic modifications. Bolsa Chica still contains a significant fraction of the historical marsh system, but its wetland and aquatic functions have been degraded from those that existed historically. The oil well field, in operation since the 1940's, continues to be operated by AERA Energy pursuant to lease and surface use agreements.*

B. **History and Background.** In October 1996, eight state and federal agencies (California State Lands Commission, California Department of Fish and Game, State Coastal Conservancy, Resources Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, and U.S. Environmental Protection Agency) and the Ports of Los Angeles and Long Beach entered into an Interagency Agreement to establish a project for wetlands acquisition and restoration at the Bolsa Chica Lowlands (**Appendix A**). The Interagency Agreement described a Concept Plan for wetland restoration and addressed: (1) the acquisition of approximately 880 acres of land in the Bolsa Chica Lowlands; (2) the restoration of wetlands, full tidal, and managed tidal habitats in the lowlands; (3) monitoring activities to determine the condition of restored habitats; and (4) the necessary operation, maintenance, and management of project features during and after construction.

The aforementioned eight state and federal agencies (known as the Steering Committee) are overseeing the ongoing development of the proposed restoration plan for the Bolsa Chica wetlands. Planning decisions are reached by consensus and rely on information, analyses, and recommendations of subcommittees made up of representatives from the Steering Committee. The Interagency Agreement delineated the following agency roles and responsibilities for the restoration project:

> State Lands Commission (SLC): Acquire and hold title to a minimum of 880 acres at Bolsa Chica; administer and disburse all monies received for the project; serve as lead agency under CEQA in the preparation of the EIR/EIS for the project; acquire, in consultation with the USFWS and Corps of Engineers, the necessary federal and state permits and approvals

for the project; operate and maintain, either directly or by agreement with another entity, the completed project.

State Coastal Conservancy: Prepare a detailed Feasibility Plan for the project, based on and consistent with the Concept Plan, and prepare a Final Plan under which the SLC may acquire the above-cited permits and approvals.

U.S. Army Corps of Engineers: Serve as one of the federal lead agencies under NEPA for preparation of the EIR/EIS for the project; administer the permit program under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and Section 103 of the Marine Protection, Research and Sanctuary Act.

U.S. Fish and Wildlife Service: Conduct necessary sediment sampling, archaeological surveys, or other technical studies necessary for all permits and approvals for the project; prepare and submit a federal consistency determination to the California Coastal Commission; serve as one of the federal lead agencies under NEPA for preparation of the EIR/EIS for the project; conduct any necessary consultation under Section 7 of the Endangered Species Act; construct the restoration features of the project.

The Concept Plan included the following planning objectives for the Bolsa Chica restoration project:

- Overwintering habitat for migratory shorebirds, seabirds, and waterbirds shall be enhanced.
- Nesting habitat for migratory shorebirds and seabirds shall not be diminished and shall be expanded, where feasible.
- Habitat for estuarine/marine fishes shall be expanded and species diversity shall be increased.
- Nesting and foraging conditions for state and federal endangered species shall not be adversely affected. In addition, implementation of the plan shall contribute to the recovery of the light-footed clapper rail, California least tern, western snowy plover, and Belding's savannah sparrow.
- The mix of habitat types shall include perennial brackish ponds, seasonal ponds/sand flats, pickleweed flats, cordgrass intertidal zone, unvegetated intertidal mudflat, and marine subtidal soft bottom.
- Modifications to the hydraulic regime, necessary to achieve the above objectives, shall include an ocean inlet, full tidal range (i.e., +7.5 to –1.5 feet mean lower low water), low residence time, shall emphasize minimized requirements for manipulation and maintenance, and shall not degrade existing flood protection levels.
- Interests of contiguous property owners shall be protected.

- Once completed, maintenance and management of the area shall maximize native estuarine/ marine fish and wildlife habitat of the Bolsa Chica Lowlands in perpetuity, including active removal of detrimental, non-native biota.

- Allowable public uses shall include passive and nonintrusive recreation activities focused on peripheral areas, interpretive foci, and trails.

- Total removal of oil extraction activities and their past effects shall be conducted in a phased, cost-effective, and environmentally sensitive manner.

- Monitoring and evaluation of the success of biological objectives shall be conducted.

As provided for in the Interagency Agreement, in 1997 the Ports of Los Angeles and Long Beach provided $78.75 million to be used for wetland restoration activities, including the purchase of 880 acres in the Lowlands, in exchange for 534 acres of port landfill mitigation credits. The Final EIR/EIS examines the role of port funding and mitigation credits in the Bolsa Chica wetlands restoration project:

> *The proposed wetlands restoration would offset the loss of habitat resulting from current and future landfill construction in the Ports of Los Angeles and Long Beach. On the basis of habitat values and aquatic functions that would be created as a result of the restoration project, the Ports were granted mitigation credits sufficient to offset 454 acres of landfill in the outer harbor areas. Construction of a new ocean inlet large enough to handle tidal volumes both for the full tidal and future full tidal areas (see Section 2.1.6) and eventual reintroduction of tidal influence into the future full tidal area are expected to create habitat values and aquatic functions sufficient to offset an additional 80 acres of landfill in the outer harbor areas of the Ports. These credits have been granted. If the Bolsa Chica Lowlands Restoration Project does not generate sufficient habitat values and aquatic functions to create all 545 acres of landfill mitigation credit or if for some reason the Bolsa Chica Lowlands Restoration Project is not implemented, an alternative tidal restoration project or projects at a location or locations other than the Bolsa Chica Lowlands would be implemented to generate sufficient mitigation credits.*

The subject consistency determination represents the second phase of a two-phase federal consistency process that began with the submittal on September 12, 1996, of a consistency determination by the U.S. Fish and Wildlife Service (Service) for wetland restoration activities at Bolsa Chica. On October 6, 1996, the Commission concurred with CD-115-96 (the Bolsa Chica Lowland Acquisition and Conceptual Wetland Restoration Plan)(**Appendix B**). That conceptual plan called for the California State Lands Commission (SLC) to purchase 880 acres of wetland habitat, for the Service to restore 385 acres to full tidal wetlands and 220 acres to managed tidal wetlands, and for the retention of 275 acres of the lowlands as an active oil production field (and designated as a future full tidal area).

Acquisition and wetland restoration was funded primarily from a $66.75 million contribution from the Ports of Los Angeles and Long Beach. On October 6, 1996, the Commission also

certified port master plan amendments (POLA 15 and POLB 8) that provided each port with 227 mitigation credits for future landfill construction in their jurisdictions in exchange for their financial contributions to the Bolsa Chica acquisition and restoration program. The SLC completed the Bolsa Chica acquisition on February 14, 1997, and mitigation credits were released for use by the ports in future landfill projects. Later in 1997 the Commission certified port master plan amendments (POLA 17 and POLB 10) and concurred with a Service negative determination (ND-41-97) which provided for an additional 40 acres of mitigation credits to each port after each contributed an additional $6 million to the acquisition and restoration plan, in particular for restoration in the Future Full Tidal Area of the Lowlands.

CD-115-96 included the acquisition of lowland properties at Bolsa Chica and a conceptual wetlands restoration plan, but did not propose a final restoration plan or seek approval of any construction or restoration work. The conceptual plan included adequate details for the Commission to determine that the plan was consistent with the California Coastal Management Program and that it justified provision of landfill mitigation credits to the Ports of Los Angeles and Long Beach. These mitigation credits are currently being used by both ports for landfill construction projects.

The conceptual plan concurred with by the Commission included construction of an ocean inlet at the southern end of the lowlands for improved tidal circulation, preliminary fish and wildlife habitat restoration objectives, and elements regarding public access and recreation, oilfield operations, and long term maintenance, operation, and monitoring of the restoration project.

The Service acknowledged in CD-115-96 that the conceptual restoration plan was the first step in a phased federal consistency review process for the restoration project. Upon selection of a final restoration plan by the Federal-State Bolsa Chica Wetlands Steering Committee, the Service would then be required to submit to the Commission a second, more detailed consistency determination for wetland restoration and construction activities at Bolsa Chica. That second submittal is now before the Commission and is the subject of this staff report. (Currently there is no plan for the submittal of a coastal development permit application to the Commission for the proposed project by any of the State agency members of the Steering Committee, which believe that the proposed restoration project is properly characterized as a Federal government activity.)

Subsequent to the aforementioned Commission actions in 1996 and 1997 on consistency and negative determinations and port master plan amendments, the Commission held a public hearing at its October 14, 1998, meeting in Oceanside to receive a progress report from the Federal-State Bolsa Chica Steering Committee on its development of the restoration plan, the Environmental Impact Report and Statement, ongoing engineering tasks, and oilfield contamination and cleanup issues, and to hear both public and Commissioner comment on those issues. The Commission staff has met on an ongoing basis since 1996 with Steering Committee agency representatives to provide staff input to the process of developing a final restoration plan. The staff submitted formal comments on the Draft EIR/S for the restoration plan in October 2000, focusing primarily on potential project effects on coastal processes and water quality.

In addition to Commission review of the subject consistency determination, Exhibit XX from the Final EIR/EIS lists the other federal, state, and local approvals required for the project, including encroachment permits from the California Department of Transportation and the California Department of Parks and Recreation for the ocean inlet and PCH bridge which would cross lands owned by those agencies.

C. **Proposed Project.**

**1. Project Elements.** The consistency determination describes the proposed wetland restoration project as follows (**Exhibits 3 and 4**):

***The Proposed Project – Concept Plan without Flood Control Diversion Structure:***

*The Proposed Project (attached Figure ES-1 and 2.4B) is the creation of approximately 366.5 acres of habitat that would receive a full tidal range through an ocean inlet near Huntington Mesa. The Proposed Project would not change the existing full tidal part of the Ecological Reserve (Outer Bolsa Bay) or the muted tidal portion of the Ecological Reserve (Inner Bolsa Bay). The edges of Rabbit Island would be tidal. The full tidal area would be created by:*

1. *buying out and abandoning the oil wells located on a portion of the acquired property and on the adjacent State Ecological Reserve,*
2. *dredging approximately 2.7 million cubic yards (cy) of material to create a basin,*
3. *constructing a berm around the perimeter of the basin except adjacent to the flood control levee,*
4. *constructing an ocean inlet into the basin, and*
5. *constructing a bridge for PCH over the inlet channel.*

*The new ocean inlet would be approximately 360 feet wide between the crest of the jetties, at +13 feet mean sea level (MSL), and would have short jetties extending approximately to the mean low tide line (Alternative A on attached Figure 8-50, and 4-2). The jetties are necessary to prevent the inlet channel from migrating. The ebb shoal will be pre-filled.*

*A new PCH bridge would be constructed over the inlet channel (attached Figure 10-2). Roadbed approach fills would elevate the roadway to the bridge crest elevation. The existing bikepath west of PCH, along with beach park safety vehicle access would be reconstructed on a portion of the bridge separate from the PCH traffic lanes. A separate, smaller bridge will be provided for the oil field vehicles to access the oil wells next to PCH and north of the inlet channel.*

*The ocean inlet would be large enough to pass tidal flows sufficient to permit the future restoration of an additional 252 acres to tidal influence. This area is referred to as the future full tidal area. This area would not be restored until oil and gas field operations cease upon depletion of the oil field within 15 to 20 years. Upon depletion of the oil field and removal of the wells and any contamination, it may be feasible to simply breach the dike*

*and allow a large portion of the area to become slough, tidal flats, and salt marsh without extensive earthwork.*

*Dredge material would be incorporated into levee and road elevation, used to construct nesting islands, or placed on or near the south end of Bolsa Chica State Beach for nearshore disposal or beach nourishment (see below FEIR/EIS Table 2-1, page 2-11). Oil wells, water injection wells, well pads, and access roads would all be removed from within the tidal area. To protect homes inland of the Lowlands from any groundwater impacts resulting from the introduction of tidal flows to the Lowlands, a French drain would be constructed between the wetlands and the housing development.*

*Approximately 200 acres of the project area would be muted tidal. Muted tidal flow means that the area would experience regular tidal ebb and flow, but would not be exposed to the full range of the tides. The muted tidal area would be connected to the full tidal basin by culverts through the levee.*

*An area of approximately 120 acres in the southeastern corner of the Bolsa Chica Lowlands would be left unchanged as seasonal ponds. Enhancement of suitable nesting areas for Belding's savannah sparrow would be achieved in the muted tidal areas, while other valuable areas would be retained intact in the seasonal pond area and in Inner Bolsa Bay. Enhancement of suitable nesting habitat for the light-footed clapper rail would be achieved in the cordgrass expansion of the full tidal area. Nesting area for the California least tern and western snowy plover would be achieved through the creation and retention of sparsely vegetated sandflat and saltflat areas protected from disturbance or water inundation.*

*The 252 acres in the southeast quadrant of the project area (future full tidal) are not proposed to be altered, at this time, and would remain a mosaic of oil well roads and pads and seasonal ponds and flats for many years. Water levels in these seasonal pond/oil field areas will likely require lowering either by pumping or drains in order to protect the ongoing oil field operations in years of high rainfall.*

*Most of the over 500 poles that formerly supported above-ground power lines would be removed from the Lowlands to reduce the adverse influence of these predatory-bird perching sites near nesting areas. Selected poles would be retained and topped with nest support platforms for great blue heron and osprey. All oil wells and oil infrastructure would be removed from the footprint of the full tidal basin. In the muted tidal, future full tidal and seasonal pond areas of the Proposed Project, oil wells, access roads, and oil pipelines would continue to operate until the lease operator concludes the field is no longer economically viable, perhaps as long as 20-30 years.*

. . .

*Revetments will be constructed along the seaward toe of slope along the elevated section of PCH* [totaling 1,400 feet immediately updrift and downdrift of the ocean inlet]. *This is necessary to prevent damage to PCH that may result from large waves from tropical storms.*

*(Such rare waves have washed over the existing beach and sand berm closing PCH.) The inlet jetties would extend about 445 feet from PCH, extending to the surf zone. Beach sand would be filled to the top of the jetties and covering the highway revetment, largely eliminating the appearance of the rock, except for the seaward ends of the jetties.*

The FEIR/EIS also reports on project elements that:

*Although the simulated maximum ebb velocity is below the threshold value of 6 ft/sec for bed scouring, the potential for levee toe scouring adjacent to the inlet entrance still exists. Therefore, the Proposed Project includes two separated armored levee sections totaling 4,800 linear feet to eliminate the scouring impact (Class III).*

**2. Benefits and Impacts.** The consistency determination summarized the expected benefits and impacts to be generated by the proposed project on coastal resources (**Exhibit 5**):

**Benefits:**

*The Proposed Project would restore full tidal wetlands function to 366.5 acres of the Bolsa Chica Lowlands and muted tidal flow to approximately 200 acres. The increased quantity and quality of open water and intertidal mudflat habitats at Bolsa Chica would provide overwintering habitat for migratory shorebirds, seabirds, and waterfowl. A healthy and diverse aquatic community of marine and estuarine invertebrates would become established in the full and muted tidal basins. Restoration of full tidal influence would recreate conditions that would be very beneficial for up to 60 species of fish that no longer exist in this part of Bolsa Chica. The full tidal basin would provide nursery habitat for the California halibut.*

*Nesting habitat for the state and federal endangered California least tern and the federal threatened western snowy plover would increase and will aid in the recovery of these species. In addition to supporting these endangered species, the nesting areas would provide nesting habitat for a variety of other water-associated birds, including elegant terns, Caspian terns, and Forster's terns. Cordgrass, a low salt marsh plant that generally requires a full tidal range to flourish, would expand at Bolsa Chica. The expanded cordgrass habitat is expected to support nesting by the state and federal endangered light-footed clapper rail. With the Proposed Project, as many as 15 pairs may nest in the Bolsa Chica Lowlands. Pickleweed salt marsh habitat would be enhanced by the introduction of tidal influence. Because the size of a Belding's savannah sparrow nesting territory is smaller in muted tidal and full tidal systems, the Proposed Project would support more pairs of Belding's savannah sparrows (a state endangered species) than existing conditions. About 255 more pairs of Belding savannah sparrows may nest in the project area if the Proposed Project is implemented.*

*In addition to providing tidal influence to much of the Lowlands, the Proposed Project would preserve several valuable nontidal habitats, including seasonal ponds/sand flats and*

*perennial brackish ponds. These seasonal ponds are overwintering habitat for migrating shorebirds and waterfowl during the winter. In summer, when the flats area exposed, these areas are used for nesting by western snowy plover, and several species of shorebirds. The result would be a diverse wetlands ecosystem. In summary, the Proposed Project would result in a substantial net gain in habitat value compared to existing conditions.*

*The Proposed Project would indirectly benefit surrounding land uses by providing an improved public passive use and visual enhancement more consistent with the nearby residential, park, beach, and commercial areas than the existing degraded oil development. New and enhanced public access opportunities would result in a beneficial impact to recreation in the project area. The tidal inlet would enhance recreational fishing opportunities. The project also may benefit the local economy by providing construction jobs for the local labor force, and increasing visitors to the area, which would benefit local businesses. The tidal influence would result in reduced mosquito control problems.*

**Construction Impacts:**

*Grading of the full tidal basin and construction of berms and the tidal inlet would result in considerable disturbance at the site. Site preparation and erosion control methods would be employed during construction (described in FEIR/EIS Section 2.7.1.3) and would reduce the impacts of this disturbance to an insignificant level.*

*To counteract the predicted loss of sand to the ebb bar that would form when the tidal inlet is opened, sandy material dredged from the full tidal basin would be pumped into the nearshore zone to pre-fill the ebb bar. Because some of this material may contain as much as 40 percent fine sediment, at times significant turbidity plumes extending as much as several thousand feet downcurrent may occur (Class I impact). Temporary degradation of water quality may occur from other construction activities, such as excavation of the tidal inlet, but these impacts would be localized to within a few hundred feet of the immediate construction area and would be adverse but insignificant (Class III).*

*Construction of the tidal inlet and pre-fill of the ebb bar would disturb marine organisms in the vicinity of these activities. Recovery of marine communities would occur rapidly after the end of construction, and impacts would be insignificant (Class III). Pre-filling the ebb bar outside the endangered least tern breeding season and peak recreational beach use period would avoid potentially significant adverse impacts to least terns and beach use.*

*The removal of nontidal pickleweed to construct the full tidal basin could result in the temporary loss of between 118 and 138 Belding's savannah sparrow territories. This loss represents approximately 60 percent of 213 total territories in the Bolsa Chica Lowlands (Class I impact). During construction, nontidal pickleweed outside the full tidal basin would be irrigated if it is a dry year or pumped of excess water if it is a wet year to improve the habitat for Belding's savannah sparrow. This water management during construction would partially offset the territories lost due to grading in the full tidal basin. However, the loss of breeding habitat would remain significant during and immediately after construction.*

*Over the long term, this impact would be mitigated due to the enhanced pickleweed habitat in the muted and full tidal areas. The long-term effect of the project would be beneficial to this species (Class IV).*

*Construction during the breeding season could potentially disturb or damage nests of the federally threatened western snowy plover. Nest locations would be flagged or fenced. No construction would occur within 100 feet of a nest. Biological monitors would be onsite during the breeding season and all construction personnel would attend an educational program on threatened and endangered species. These measures would ensure that construction impacts to the western snowy plover would be insignificant (Class III).*

*Although no eligible cultural resources have been found within the project area, there is a slight chance a previously unknown cultural resources could be discovered during construction (Class III). Archaeological monitors would be present during construction and if cultural resources were uncovered proper procedures would be followed to reduce impacts to insignificant (Class III).*

*Beach areas about 800 feet north and south of the proposed tidal inlet would be closed to public access during construction of the PCH bridge and tidal inlet. This closure could result in long-term, temporary, significant, adverse (Class II) land use and (Class I) recreation impacts affecting use of the beach during summer holidays and weekends. Other adjacent land uses would not be significantly affected by project construction activities (Class III). During all phases of construction, public safety would be protected by use of barriers, signs, flagmen, and fences where applicable; therefore, no significant, adverse (Class III) impacts would occur.*

*Inlet construction would result in a temporary loss of surfing use at Lots 14 and 15, and would constrain the already heavily used Lots 23 and 24, resulting in a temporary, significant, adverse (Class I) impact during all four seasons.*

*Heavy equipment working in the Lowlands would be visible to those with views of the area. Most of the construction activity would occur to the viewer as an element in the middle ground to background of the viewshed and would not be a prominent visual feature, nor substantially change the overall character of the Lowlands. This is considered an adverse but insignificant (Class III) impact for the duration of construction. The most prominent visual activity would be the work at Staging Area 1a for construction of the PCH bridge and tidal inlet. The construction effort would temporarily degrade the character of the site, resulting in a temporary, significant, adverse (Class I) impact. Night lighting for project construction would not result in significant, adverse (Class III) impacts.*

*Traffic issues from project construction involve potentially significant impacts (Class II) from possible conflicts and safety concerns between construction traffic and local traffic using Seapoint Avenue, and conflicting turning movements at the PCH staging area. An access plan and traffic control plan should be implemented to reduce potential conflicts to insignificant. The Proposed Project would not have a significant, adverse impact (Class III)*

*on roadway segments during construction, and no significant, adverse impacts (Class III) to traffic flow are expected during PCH bridge construction. Project traffic is considered to be an adverse but insignificant (Class III) impact at area intersections.*

*Construction-related exhaust, dust, and asphalt emissions are anticipated from the Proposed Project. Exhaust emissions would be produced by heavy equipment, truck haul trips, and worker commutes. Nitrogen oxide ($NO_X$) from exhaust emissions is expected to exceed both the daily and quarterly criteria during construction, resulting in a significant, adverse impact (Class I). Demolition of existing structures and soil disturbance would create dust emissions. Dust emissions from the Proposed Project are considered a significant, adverse (Class II) impact. The application of asphalt during construction could release reactive organic gas (ROG) emissions. ROG emissions would not exceed impact thresholds and impacts would be insignificant (Class III).*

*The transport of workers, construction equipment, and materials to the site would incrementally increase noise levels on access roads surrounding the site. An adverse but insignificant (Class III) impact would occur on major routes, while a significant, adverse impact (Class II) would occur on local access roads immediately adjacent to the site.*

*Noise would be generated onsite during site preparation, grading, and construction. Compliance with County of Orange noise standards and the City of Huntington Beach Noise Control Ordinance would ensure that any onsite construction noise impacts would remain insignificant (Class III). Project construction is specifically scheduled around the breeding and nesting seasons of sensitive animal species to avoid any significant noise impacts (Class III). Phase II construction would also result in insignificant (Class III) noise impacts.*

*The project would not result in significant, adverse impacts (Class III) to energy consumption. Fossil fuel use associated with construction of the project would result in consumption of less than one-half of 1 percent of the total regional fuel demand, and consumption of electricity would not exceed available resources.*

*Temporary water and electric utility services would be required at one or more of the construction staging areas. Utilities are currently available onsite and the use of those utilities would be an insignificant (Class III) impact. The project would have insignificant impacts (Class III) on other public services, such as solid waste disposal, fire protection, police protection, and vector control.*

**Operational Impacts:**

*Pre-fill of the ebb bar with material dredged from the full tidal basin, combined with a beach monitoring and maintenance program, would prevent significant beach erosion during Phase I (Class III). However, when the future full tidal basin is opened during Phase II, the increased tidal prism would cause more sand to be lost to the ebb bar. To prevent the loss of beach sand, about 410,400 cy of material would be dredged from an offshore borrow*

*site and discharged at the ebb bar. Discharge of sediment at the ebb bar could have a temporary significant adverse impact on water quality (Class I).*

*Introduction of tidal flows to the Lowlands could cause groundwater levels in the residential area adjacent to the Lowlands to rise and the groundwater to become more saline (Class II). The proposed dewatering trench (French drain) would be installed to reduce impacts to groundwater to insignificant. However, additional analysis is needed to determine the exact design needed to effectively manage groundwater levels.*

*The construction of a tidal inlet would make the Bolsa Chica wetlands vulnerable to an offshore oil spill (Class I).*

*Tidal inundation around the edges of Rabbit Island could result in a loss of coastal woolly-heads. Although this plant is not on federal or state lists of protected species, the Rabbit Island population of coastal woolly-heads is sensitive because it is 1 of only 10 populations known to occur in the mainland United States (Class II). Several sensitive insect species and the silvery legless lizard would also be affected by loss of part of Rabbit Island. Because the insects and lizard are most closely associated with the dune habitat in the center of Rabbit Island, which would be least affected by tidal flows, and because all of these sensitive species are present in dunes along Bolsa Bay, these impacts would be adverse but insignificant (Class III). Except for possible impacts to the coastal woolly-head, loss of part of the Rabbit Island's environmentally sensitive habitat area (ESHA) to tidal wetlands, a more valuable habitat, is considered insignificant (Class III).*

*The part of the eucalyptus grove ESHA within the Bolsa Pocket could be damaged by the introduction of muted tidal flows. The eucalyptus trees provide valuable habitat for a variety of raptors. The loss of a small portion of the eucalyptus grove is considered an adverse but insignificant impact because eucalyptus trees on Bolsa Mesa would be preserved (Class III). Very few living trees are found in the Pocket but saltier groundwater could potentially harm the handful of trees growing on the edge of adjacent higher ground.*

*The Proposed Project would include regular beach nourishment at approximately 2-year intervals. Placement of sand in the surf zone during maintenance dredging may interfere with the spawning of California grunion (Class II). Spawning occurs during nighttime high tides between March and August.*

*Construction of the proposed tidal inlet would result in the permanent loss of beach as a result of land to water conversion. This impact would be adverse but insignificant (Class III). The continuity of the beach would be broken and would affect beach users traversing the length of the beach. Access across the inlet would be provided on the PCH bridge via a pedestrian access crossing, reducing the impact of breaking beach continuity to adverse but insignificant (Class III). The surfing experience would change as a result of construction of the tidal inlet. This difference would be perceived in different ways and would result in adverse but insignificant (Class III) impacts because some surfers would view the change as beneficial and some would not.*

*The project is compatible, from a land use perspective, with adjacent existing and future planned uses. No significant, adverse (Class III) policy impacts would occur. A potentially significant (Class II) safety issue may result if persons stray too close to the jetties. Situations that may result in injury include persons being washed off of or falling from the jetties, or getting swept into the inlet. Warning signs and lifeguard stations would be provided near the tidal inlet to reduce impacts to insignificant.*

*The new PCH bridge over the tidal inlet would change the character of the beach area when it is converted to this new use. Visually, there should not be a negative impression. Therefore, the new bridge would cause no significant, adverse visual impacts (Class III).*

*Post-construction traffic activity would be similar to that of year 2002 traffic without cumulative traffic or project traffic added. Operations would include infrequent maintenance, and traffic impacts would be adverse but insignificant (Class III). In the year 2002 cumulative project scenario, four intersections would operate at level of service (LOS) E. This cumulative condition would result in a significant, adverse (Class II) impact. The project contributes incrementally, but insignificantly, to the cumulative impact.*

*Following construction, minor air emissions may result from French drain operations and maintenance dredging. Operation of the French drain would consume electricity and would contribute a small amount of emissions associated with the production of electricity. Emissions associated with the generation of electricity are considered insignificant (Class III). Maintenance dredging may be required to keep the tidal inlet clear and would result in significant, adverse impacts to air quality (Class II).*

*Post-construction monitoring and maintenance would not result in a significant number of additional vehicle trips to the site and would not change vehicle-generated noise levels in the project area, an insignificant (Class III) impact. Operation of the French drain may require the use of pumps; however, the pumps would not be audible at any offsite locations. Therefore, insignificant, adverse (Class III) noise impacts would result. Maintenance dredging would not cause any significant, adverse noise impacts (Class III) if restricted to the hours of 7:00 a.m. to 10:00 p.m.*

**3. Long-Term Management.** The consistency determination examines the proposed long-term management of the restored wetland complex:

*Title to any properties acquired in the Bolsa Chica Lowlands for the Project will be held by the SLC. Pursuant to Section 1(d) of the Interagency Agreement, the SLC shall hold all lands so acquired "... in public trust ... for the purposes of ecological restoration and preservation, scientific study, open space, and fish and wildlife habitat protection."*

*Section 7(a) of the Interagency Agreement then makes the SLC responsible for effecting the Restoration O & M and Management Components of the Project (i.e., for*

*carrying out the long-term operation and management of the Project). The Agreement acknowledges, however, that the SLC may enter into an agreement with another agency or entity for this purpose. In this regard, the CDFG and the Service have a "first right of refusal" to enter into an agreement to manage the Lowlands on the SLC's behalf. If the Service should ultimately enter into such an agreement, then the lands acquired for the Project will be managed by the Service as a unit of the National Wildlife Refuge System (see Section 7(c) of the Agreement). If the CDFG should ultimately enter into such an agreement, the new lands would be added to the existing Ecological Reserve which they manage.*

**4. Schedule and Budget.** The consistency determination includes discussion regarding the construction schedule:

*Construction would occur in four phases (see FEIR/EIS Figures 2-19A and B) and would avoid or minimize impacts to fish and wildlife resources. The FEIR/EIS Environmental Constraint figure 2-20 is attached. Phase 1 (September-March) includes clearing and grubbing the full tidal basin, west half bridge and PCH detour construction, inlet construction begins. Phase 2A (March to September) includes completion of PCH bridge, levees and revetments of the full tidal basin, the French drain, cordgrass shelf, and preparations to begin dredging in the full tidal basin. Phase 2B includes dredging the full tidal basin, pre-filling the ebb shoal, constructing inlet jetties, PCH revetments, and nesting areas. Phase 3 includes muted tidal area culverts, salvage revegetation, and removal of some staging areas. Phase 4 includes completion of dredging, if necessary, opening of the inlet, and demobilization of construction equipment. See Chapter 2 of the FEIR/EIS for a more complete description.*

The consistency determination states that construction of the proposed project would take approximately three years.

The current estimates of the incurred costs, future costs, and currently available funds for the proposed project are outlined in the consistency determination as follows:

| | |
|---|---|
| *EXPENDED* | |
| *Purchase of KREG property* | *$25,000,000* |
| *EIR/EIS & prelim. engineering* | *2,400,000* |
| *Contaminants Sampling and EcoRisk Assessment* | *6,000,000* |
| *SET ASIDE FOR FUTURE USE* | |
| *Future Full Tidal Restoration Account* | *1,800,000* |
| *Maintenance Account (long-term O&M)* | *6,200,000* |
| *FUNDS CURRENTLY AVAILABLE* | |
| *Wetlands Restoration Account* | *53,000,000* |
| *(Other funds only for Fieldstone Acquisition* | *1,200,000)* |
| *ACTIONS YET TO BE TAKEN* | |
| *Oil buyout and well removal in tidal basin* | *8,000,000* |

| | |
|---|---|
| *Final design and project management* | *9,400,000* |
| *Proposed Project Construction Cost (Dec. 99 est.)* | *53,700,000* |

*Based on these estimates the potential "shortfall" may be as much as $18,000,000. The construction cost estimate will be updated, but the actual cost of construction will be better known after final design is completed and once the actual construction bids are opened. The construction cost estimate also includes a 20% contingency cost. Also, obtaining commitments for additional funds, at this time, is made more difficult by the fact that there is no actual shortfall of funds at this time.*

The consistency determination also states that:

*Funding for the long-term operation and maintenance of the Project is assured through the creation of a $5 million Maintenance Account, which will be held by the SLC (See Section 13(c) of the Interagency Agreement). The investment earnings from this principal account will be available only for annual expenses, with the first "expense" being a requirement to reinvest a sufficient amount to offset the effects of inflation.*

D. **Status of Oilfield Cleanup and Ecological Risk Assessment.** The consistency determination addresses oilfield contamination and cleanup and the Ecological Risk Assessment for the Bolsa Chica Lowlands:

*Five decades of oilfield operations in the lowland have contributed some degree of contamination in the sediments of the wetlands and the network of oil well pads, sumps, and roads. When the 880-acre property was acquired by the State in 1997, a voluntary cleanup agreement was executed with the Responsible Parties (oil companies and the seller). In this agreement, the Project assumed responsibility to characterize the nature and extent of contamination, identify contaminant threats to natural resources, determine the appropriate cleanup criteria for the site, and determine areas to be cleaned up. The Fish and Wildlife Service has the lead role in the Risk Assessment phase which includes completing the biotic, water and sediment sampling and preparing an Ecological Risk Assessment (ERA). The ERA will integrate the sampling results with the known wildlife use of the site and estimate the type and amount of contaminant exposure risk to fish and wildlife. This information will be used to develop clean-up criteria which, once implemented, will result in an acceptable or minimal contaminant exposure to wildlife subsequently using the site. The Responsible Parties will then prepare and execute a cleanup plan at their expense. Verification sampling is to be conducted after cleanup to verify that the desired levels of cleanup have been attained. The Regional Water Quality Control Board has approval and oversight of the cleanup plan, with funding support from an EPA grant. EPA is to supplement the ERA with its evaluation of whether risks to human health warrant additional response actions.*

*The sampling to characterize the nature and extent of contamination is almost complete and results are presented in a draft ERA document that will be completed and made public after review by the responsible parties. The discussions with the oil company and former owner*

*of the property are under way to determine the cleanup levels and cleanup plan.*

*Until the cleanup levels and plan are adopted, specific or quantified cleanup actions cannot be defined. However, closure of wells and cleanup in the vicinity of wells is not expected to be in dispute and has been conducted by the Lease Holder, AERA Energy, on their own schedule for the last several years pursuant to their lease agreement with the Landowner. Contaminants warranting cleanup beyond the vicinity of active and idle wellheads are the principal focus of the ERA and cleanup plan. Some generalized cleanup methods can be described: safely sequestered contaminants may be left in place, stable contaminants may be sequestered in constructed fills within the restoration project (e.g. berms), contaminated sediments may be hauled to appropriate landfill sites, or "landfarming" treatment techniques may be used within the lowland. The volumes of dirt requiring treatment or disposal handling different from that shown for the restoration project alternatives are unknown at this time. If the cleanup plan proposed by the responsible parties entails substantial changes to the habitat restoration project and its associated impact evaluation, a supplemental environmental analysis may be necessary.*

The oilfield cleanup work addressed by the ERA will require the leaseholder to obtain a U.S. Army Corps of Engineers Section 404 (Clean Water Act) permit and may require a coastal development permit from the Commission. In addition, the Service states in the Final EIR/EIS and in the consistency determination that no restoration work or exposure of land to tidal action will occur until the oilfield cleanup activity is complete and verified.

## II. Status of Local Coastal Program.

The standard of review for federal consistency determinations is the policies of Chapter 3 of the Coastal Act, and not the Local Coastal Program (LCP) of the affected area. If the LCP has been certified by the Commission and incorporated into the CCMP, it can provide guidance in applying Chapter 3 policies in light of local circumstances. If the LCP has not been incorporated into the CCMP, it cannot be used to guide the Commission's decision, but it can be used as background information. The Bolsa Chica LCP has **not** been certified by the Commission nor incorporated into the CCMP.

Port funds must be used for public trust purposes. Thus, because the ports funded the acquisition of the lowland property by the State Lands Commission, those lands were impressed with the public trust at the time they were acquired by the State, and no amendment to the LCP is required. Under Public Resources Code Section 30519(b), the Commission (rather than the County of Orange) has the authority to issue coastal development permits for development undertaken on public trust lands. In the event the Commission receives such an application, the standard of review will be Chapter 3 of the Coastal Act and not the certified Bolsa Chica LCP. The balance of the land in the area within the Bolsa Chica LCP that is not acquired by the State using port funds will remain subject to the County's jurisdiction if there is a certified LCP, or the Commission's jurisdiction in the absence of a certified LCP.

## III. Federal Agency's Consistency Determination.

The U.S. Fish and Wildlife Service has determined the project consistent to the maximum extent practicable with the California Coastal Management Program.

**IV. Coastal Act Issue Analysis.** As noted previously, this staff report does not contain a recommendation for Commission action on the consistency determination, and accordingly, does not contain proposed findings to support a recommendation. Instead, the following sections contain only a preliminary analysis of the project with relevant Coastal Act policies.

**A. DREDGING AND FILLING.** The Coastal Act provides:

**Section 30233**

*(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:*

. . .

*(7) Restoration purposes.*

*(8) Nature study, aquaculture, or similar resource dependent activities.*

*(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.*

*(c) In addition to the other provisions of this section, diking, filling, or dredging in existing estuaries and wetlands shall maintain or enhance the functional capacity of the wetland or estuary. Any alteration of coastal wetlands identified by the Department of Fish and Game, including, but not limited to, the 19 coastal wetlands identified in its report entitled, "Acquisition Priorities for the Coastal Wetlands of California", shall be limited to very minor incidental public facilities, restorative measures, nature study, commercial fishing facilities in Bodega Bay, and development in already developed parts of south San Diego Bay, if otherwise in accordance with this division. . . .*

As described in above Section I-C-1 of this report, the proposed wetland restoration involves dredging approximately 2.7 million cu.yds. of material from the Lowlands to create a tidal basin and ocean inlet, placing a portion of the dredged material in the Lowlands to create a berm around the basin and to construct nesting islands, disposing dredged materials in ocean waters to pre-fill the offshore ebb bar and to pre-nourish the beach downcoast of the ocean inlet, and dredging sandy materials from an offshore borrow site to expand the ebb shoal during Phase 2 of the project (Future Full Tidal Area). These activities need to be examined for consistency with Section 30233 of the Coastal Act. Under this section, dredging and disposal within wetlands, estuaries, and open coastal waters is limited to those cases where the proposed project is an

allowable use, is the least damaging alternative, and where mitigation measures have been provided to minimize environmental impacts.

The allowable use test is met because the aforementioned dredging and disposal activities would be performed for habitat restoration purposes, an allowable use under Section 30233(a)(7).

The second test requires the Commission to examine whether the proposed project is the least environmentally damaging feasible alternative. The Service provided detailed analysis in the Final EIR/EIS of numerous wetland restoration alternatives to the proposed project (the Concept Plan without the flood control channel diversion structure). Those alternatives are referenced in the consistency determination and are summarized below:

1st Sub-Alternative: Restoration of Future Full Tidal Basin Concurrently with Phase I Restoration. This alternative is identical to the proposed project but would in addition restore the Phase II future full tidal basin in the northeast corner of the Bolsa Lowlands concurrently with restoration of the rest of the Lowlands rather than in 15 or 20 years when oil operations are completed.

2nd Sub-Alternative: Concurrent Restoration of Expanded Future Full Tidal Basin. This alternative is identical to the 1st Sub-Alternative but the future full tidal basin area would be dredged to increase the area of intertidal habitat.

Alternative 1: Flood Control Channel Routed into the Concept Plan Full Tidal Basin. This alternative would be the same as the Concept Plan but with all flows from the EGGW Flood Control Channel routed into the full tidal basin (**Exhibit 6**).

Alternative 2: Full Tidal Basin with a New Ocean Inlet near Rabbit Island. This alternative would create a full tidal basin and managed tidal areas similar to the Concept Plan but with a new ocean inlet near Rabbit Island where the EGGW Flood Control Channel discharges into Outer Bolsa Bay (**Exhibit 7**).

Alternative 3: Full Tidal Basin with an Ocean Inlet near Warner Avenue. This alternative would introduce tidal flows to the Concept Plan alternative through a new ocean inlet near Warner Avenue (**Exhibit 8**).

Alternative 4: Three Jetty Plan. With this alternative, a tidal inlet to the wetlands would be constructed near Rabbit Island and a separate inlet for discharge of flows would be constructed from the EGGW Flood Control Channel parallel to the inlet to the wetlands (**Exhibit 9**).

Alternative 5: Irrigation/Water Management. Minor modifications would be done to existing conditions to permit brackish water ponds to persist year-round. Water would be pumped between cells to prevent water levels from becoming too high or too low (**Exhibit 10**).

Alternative 6: The Concept Plan. This plan is identical to the proposed project, except that a side weir would be installed into the levee of the EGGW Flood Control Channel to allow spillover of a portion of the 100-year peak flood discharge into the full tidal basin. Storm flows would be conveyed to outer Bolsa Bay and the restored wetlands via the EGGW Channel; flows from the channel would begin to spill into the full tidal basin during a 10-year storm (**Exhibit 11**).

No Action Alternative. Nothing would be done to alter the water regime within the Lowlands.

The Final EIR/EIS also examined three alternatives which received additional analysis to determine their technical and economic feasibility prior to elimination from further detailed analysis:

Full Tidal Basin with Culverts and No New Inlet. This alternative would seek to restore a habitat mix similar to the Concept Plan by the construction of a series of large culverts running beneath PCH and the beach to connect the wetland to the ocean at the southern portion of the project area.

Small Area of Full Tidal with Huntington Harbour Connection and No New Inlet. This alternative would create full tidal expansion in the Pocket and Old Slough, widen the Warner Avenue opening to increase water supply through Huntington Harbour, dredge Outer Bolsa Bay, and discharge the EGGW Flood Control Channel directly into the Pocket full tidal basin.

Concept Plan with Discharge of Low Flows into the Wetlands. This alternative would split the flow from the EGGW Flood Control Channel to allow low flows to discharge to the wetlands and storm flows to bypass the wetlands and discharge into Outer Bolsa Bay.

Finally, the Final EIR/EIS reported on two project alternatives which were examined but eliminated from further detailed analysis:

Full Tidal Basin with Meandering Inlet. This alternative would include a habitat mix similar to the Concept Plan but tidal influence would occur through creation of a 1,000-foot-long causeway supporting PCH with no jetty structures for stabilization. This wide opening would allow the tidal channel connecting the tidal basin to the ocean to meander within the 1,000-foot opening to the ocean.

Orange County Coequal Plan. With this alternative, a new tidal basin would be constructed in the central Lowlands and would introduce tidal flow through construction of a new ocean inlet near Huntington Mesa. All flood control channel waters would be diverted into the new tidal basin. Additional habitats would include muted tidal and seasonal ponds. The area near the northeast boundary would be managed by freshwater irrigation.

The Service addresses in its consistency determination the project alternatives and its selection of the proposed project:

> *The selection of the Proposed Project was based on two considerations. The first consideration was the lesser extent of significant, adverse impacts that would result from project implementation. The second consideration was the extent to which wetland function and values within the Bolsa Lowlands would be improved, i.e., the ability of the selected alternative to meet the project purpose and need.*
>
> *Of the project alternatives analyzed in detail, Alternative 5 had the fewest adverse impacts because it would involve minimal construction. Also, because no tidal inlet would be constructed for Alternative 5, it would avoid the significant, adverse impacts to water quality, recreation, and land use from construction of the tidal inlet and pre-fill of the ebb bar at Bolsa Chica State Beach. However, Alternative 5 provided by far the lowest habitat benefits of the restoration alternatives. Alternative 5 would provide no benefits to marine fishes such as California halibut and may even be detrimental to marine fishes that would enter the Lowlands during the limited periods of tidal action. Alternative 5 would enhance the pickleweed vegetation in the Lowlands by providing periodic tidal flow but probably would not increase the diversity of wetlands vegetation. Specifically, no cordgrass would become established in the Lowlands if Alternative 5 were selected. Because no cordgrass would become established in the Lowlands with Alternative 5, no habitat would be provided for the endangered light-footed clapper rail. Alternative 5 would provide only a slight enhancement of overwintering habitat for migratory shorebirds, seabirds, and waterfowl. Foraging opportunities for the endangered California least tern and other tern and gull species would be only marginally increased. Furthermore, Alternative 5 would be expected to create more problems for Vector Control than the existing condition (Class III). In contrast, the tidal inlet alternatives would be less conducive to mosquitoes than the existing condition.*
>
> *All of the tidal inlet alternatives would provide similar habitat benefits including:*
>
> 1. *increased quality and quantity of open water and intertidal mudflat habitats for migratory shorebirds, seabirds, and waterfowl;*
> 2. *a healthy and diverse aquatic community of marine and estuarine invertebrates and fishes including nursery habitat for the California halibut;*
> 3. *increased nesting habitat and foraging opportunities for the state- and federal-listed endangered California least tern and the federal-listed threatened western snowy plover, as well as a variety of other water-associated birds;*
> 4. *expansion of cordgrass habitat to support nesting by the state and federal-listed endangered light-footed clapper rail; and*
> 5. *enhancement of pickleweed saltmarsh habitat that would expand nesting territories of the state-listed endangered Belding's savannah sparrow.*
>
> *Of all the restoration alternatives, the Proposed Project would provide the highest*

*quality environment for aquatic fish and invertebrates because the EGGW Flood Control Channel would not discharge into the full tidal basin. Therefore, the disturbance to the aquatic community from the freshwater influx and pollutants during storm flows would not occur.*

*Because the Proposed Project would have no discharges from the EGGW Flood Control Channel, metals and bacteria would not be carried into the wetlands and the ocean. All of the other tidal inlet alternatives would have a significant, unmitigable, adverse impact to water quality in the wetlands and coastal waters from pollutants in storm flows (Class I). Bacteria in ocean waters would exceed thresholds and swimming and surfing would be restricted. Loss of swimming and surfing use of ocean waters during periods when bacteria exceeded threshold levels would be an unmitigable, significant, adverse impact to recreation (Class I).*

*The Proposed Project also would not result in the permanent loss of beach parking spaces that would occur with Alternatives 2, 3, and 4. The loss of parking spaces is a significant but mitigable impact (Class II). The Proposed Project would have a significant, unmitigable impact to surfing during project construction (Class I) that would not occur for Alternatives 2 and 4. However, construction impacts to surfing would be temporary. The Proposed Project was selected as preferred because it would provide much greater habitat benefits than Alternative 5, and would avoid the unmitigable, significant, adverse impacts to water quality and recreation that would occur with the other tidal inlet alternatives. The greatest habitat benefits would occur if the Proposed Project were combined with the 2nd Sub-alternative. Habitat benefits would also be increased, but to a somewhat lesser extent, if the Proposed Project were combined with the 1st Sub-alternative. No additional significant, adverse impacts would occur with either of these sub-alternatives, although the potentially significant (Class II) impacts of excavation of an offshore borrow pit would occur at the same time as the Phase I construction impacts rather than 15 or 20 years in the future.*

The proposed project appears to be the most environmentally beneficial and, overall, the least environmentally damaging feasible alternative to restore the Bolsa Chica Lowlands to tidal wetland function as envisioned in the 1996 Concept Plan and CD-115-96. The other alternatives, while technically feasible, would lead to significant adverse effects on coastal resources, particularly water quality and recreation, and/or would not provide the volume of seawater inundation necessary to restore the range and diversity of tidal wetland habitats and functional values across the Lowlands outlined in the 1996 Interagency Agreement.

However, and as discussed further in the sections below, the proposed project does hold the potential to generate significant adverse impacts on coastal resources at and adjacent to the project site, in particular on water quality and public access and recreation. The design elements and mitigation measures built into the project will minimize most of the potential adverse effects on coastal resources. But before the Commission can determine that the proposed project is in fact the least environmentally damaging feasible alternative and that additional mitigation measures are not necessary, additional information and analysis regarding dredged sediment

quality and nearshore disposal actions (as discussed below in Section D) must still be received from the Service.

**B. SHORELINE STRUCTURES/COASTAL PROCESSES.** The Coastal Act provides:

**Section 30235**

*Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.*

**Section 30233(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.*

1. Existing Environment. Bolsa Chica State Beach is a relatively wide sandy beach starting at the Anaheim jetties to the north, and ending at the Huntington Cliffs to the south. South of Huntington Cliffs is Huntington Beach City Beach. Much of the Bolsa Chica State Beach is 200-foot-wide or wider, with the beach width decreasing at the southern end, in the area of Huntington Cliffs. Beach width varies seasonally and fluctuations of the Mean Lower Low Water line can range from 50 to 150 feet within the Bolsa Chica area. The following table shows the average beach widths and seasonal variations for the alternative tidal inlet locations.

**Typical Beach Widths and Seasonal Variability, Bolsa Chica State Beach**

| Location | Average Beach Width | Average Seasonal Beach Width Variability, At MSL Line |
|---|---|---|
| Warner Avenue | 413 | 63 |
| Rabbit Island | 311 | 29 |
| Concept Plan (proposed) | 243 | 22 |

Historically the Santa Ana River provided sand for this beach area. The Anaheim Jetties were constructed in the 1940s and blocked the delivery of sediment from the Santa Ana River to this area. Since the construction of these jetties, the main source of new sand to these beaches has been from regular nourishment of the beaches at Surfside and Sunset beaches. Since 1945, over 16 million cubic yards have been placed on Surfside or Sunset beaches (DEIR, Table 3.2-6). As noted in the FEIR, this nourishment project "is an authorized project with an indefinite life and will remain authorized unless specifically acted upon by Congress. However, future beach nourishment stages will be dependent on funding contained in future federal energy and water

appropriations and from the State of California and local governments. If the Surfside/Sunset Beach nourishment program is terminated, sediment deficiency will be likely to occur for the entire coastal segment from Surfside/Sunset to West Newport Beach." (DEIR, Page 3-62)

Sediment transport along the beach at Bolsa Chica has a strong seasonal pattern. During the winter months, November to March, storms and swell from the west and northwest move sediment to the southeast. This trend is reversed in the summer months, May to October, when the swell comes from the south. The summer swell is typically milder than winter storms, resulting in net sediment transport to the southeast. The gross annual transport rate is about 300,000 cubic yards, and the net annual transport (to the southeast) is about 80,000 cubic yards.

The wave climate and offshore bathymetry at Bolsa Chica State Beach provides many opportunities for surfing, mostly from beach surf breaks. One spot, to the south of the project site, close to Huntington Cliffs has bathymetry that provides consistent wave focusing that provides more desirable surfing conditions. Along the rest of Bolsa Chica State Beach, the nearshore bottom is sandy and the preferred surf spots tend to vary up and down the shore, based on bottom conditions and the combination of wave direction and period. A surfer survey showed that the most crowded areas for surfing were near to Lots 14 and 15 (near the proposed tidal inlet) and Lots 23 and 24 (between Warner Blvd. and Rabbit Island). The DEIR noted, however, "no evidence of a specific nearshore bathymetric feature that produces a unique wave at any particular location," which is typical of beach break surfing areas.

2. Proposed Project. The proposed project will include construction of a tidal inlet across the sandy beach to develop tidal exchange between the ocean and the proposed full tidal wetlands (**Exhibits 12-14**). The main elements for this inlet will be:

- 420-foot-long, six-lane bridge (with two bike lanes) along Pacific Coast Highway;
- one 445-foot-long rip-rap rock jetty, with crest elevation of +13 MSL, extending to mean low tide;
- one 420-foot-long rip-rap rock jetty, with crest elevation of +13 MSL, extending to mean low tide;
- 1,400-foot-long (approximately) rip-rap rock revetment paralleling the highway;
- excavation of approximately five acres of beach to open the jetty inlet (190,000 cubic yards);
- non-navigable tidal inlet, approximately 360 feet wide (between crests of the jetties);
- pre-filled ebb tidal bar, created with approximately 1,331,000 cubic yards of sediment;
- advance downcoast nourishment with approximately 190,000 cubic yards of beach sand;
- six monitoring sites to measure complete profiles (to –40 feet MLLW) twice a year;
- regular dredging of the flood bar to maintain full tidal exchange; and
- regular nourishment of downcoast beaches, using sand dredged from the flood bar.

3. Phase 1 and Phase 2 Restoration. The restoration project will occur in two phases and the tidal inlet has been designed to handle the tidal exchange that will be needed for the full-tidal condition of Phase 1 and Phase 2. The most significant changes that will occur between Phase 1

and Phase 2 will be the increased tidal exchange, increased flows through the inlet, and the increased size of the ebb and flood tidal bars. The jetties and tidal inlet will be designed and built for the Phase 2 flow conditions. The ebb bar will be pre-filled to conform to the size and extent of the ebb bar that would be expected to develop for the Phase 1 tidal exchange conditions of each phase. The ebb bar will be constructed for Phase 1 conditions and later will be expanded for Phase 2. When the Phase 2 restoration is completed, the existing ebb bar will be artificially enlarged with additional nourishment material to match the new tidal exchange conditions.

4. Project Alternatives. Alternatives to the full tidal option are discussed above in Section A of this report. Options that would provide full tidal exchange are:

- the proposed inlet at the south end of the Bolsa Chica Ecological Area
- a new tidal inlet adjacent to Rabbit Island
- a new tidal inlet adjacent to Warner Avenue
- culverts connecting the ocean and the full tidal area

The historic inlet for this area (circa 1873) was Los Patos channel, near the northwest corner of Bolsa Chica Mesa, and closer to the proposed Warner Avenue inlet area. Many of the coastal impacts from a new tidal inlet will occur regardless of the location of the inlet. Shifting the inlet location will just shift the location of the impacts. Downcoast erosion is a possible adverse impact from any of the new inlets and ebb shoals. The Rabbit Island and Warner Avenue inlet locations would be further from the Huntington Cliffs than the proposed inlet location. Either of these inlet locations could reduce the potential for adverse impacts at Huntington Cliffs. However, due to the seasonal reversals in sediment transport, these inlet locations also could exacerbate erosion concerns at the Surfside/Sunset beaches.

The inlet designs will change slightly for the various inlet locations. The Warner Avenue location would not require any shoreline protection, due to the current width of the beach. But, since the beaches at Warner Avenue and Rabbit Island are wider than at the proposed inlet location, and since these beaches have greater seasonal variability, these sites would require longer jetties to maintain full tidal exchange. There will be small differences in impacts to coastal processes between the different inlet locations; in general, all three inlet locations pose the potential for comparable impacts from a coastal process perspective.

The option that would minimize impacts to coastal processes would be the use of culverts that would go beneath Pacific Coast Highway and the Bolsa Chica State Beach. The culvert option would entail use of a dozen 20-foot diameter culverts. The ocean end of culverts would have to extend beyond the zone of active sand transport to avoid being sanded in, so each culvert would have to be about 8,000' long. It is questionable whether fish would use these culverts to travel into and out of the restored wetland. In addition, due to the size and length of the culverts, this option would cost between $150 and $200 million and could not be covered by the existing restoration budget.

5. Impacts from the Proposed Project and Efforts to Eliminate or Minimize Impacts.

(a) Loss of Beach. During construction of the Pacific Coast Highway Bridge, the jetties and the tidal inlet, public access to the work area will be restricted for public safety reasons. The restricted access region would be approximately 1,000 feet from the center of the inlet, in both directions, spanning 2,000 feet total. The average beach width in this location is about 243 feet, so the total area of temporarily lost beach access is about 486,000 square feet, or 11.2 acres. This temporary loss of beach access would last for about three years. Beaches up and down coast of the construction area would remain open for public access, although construction activities could reduce available parking and access to the beach from the Bolsa Chica State Park facilities. The only access for the public beaches south of the construction area will be to either walk 2,000 feet along the temporary bike path, or walk north from the City beach. No new temporary access will be provided to the beach south of the construction site.

After the construction phase is completed, access will be allowed again to the remaining beach areas. The revetments, the jetties and the tidal inlet will be permanent structures and will continue to occupy land that previously had been public beach. The jetties and tidal inlet are needed to maintain a stable tidal inlet, and they will permanently replace about five acres of beach.

The area of revetment encroachment has not been calculated since the revetment designs have not been finalized or provided. The proposed revetments, north and south of the tidal inlet, would total 1,400 feet. They would be immediately adjacent to the elevated roadbed of PCH and would be mostly covered by sand. The revetments are being proposed as a last line of defense to provide the minimum necessary protection for PCH and the State Parks parking lots from extreme beach retreat during a severe storm. Due to their location at the backshore, they should only interfere with coastal processes during extreme storm events. The Service did not consider any alternatives to the revetment, stating that this design is "the most effective at dissipating wave energy with minimum wave reflection and effects on adjacent shore." (September 20, 1995 Letter Report from Chris Webb, Moffatt & Nichol Engineers, to Mr. Ron Tibbets, County of Orange, Environmental Management Agency.)

The proposed project will result in permanent replacement of about five acres of beach with the jetties and tidal inlet. In addition, some of the structures, such as the revetments and the lower slopes of the outer sides of the jetties, will encroach onto the beach, but will be covered by sand under average, non-storm conditions. The Service considers these impacts to be permanent, unavoidable impacts. The Service is not proposing any mitigation for this permanent loss of beach area, or for the encroachment of structures that will be covered by sand during normal, non-storm conditions.

(b) Impacts to Coastal Processes. The major project features that may alter coastal processes will be the revetments, the jetties holding open the tidal inlet, and the dynamics of the tidal inlet and flood and ebb tidal bars. Each feature will affect coastal processes in different ways.

The Service has addressed impacts from revetment construction. The proposed revetments will be situated far back on the beach, at a location where they should only infrequently be affected by waves or be in a situation where they could alter or impact coastal processes. During these infrequent times, the impacts from the revetments could include scour, end effects, and fixing the back of the beach. The revetments are designed as a "last line of defense." As such, they could only infrequently be subject to wave action. However, during the times that they are subject to wave action, they would provide erosion protection for the support for the elevated roadbed and parking area from erosion and undercutting.

The proposed jetties will have greater and more regular impacts on shoreline processes than the revetments. The jetties will extend only to Mean Lower Low Water. This termination is being proposed so that there will be minimal interruption of longshore sediment transport and nearshore currents. A similar short jetty design was used for the recently constructed Talbert Channel and has been effective in minimizing interruption of longshore transport. Some small amount of accretion will occur upcoast of the jetties and some erosion would occur downcoast. Since the littoral transport shifts direction seasonally along this beach, the jetty impacts would be fairly small but would occur both north and south of the jetties. The Service's modeling efforts estimate that the jetties could cause up to 10 feet of erosion after they have been in place for five years, and could go up to 23 feet after 20 years.

The tidal inlet and ebb and flood tidal bars are likely to have the greatest impact on coastal processes. Under normal inlet conditions, the tidal flow in and out of the inlet will modify and interfere with both longshore currents and on-shore wave action. Flood and ebb shoals are features that develop at the ocean side (the ebb tidal bar) and the wetland side (the flood tidal bar) of most tidal inlets. For a stable inlet, the flood and ebb bars will eventually reach a state of dynamic equilibrium – growing larger and smaller to adjust to changes in tidal currents and wave climate. For a new inlet, the material that will create the ebb and flood bars will come from littoral sediment supplies and, absent mitigation, substantial downcoast erosion would occur as the ebb and flood bars become established. The ebb bar will also cause waves to break further offshore, on the shoal, and will modify and refocus local wave energy.

The size of the bars is dependent upon the tidal exchange and wave environment. For the ebb bar, once it reaches a stable size and volume, it will begin to by-pass material downcoast and a new "equilibrium" littoral transport system will develop. The equilibrium ebb bar for the Phase 1 effort is estimated to cover 1,960,000 square feet of nearshore area and require 623,000 cubic yards of sand, slightly coarser than the sands that currently exists in the nearshore area. It could take many years for the ebb bar to become completely established, but the shoal will grow quickly in the first few years, and more slowly thereafter.

It is anticipated that the flood shoal will trap 165,000 cubic yards of sand the first year, 134,000 cubic yards the second year, 64,000 cubic yards the third year, and only 10,000 cubic yards the fourth year. The equilibrium flood bar would cover 3,725,000 square feet and require 373,000 cubic yards of sand.

The 996,000 cubic yards of sand that would build the equilibrium ebb and flood bars, if taken from longshore sediment transport supplies, would result in significant erosion both north and south of the inlet. Using a conversion factor of 1.7 cubic yards of sand/square foot of dry beach, this could cause the erosion loss of 13.45 acres of dry beach north and south of the inlet.

The Service proposes several measures to avoid the erosive impacts of ebb and flood bar development. For the ebb bar, the applicant is proposing to construct or pre-fill the ebb bar for both Phase 1 and Phase 2 tidal conditions. The initial ebb bar will be constructed with 1,331,000 cubic yards of sediment that will be dredged from the tidal wetlands. During the Phase 2 project, over 400,000 cubic yards of sand will be added to the ebb bar to accommodate the increased tidal exchange that will occur with this part of the project.

The Service will also place 190,000 cubic yards of sand from the tidal inlet onto downcoast beaches as "advance fill" to offset the sand losses that are likely to occur when the flood shoal develops. The Service anticipates that the flood shoal will trap 165,000 cubic yards of sand the first year, 134,000 cubic yards the second year, 64,000 cubic yards the third year, and only 10,000 cubic yards the fourth year. The growth of the flood shoal will dampen the tidal exchange in the wetland, and to maintain full tidal action in the restored wetland area, the applicant proposes to dredge the flood shoal on a regular basis. The material dredged from the flood tidal bar will also be placed on downcoast beaches.

The intent of all these actions (pre-filling of the ebb bar, advance fill of the downcoast beaches, and routine nourishment of the downcoast beaches) is to minimize or eliminate any downcoast erosion from the tidal inlet. The Service estimates the new tidal inlet could cause over 100 feet of beach loss if no steps are taken to mitigate impacts from the jetties and inlet. With the pre-filled ebb bar and routine dredging of the flood bar, the project-induced impacts would result in about 7 feet of erosion in the first two years, but beach accretion by the fourth year of operation (7 feet in Year 4, 18 feet in Year 6, and up to 37 feet in Year 10).

(c) Possible resource impacts associated with the ebb tidal bar. The Service proposes to use 1,331,000 cubic yards of sediment to pre-fill the ebb bar. The sediment that will be used to construct the ebb bar will contain a high percentage of fines. Some samples have up to 40% fines; however the overall mix of sediment will contain slightly more than 20% fines. The 1,331,000 cubic yards of sediment on the ebb bar would provide an effective volume of 861,700 cubic yards of sandy bar material and 469,300 cubic yards of fines. The fines should be sorted by wave action and carried away from the bar; the Service anticipates that about half the fines would be lost immediately and the rest would be lost due to sediment sorting and selective transport.

Modeling for the ebb tidal bar has found that the Phase 1 ebb bar equilibrium volume is 623,000 cubic yards of sand. This is larger than the 861,700 cubic yard effective sand volume that will remain from the initial placement of 1,331,000 cubic yards of sediment. The Service has assumed that the excess bar material will function as nearshore nourishment and be beneficial to downcoast beaches. However, the Service has not provided information on the effects from this overfilling. Since the ebb bar will modify wave patterns and nearshore wave energy, the overfill

bar could result in a temporary increase in the area of beach influenced by the bar. The overfill could too add to the available nourishment volume and be beneficial to downcoast beaches. The impacts and benefits from this overfill are not fully known since the Service has, at the time of this writing, not been able to provide a complete quantitative analysis of these effects.

The general concept of pre-filling the ebb bar appears valid and should be quite beneficial in preventing some of the clear adverse impacts that could occur if the inlet were constructed and the ebb bar were allowed to form naturally. However, there are not many examples of new tidal inlets where the ebb bar was pre-filled. Commission staff has requested the Service to provide examples of other inlets where this has been done, but at the time of this writing, the Service has not been able to provide any such examples. This lack of prior experience does not negate the clear benefits that should occur from pre-filling, but rather that the ebb bar will need to be carefully surveyed and monitored to determine whether it is performing within the limits anticipated by the modeling. This monitoring can provide feedback on the utility of pre-filling the ebb bar and useful information to insure that the Phase 2 pre-filling is performed as well (or better) than the Phase 1 effort. At present, the Service has not provided information on experience with pre-filling other ebb bars or a plan for sufficient surveying or monitoring of the pre-filled ebb bar.

(d) Huntington Bluffs. The proposed inlet location is closer to the Huntington Bluffs than the other two alternatives. The cliffs are 3,000 feet to 7,000 south of the proposed inlet. In 1994, Moffatt & Nichol Engineers modeled the impacts of the proposed inlet to erosion at Huntington Cliffs. The analysis estimated that a beach width of 200 feet would be adequate to protect the back shore from erosion, but the beach at Huntington Cliffs is below this identified threshold. The analysis noted that Huntington Cliffs would be expected to erode approximately 60 feet in ten years without the project, and 65 feet in ten years with the project. The proposed project may increase erosion at Huntington Cliffs by up to 5 additional feet in 10 years (an 8% increase over background conditions).

Beach nourishment is the only erosion mitigation measure that the Service is proposing. Huntington Cliffs could be adversely impacted from both interruptions in local sediment supplies and modifications to local wave energy. The information from the Service indicates that beach nourishment will only occur when the tidal inlet needs to be dredged. If the tidal inlet is the component that determines when nourishment will occur, nourishment may not be undertaken frequently enough or in large enough volumes to completely mitigate for adverse impacts to Huntington Cliffs. Huntington Cliffs is the only location in the project area where excessive beach erosion could result in irreversible adverse impacts. In the rest of the project area, beach erosion would cause a loss of beach, but this could be corrected with sufficient nourishment. Bluffs cannot be restored with beach nourishment. The Service has not provided adequate information on erosion mitigation to provide assurance that nourishment will address the potential impacts to Huntington Cliffs. Due to the lack of information on efforts that could be taken to reduce the project-related impacts to Huntington Cliffs and the possible lack of monitoring information for the area of the cliffs, it is not possible to fully analyze the impacts of the proposed inlet to this area at this time.

(e) Monitoring and Mitigation for Beach Erosion. The Service has proposed to measure profiles at three locations north of the inlet and three locations south of the inlet. The locations that will be monitored are, from north to south: Warner Avenue, a site just north of the inlet, a site just south of the inlet, Huntington Pier, and two other locations that will be determined during the final design. The profiles would be measured spring and fall and would extend from a stable back beach location to –40 feet MLLW. In addition, the Corps of Engineers will collect monthly beach width data along the entire project area shoreline. The monitoring would be used to determine whether any beaches have eroded more than the range of seasonal fluctuation and if so, the inlet would be dredged and an appropriate quantity of sand would be placed on the eroding beach. The monitoring would not necessarily identify any changes to the backshore at locations such as Huntington Cliffs, although during final design the Service may decide to establish a profile location at Huntington Cliffs. Finally, the monitoring will not provide information on the performance of the pre-filled ebb bar. Some of the profiles could cross through the ebb bar; however, the Service has not proposed any monitoring that specifically addresses the bar. "As shoreline stability is the objective of the beach nourishment program, the project proposes to use coastline response as the data set for decision-making, not fluctuations in the ebb bar." (Responses to Coastal Commission Questions, Bolsa Chica Wetlands Restoration Project, provided July 24, 2001.)

Staff however, notes that since the bar will be again filled during Phase 2, monitoring of the bar following the pre-fill in Phase 1 could provide valuable information that would enhance the design and performance of the second ebb bar pre-fill. The Service has been asked to provide details on the monitoring program and to consider additions to the monitoring that would ensure it can provide useful project information. In response to this request, the Service has noted that the proposed monitoring should be sufficient to monitor project-induced effects and the efficiency of the beach nourishment program. Without further information on the final design of the monitoring program and the nourishment program, it is not possible at this time to analyze the effectiveness of these programs for identifying and either avoiding or minimizing all project-induced beach and bluff effects.

(f) Routine Nourishment. The Service has proposed to place material dredged from the flood shoal onto identified areas of eroding beach. The timing and method of this regular nourishment has not been identified, nor has the Service provided criteria for placement (other than by stating that those beaches that have narrowed more than their seasonal fluctuation would be addressed). The nourishment must be responsive to local conditions and to beach conditions at the time of the placement. However, nourishment can have local impacts to access and habitat (e.g., grunions). The Service has not provided sufficient information on this effort, and due to this lack of information, it is not possible at this time to analyze the impacts from this nourishment or to determine whether it will be performed in the least environmentally damaging manner.

(g) Sea Level Rise. The Commission staff examined the sea level change estimates used by the Service in their design of the wetland restoration project. The Service anticipated a rise of 0.9 feet in 100 years. This figure is somewhat lower than some environmental groups recommend, but is nevertheless a reasonable figure and within the accepted range of possible sea level rise scenarios.

(h) Conclusion. Many aspects of this project are being proposed to minimize or avoid impacts to adjacent beaches. However, at this time, additional information is needed before the Commission can determine the project's potential impacts on shoreline processes.

**C. PUBLIC ACCESS AND RECREATION.** The Coastal Act provides:

**Section 30210**

*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:*

*(1) It is inconsistent with public safety, military security needs, or the protection of fragile coastal resources,*

*(2) Adequate access exists nearby, or,*

*(3) Agriculture would be adversely affected. Dedicated accessway shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the accessway. . . .*

**Section 30213**

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

**Section 30214**

*(a) The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:*

*(1) Topographic and geologic site characteristics.*

*(2) The capacity of the site to sustain use and at what level of intensity.*

*(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses.*

*(4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter. . . .*

**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.*

**Section 30221**

*Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.*

**Section 30007.5**

*The Legislature further finds and recognizes that conflicts may occur between one or more policies of the division. The Legislature therefore declares that in carrying out the provisions of this division such conflicts be resolved in a manner which on balance is the most protective of significant coastal resources. In this context, the Legislature declares that broader policies which, for example, serve to concentrate development in close proximity to urban and employment centers may be more protective, overall, than specific wildlife habitat and other similar resource policies.*

The Final EIR/EIS states that:

*Bolsa Chica State Beach extends approximately six miles from Warner Avenue at the north end of the project area southward to the Huntington Beach Municipal Pier. . . . Recreational facilities are located along a three-mile northern segment of the beach and include 2,200 parking spaces, 100 camping spaces, five concession plazas, 550 fire rings/barbecue pits, 14 restrooms, 28 cold-water showers, and a handicapped access ramp across the sand. Parking along PCH was prohibited in 1981, and uncontrolled access to the beach was also precluded by fencing that runs the length of the state parking lot.*

*Approximately 3 to 4 million people currently visit Bolsa Chica State Beach annually. Based on daily parking and annual parking pass users, peak daily usage is approximately 65,000 people over the 2-mile stretch of Bolsa Chica State beach (Personal communication, D. Ito, 2000).*

The consistency determination examines the expected impacts on access and recreation in the Lowlands and on Bolsa Chica State Beach as a result of the proposed project:

*Beach areas about 800 feet north and south of the proposed tidal inlet* [and the 400-foot-wide inlet corridor] *would be closed to public access during construction of the PCH bridge and tidal inlet. This closure could result in long-term, temporary, significant, adverse (Class II) land use and (Class I) recreation impacts affecting use of the beach during summer holidays and weekends. Other adjacent land uses would not be significantly affected by project construction activities (Class III). During all phases of construction, public safety would be protected by use of barriers, signs, flagmen, and fences where applicable; therefore, no significant, adverse (Class III) impacts would occur.* [In addition, the Service confirmed that the existing bicycle-pedestrian trail along Bolsa Chica State Beach will be maintained for public use throughout the three-year construction period via the PCH detour, and this trail will provide public access to that portion of the State Beach south of the inlet construction zone.]

*Inlet construction would result in a temporary loss of surfing use at Lots 14 and 15, and would constrain the already heavily used Lots 23 and 24, resulting in a temporary, significant, adverse (Class I) impact during all four seasons.*

*Construction of the proposed tidal inlet would result in the permanent loss of beach as a result of land to water conversion. This impact would be adverse but insignificant (Class III). The continuity of the beach would be broken and would affect beach users traversing the length of the beach. Access across the inlet would be provided on the PCH bridge via a pedestrian access crossing, reducing the impact of breaking beach continuity to adverse but insignificant (Class III). The surfing experience would change as a result of construction of the tidal inlet. This difference would be perceived in different ways and would result in adverse but insignificant (Class III) impacts because some surfers would view the change as beneficial and some would not.*

. . .

*The existing loop trail and Ecological Reserve parking lots will remain. The existing trespass along the flood channel levees would continue, although measures to reduce damaging incursions into the lowland from this area will likely be implemented. The existing bicycle-pedestrian trail along the beach will be maintained by rerouting the trail across the inlet on a portion of the new bridge, separate from the PCH traffic lanes. This separate section of the bridge will also provide beach safety vehicle access across the inlet. Caltrans approved detours would maintain PCH traffic flow throughout construction. The existing exit from the beach park to PCH would be reconstructed. Temporary reduction in the number of parking slots on the State Beach due to inlet construction safety requirements will be insignificant, except on peak use days. (At this time, due to State Park's reconstruction of all the restrooms at Bolsa Chica State Beach, all restroom facilities have been replaced with portable toilets and about 1,300 parking slots are unavailable through the peak beach use months.) No beach facilities would be permanently reduced as a result of the Proposed Project.*

*Environmental interpretation and education and related public access and facilities will be*

*an integral part of later planning for the Project* [**Exhibit 15**]. *The expected focus will be on suitability and location for trails and kiosks and seasonal protection of high bird use areas. The actual planning for interior trails and seasonal public access will be conducted by the long-term land manager after construction is complete, in consideration of sensitive wildlife uses and safe operation of continuing oil field operations. Potential connection to existing or proposed trail systems outside the Lowland must await consideration of those properties adjacent to the lowland. Improved public access connections to the State Beach may be considered at a future date, as well.*

*The lowland Project area is not suitable for intensive recreational uses. The goal of the Project is to restore a currently degraded wetland ecosystem to a productive, biologically diverse ecosystem. As such, intensive recreational uses inside the wetland area would be in conflict with the goals of habitat restoration and wildlife conservation. After wetland restoration is complete, trails and interpretive kiosks will be considered as a means of meeting the proponent's environmental interpretation and fish and wildlife education missions, as well as, the public access and recreational policies of the California Coastal Act. Also, continued safe operation of a portion of the existing oil field is expected to preempt most public access in the south end of the lowland for many years.*

*Waterborne recreation will be considered only where consistent with the primary purposes of fish and wildlife resource conservation. The inlet channel and jetties are not intended to be navigable, but will be designed and implemented to retain and protect the existing recreational uses of the State Beach Park to the maximum extent possible. The inlet is expected to attract recreational fishing interest. The ebb shoal may create a more appealing surf break than currently exists, drawing more surfers to this section of beach than occurs now. Public access and State Beach safety and maintenance vehicle access would be retained across the inlet channel, separate from the Pacific Coast Highway bridges.*

*The construction of the inlet unavoidably requires the replacement of beach strand with an ocean connection. Just as the many acres of asphalt parking lot covering beach sand enables public access to the remaining sand, there must be an inlet across the beach to obtain the sought after biological improvements in the restored wetland. About 4 acres of ocean beach, lightly used by sunbathers except on peak use days would no longer be suitable for sunbathing purposes. This reduced recreational use would likely be offset as indicated above by other coastal recreational uses.*

The proposed project will generate significant, adverse effects on public access and recreation, including surfing, at Bolsa Chica State Beach due primarily to the construction of the ocean inlet and the resultant loss of approximately five acres of sandy beach (**Exhibit 16**). While the project includes construction and post-construction mitigation measures (a pedestrian and bicycle bridge across the inlet) to minimize the disruption of lateral access along the shoreline due to the inlet, the loss of five acres of sandy beach to the approximately 400-foot-wide ocean inlet cannot be adequately mitigated. This element of the project is inconsistent with the aforementioned public access and recreation policies of the Coastal Act.

However, as noted elsewhere in this report, the construction of an ocean inlet is essential in order to restore full tidal function to the Bolsa Chica Lowlands. Restoration of the Lowlands with the ocean inlet will generate 366 acres of full tidal habitat and 200 acres of muted tidal habitat, protect 120 acres of existing seasonal pond habitat, and provide for a future full tidal habitat of 252 acres. The range of wetland habitats proposed for the Lowlands will also serve as mitigation for landfill construction in the Ports of Los Angeles and Long Beach, as provided for in the Interagency Agreement that led to the funding by the Ports of the purchase and restoration of the Lowlands. Commission concurrence with CD-115-96 (USFWS) for the Concept Plan for wetland restoration at Bolsa Chica and certification of port master plan amendments for landfill mitigation credits rested in part on the construction of the proposed ocean inlet to create full and muted tidal habitat in the Lowlands. Mitigation credits for landfill construction were released to the Ports in early 1997 after purchase and restoration funds were transferred to the State Lands Commission, and hundreds of acres of landfills have been or are presently under construction in both ports. Without construction of full and muted tidal wetlands in the Bolsa Chica Lowlands via an ocean inlet, the existing significant adverse effects on marine habitat and resources from port landfill construction would go unmitigated. Allowing this situation to occur would be inconsistent with the landfill and marine habitat mitigation policies of Section 30233(a) of the Coastal Act.

The Commission is then left with weighing these two Coastal Act inconsistencies – the absence of mitigation for the loss of four acres of sandy beach to the proposed ocean inlet and the loss of mitigation for 534 acres of marine habitat being filled in outer harbor waters within the ports. The project creates a conflict between the access and recreation policies of Chapter 3 of the Coastal Act on the one hand and the marine resource policies on the other. The wetland restoration and marine habitat benefits that would arise from the Bolsa Chica wetlands restoration project are hugely significant both on a regional and national scale. However, the access and recreation impacts, while significant and adverse, are nevertheless not as significant. The loss of five acres of sandy beach due to the 400-foot-wide inlet connecting the Lowlands and the Pacific Ocean must be evaluated in part within the context of the nine miles of public beach that stretch from Orange County's Sunset Beach (adjacent to the north end of Bolsa Chica State Beach) south through Huntington City and State Beaches and to the Santa Ana River jetties. Given the information contained in the consistency determination and the Final EIR/EIS, the proposed project would on balance be the most protective of coastal resources. The Commission should utilize the balancing provisions of Section 30007.5 of the Coastal Act in reviewing the proposed project due to the significant natural resource benefits that will arise from construction of an ocean inlet across Bolsa Chica State Beach.

**D. WATER QUALITY.** The Coastal Act provides:

**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 ground water 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.*

Huntington Beach, to the south of the project site, has in recent years experienced persistent shoreline water quality problems due to several potential sources of contamination. Concerns have been raised over the potential for similar adverse water quality impacts along the Bolsa Chica shoreline as a result of proposed project construction activities, oilfield contamination clean-up, and the operation of restored tidal wetlands in the Bolsa Chica Lowlands, in particular the potential relation between wetland functions and bacterial contamination of nearshore coastal waters. This preliminary staff report examines this new issue and more routine water quality matters in the context of the proposed project.

1. Current Water Quality Conditions in the Lowlands and Immediate Offshore Waters. The Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project states:

*The Bolsa Chica Lowlands and wetlands are part of a semi-enclosed coastal body of water. Ocean Waters enter the system through Anaheim Bay, pass through Huntington Harbour, and enter Outer Bolsa Bay through a narrow channel under the Warner Avenue Bridge. Outer Bolsa Bay is the only area within the wetlands that has full tidal conditions. Tidal waters flow between Outer and Inner Bolsa Bay through tide gates that partially restrict tidal exchange. The tidal range of Inner Bolsa Bay is muted to about 22 percent of that of Outer Bolsa Bay. Water quality within Bolsa Bay is dependent on the quality of the water entering through Huntington Harbour.*

*Over the past century, the lowlands have been altered extensively by the construction of dikes, channels, tide gates, and roads; oil development; and agricultural and urban development in the surrounding area. The Lowlands consist of a series of diked, nontidal ponds landward of Bolsa Bay. Some of these ponds are connected by culverts and some are isolated. The amount of surface water in the Lowlands varies seasonally and with the amount of rainfall in a given year. In some areas, ponding of fresh water on saline soils has resulted in the creation of brackish water environments. The non-tidal areas are separated from Bolsa Bay by a dike built in 1978. Bolsa Bay and the Lowlands are an expansive complex of tidally influenced saltwater areas and perennial and seasonal brackish and freshwater areas.*

*Stormwater and urban runoff represent other input sources of waters into Bolsa Chica. The EGGW Flood Control Channel discharges stormwater runoff from the watershed into Outer Bolsa Bay through one-way flap gates. Urban runoff enters the Bolsa Chica*

> *Lowlands from the Springdale Pump Station, which drains dry and wet weather runoff to Lake Signal and the Freemen Creek drainage. Additional urban runoff enters the Lowlands from Huntington Beach Mesa, particularly from the Seacliff culvert that drains water from a housing development and golf course onto the southern boundary of the site. Non-point source runoff from the Pacific Coast Highway (PCH) also may enter the site from along the western boundary. [EIR Vol. 1, 3.4.1, pages 3-38 and 3-39]*

To protect beach-goers from exposure to waterborne disease, a new state law (AB 411) mandates the implementation of recreational water quality monitoring programs at public beaches with 50,000 or more annual visitors. Specifically, the law requires monitoring for total coliform (TC), fecal coliform (FC), and the enterococcus (ENT) groups of bacteria, all of which may indicate the presence of fecal contamination. The state also enforces a set of uniform standards for TC, FC, and ENT bacteria including single-sample standards (10,000, 400, and 104 most probable number (MPN) or colony forming units (CFU)/100 mL), and 30 day geometric mean standards (1000, 200, and 35 MPN or CFU/100 mL); a lower single-sample standard for TC of 1,000 MPN or CFU/100 mL also applies when the TC/FC ratio falls below 10. The enterococci standard conforms closely to the national guidelines for marine water quality criteria published by the U.S. Environmental Protection Agency. If indicator bacteria levels in the ocean exceed any of the above standards, the local health officer is required to either post signs that warn against swimming in the water, or close the ocean to the public if a sewage spill is suspected. The state standards and U.S. Environmental Protection Agency guidelines are based on a series of epidemiological studies that link gastrointestinal illness and exposure to ocean water containing high levels of indicator bacteria, particularly ENT. The origin of ENT in these epidemiological studies was presumed to be anthropogenic sources of fecal pollution, such as sewage, agricultural runoff and urban runoff. (Above information from: Generation of Enterococci Bacteria in a Coastal Saltwater Marsh and Its Impact on Surf Zone Water Quality, S. Grant, et al., March 2001)

Daily to weekly monitoring for bacteria in the surf zone in the vicinity of Bolsa Chica is conducted by the County Sanitation Districts of Orange County, and reported to the County's public health department. On average, coliform densities at this location are within California Ocean Plan water contact standards during dry weather months; however, the standards are often exceeded after rains.

Regarding EGGW Flood Control Channel and offsite water flows into the Lowlands, the Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project states:

> *The watershed surrounding the Bolsa Chica wetlands is occupied by a number of concrete flood control channels, primarily the EGGW/Oceanview Flood Control Channel system. This system collects and conveys runoff from a watershed of approximately 27 square miles northeast of Bolsa Chica that includes the cities of Huntington Beach, Fountain Valley, Westminster, Garden Grove, Santa Ana, Orange, and Anaheim. The watershed of the EGGW Flood Control channel is approximately 85 percent urbanized, and the remaining vacant and agricultural land is expected to be fully developed in the next 50 years. [EIR Vol. 1, 3.3.2.1, page 3-37]*

*The EGGW Flood Control Channel receives flow from two upstream channels that originate in Garden Grove and Fountain Valley. In the project area, the main channel is unlined and runs through the northwest portion of the Lowlands. The channel terminates with one-way flap gates at the south end of Outer Bolsa Bay. From Outer Bolsa Bay, runoff is conveyed through Huntington Harbour, Anaheim Bay, and ultimately, to the Pacific Ocean. Except during and immediately following rainfall, flow in the EGGW Flood Control Channel is negligible. The EGGW Flood Control Channel is currently being upgraded to convey the 100-year storm. The improvements will occur over an extended period of time. [EIR Vol. 1, 3.3.2.1, page 3-37]*

*As discussed above, there is some limited uncontrolled flow into the Bolsa Chica Lowlands from Huntington Mesa. The remaining runoff from the Mesa is generally routed to the EGGW Flood Control Channel via the Slater Storm Channel and Slater Pump Station. [EIR Vol. 1, 3.3.2.1, page 3-37]*

*Immediately east of the Site, runoff from a 184-acre residential area, generally bounded by Whittford Lane, Halcroft Lane, and Central Park Drive is discharged into Freeman Creek through the Springdale (i.e., Bolsa Chica) pump station. [EIR Vol. 1, 3.3.2.2, page 3-38]*

2. Water Quality Benefits and Improvements from the Proposed Project. The Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project states:

*The Project will result in the restoration and protection of environmentally sensitive habitat areas. The Project will provide for the retention and enhancement of existing fish and wildlife resources by reestablishing areas of full tidal influence in the wetland ecosystem. The new full tidal basin would occupy approximately 366.5 acres in the central Lowlands. Approximately 200 acres of additional Lowlands would be connected to the full tidal basin by culverts to establish a muted tidal area. Approximately 120 acres in the southeast area of the Lowlands would remain as seasonal ponds.*

*Water quality in the newly constructed full tidal basin is expected to be excellent. Full tidal flow would provide saline waters with nutrients and dissolved oxygen. Adequate tidal exchange would ensure water quality within the range of seawater. Residence time would be less than 1.5 days. Water temperature may increase due to the shallower depths of the wetlands compared to coastal waters; however, these increases would be slight due to the constant renewal by tidal flushing. Waters in the muted tidal basin would have less tidal flushing. Therefore, the range of water quality values in the muted tidal basin would be more extreme than that in the full tidal basin. [EIR Vol. 1, 4.4.2.1, page 4-40]*

Water quality would be affected by several components of construction, including dredging to create the new basin, deposition of the resulting material in to the nearshore zone of the ocean, construction of an ocean inlet to the basin, and deposition of material from the inlet construction

onto the beach. Most of these impacts are related to temporary increases in turbidity resulting from these construction activities.

The Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project states:

> *Resuspension and subsequent settling of fine particles in the dredged materials result in turbidity. Factors affecting the settling of suspended material include physical characteristics of the sediment (grain size, organic content, mineralogy) and chemical characteristics of the water (temperature, salinity, pH, and turbulence). Silts/clays remain in suspension longer than sands, high turbulence contributes to increased sediment resuspension, and high current speeds will transport turbidity plumes greater distances than low current speeds. [EIR Vol. 1, 4.4.2.1, page 4-37]*
>
> *Following dredging, the new tidal basin would be opened to the ocean via the new inlet. Turbidity within the new tidal basin, inlet and nearby coastal waters may be above background for a short time until fine sediment is flushed out. (Sediments with contaminant concentrations above screening levels would have already been removed, so resuspension of contaminants is unlikely). [EIR Vol. 1, 4.4.2.1, page 4-39]*
>
> *Increases in turbidity are expected in nearshore waters during prefilling of the ebb bar, and possibly during the construction of the inlet and placement of excavated material (from the inlet construction) on the beach. Turbidity plumes resulting from prefilling of the ebb bar would spread upcoast and downcoast via offshore currents. The distance and extent of the plumes would be determined by the actual grain size dredged, amount of silt/clays, production rate, and oceanographic conditions. For the most part, turbidity plumes would extend parallel to the shoreline given the predominant longshore current flows. However, this condition clears rapidly once the dredge discharge ceases. This activity would occur primarily during the fall and winter months, when turbid conditions commonly occur during rainfall events when river runoff spreads turbid water along the coast. [EIR Vol. 1, 4.4.2.1, page 4-37]*
>
> *Turbidity related to inlet construction and placement of excavated material on the beach is expected to be minimal and highly localized due to the low volume of material and the nature of the material itself (beach materials previously subjected to natural mixing and resuspension).*

3. Water Quality and Dredged Material Disposal. Approximately 1.33 million cu.yds. of material excavated and dredged from the Lowlands to create the tidal basin and ocean inlet will be disposed in the nearshore zone off Bolsa Chica State Beach, another 190,000 cu.yds. will be placed directly on the State Beach south of the ocean inlet, and approximately 822,000 cu.yds. would be placed within the Lowlands to construct levees and nesting islands. The potential impacts from disposal of this material on marine water quality include increased turbidity, placement of fines, reductions in dissolved oxygen, and potential resuspension of any chemical contaminants present in the dredged materials. These localized water column impacts will in turn affect fish and marine birds in the project area.

The Service has provided information on the volume of material available for different levels of fine material content. Of the 1,331,000 cubic yards of available sediment, 243,600 cubic yards has 30 to 40% fines, by volume. It appears, from the provided information, that the ebb bar could be pre-filled completely without using the material that has between 30 and 40% fines. The downcoast nourishment benefits may outweigh the impacts from placing a high volume of fine material in the nearshore environment. As of this writing, the Service has not provided information that allows a comparison of the different possible ebb bar designs or to determine the impacts from pre-filling the ebb tidal shoal as proposed by the Service.

While some information is provided on Phase 2, further shoreline analysis would be needed for this portion of the project once the Service can assure the time schedule for Phase 2 set-up and completion. Significant changes could occur to the shoreline from sea level rise, changes to the nourishment program at Surfside/Sunset, or other shoreline development not now anticipated. The monitoring for Phase 1 will provide information on shoreline conditions that will facilitate the development and analysis of options for Phase 2. The shoreline impacts for Phase 2 should be reanalyzed, and in more detail during any subsequent analysis of Phase 2.

The Service has provided information in the Draft and Final EIR that the main impact from placing a high volume of fines into the nearshore environment will be aesthetics. The sediment plume will definitely be visible while the ebb bar is being pre-filled, and for some undetermined period after construction is completed. The Service notes that the impacts from this project will be similar to the impacts from the beach nourishment projects that are undertaken regularly at Surfside/Sunset. However, the material used for nourishment at Surfside and Sunset usually has a fines content of 15% or less, where this project will have a much higher percentage of fines. Also, Surfside and Sunset are constructed as beach nourishment projects with controlling weirs and silt curtains to limit the concentration of fines in the runoff. The Service has not proposed any equivalent control features for the proposed project, and there are few possible turbidity controls for nearshore operations. At the same time, unlike Sunset/Surfside, the construction will occur during the winter months when there are often high background levels of fine sediments from coastal streams and rivers. The turbidity impacts from this project may be comparable to natural background levels.

The chemical analysis of the material to be used for the ebb bar show some samples that have slightly elevated concentrations of metals and other contaminants. The U.S. Environmental Protection Agency has noted that the Service has not performed sufficient sampling of the sediments within the restoration area and that toxicity and bio-accumulation testing should be performed to properly characterize project sediments. These sediments will be used to construct the restoration areas and the ebb tidal bar. The contaminant levels may be acceptable; however, the applicant has not finished the sampling and bioaccumulation testing that would be needed to determine the bioavailability of the sediments. The information is needed to analyze project impacts.

4. Water Quality and Bird Excrement. The Final Consistency Determination for the Bolsa Chica Lowlands Restoration Project states:

*Due to the advent of AB 411 monitoring of surf zone bacteria and public warning thresholds in 1999, and the resultant series of beach warning postings and occasional closures in Huntington Beach centered around the Santa Ana River mouth and the sanitation district outfall discharges, water quality influences upon beach recreational uses have attracted much attention. It has been suggested by some that the creation of a new tidal inlet at Bolsa Chica would result in extensive beach closures such as those that have occurred in Huntington Beach. Large-scale and expensive studies have been undertaken by others to learn more about the situation in south Huntington Beach, such as, off-shore sampling to track sewer outfall discharges and thermal upwelling at the AES power plant cooling water discharge, and 24-hour bacterial sampling in the Santa Ana River and Newport Slough . To date, we have found no data or science based information that supports the view that tidal wetlands will cause chronic, wide-spread, or significant beach postings or closures. [The Final Consistency Determination for the Bolsa Chica Lowlands Restoration Project, 4.3, pages 34 through 37]*

See **Appendix C**: "Generation of Enterococci Bacteria in a Coastal Saltwater Marsh and its Impact on Surf Zone Water Quality" by S.B. Grant, et al.

Substantial comments were submitted to the Service during the EIS/EIR comment period related to the potential bacterial contamination of nearshore waters. The Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project analyzed and responded to these comments as follows:

*Many commenters expressed a concern that even though the Proposed Project would not route the water from the EGGW Flood Control Channel through the new full tidal basin, bacteria generated by birds and other wildlife in the resultant wetlands might cause an exceedance of bacteria standards in the ocean. Several commenters suggested that the creation of a new tidal inlet at Bolsa Chica would result in extensive beach closures such as those that have occurred in Huntington Beach. The discharge from the Talbert Marsh was initially suspected as the cause for the Huntington Beach closures.*

*The results of the Huntington Beach water quality investigation became available in November 2000 and were reviewed by the preparers of this EIR/EIS. The Huntington Beach studies showed that the levels of bacteria generated within the marsh contributed to the bacteria problem, but were not sufficient, in and of themselves, to account for the problem itself. Specifically, the studies showed that bacteria generated by birds in Talbert Marsh could cause bacteria concentrations in the surf line near the marsh to briefly exceed criteria on outgoing nighttime or early morning tides. The study further concluded that fecal material deposited by western gulls is a significant source of indicator bacteria in the water flowing out of the Talbert Marsh and that indicator bacteria growing on vegetation in the marsh and in marsh sediments may also contribute to the nearshore loading of these microorganisms. The study additionally concluded that the levels of bacteria recorded along the beach were higher than could possibly have been generated by Talbert Marsh alone and that there has to be another source. Finally, the Talbert Marsh investigation included a study using a nearshore transport model*

*showing bacteria transport from Talbert Marsh along the shore. The modeling indicated that it is physically impossible for the levels of contamination measured at the beach to be caused by Talbert Marsh and the lower Santa Ana River/Newport Slough system combined. This result supports the hypothesis that another source must be involved.*

*These data suggest that bacteria within the wetlands at Talbert Marsh may cause bacteria standards to be exceeded in the ocean. However, the Talbert Marsh, with its large area of mud flat and small volume of open water, has a different configuration than many other coastal wetlands and the large full tidal basin that would be created at Bolsa Chica by the Proposed Project. In addition, Talbert Marsh supports an unusually high number of western gulls and to a lesser degree, elegant terns. The peak number of birds counted in Talbert Marsh during the Huntington Beach study ranged from 200 to 1,000 individuals, i.e. 8 to 40 birds per acre. It is expected that Bolsa Chica would not attract a high density of gulls such as does Talbert Marsh. Specifically, gulls are attracted to garbage and several garbage sources are found near Talbert Marsh, which is closer to developments than the Bolsa Lowlands. Gulls exploit these sources and then rest on the large amount of intertidal mudflat at Talbert Marsh.*

*A year's worth of detailed bird counts was done at Bolsa Chica (Guthrie et al. 1993). This study counted birds at Bolsa Chica every two weeks for a year in 1992 and 1993. The density of gulls and terns counted in this study in Inner and Outer Bolsa Bay would be expected to be representative of potential gull and tern density in the Bolsa Chica Lowlands when tidal flow is restored. Except for May, June and July, 1992, when the total number of gulls and terns in Bolsa Bay was as high as 865 because of a large number of terns nesting on islands in Inner Bolsa Bay, the total number of gulls and terns was always less than 250 and was as low as 10 in August of 1992.*

*Thus, the highest density of gulls and terns in the 175 acres of tidal wetlands in the Bolsa Chica Ecological Reserve was less than 5 gulls or terns per acre. Western gull numbers in all of Bolsa Chica never exceeded 11. The most abundant gull at Bolsa Chica was the smaller California gull. Numbers of gulls and terns in Bolsa Bay in excess of 100 was always recorded in Inner Bolsa Bay and was a result of nesting terns on the two tern islands. The highest density of gulls and terns in Outer Bolsa Bay, where there are intertidal mudflats where gulls could rest as they do at Talbert Marsh, was 15. The amount of feces and associated bacteria is directly proportional to the body weight of a bird. Thus, the fact that the birds that would be expected to occur in highest numbers at Bolsa Chica (terns, smaller gulls, ducks, shorebirds) are all smaller than and in less concentrations than the western gulls that occur in such high numbers at Talbert Marsh indicates that even less of a bacteria problem from wildlife would be expected at the Proposed Project.*

*Although close in proximity to Bolsa Chica, Talbert Marsh is not an appropriate comparison to the Proposed Project due to the variety of physical differences between the wetlands. Talbert Marsh is much smaller in size than Bolsa Chica, with one-fifth (20%) of the tidal prism and is, therefore, unable to dilute contaminants. The dilution that will*

*occur in Bolsa Chica is many times (approximately 5 times) greater than that occurring at Talbert Marsh. Potential contamination in tidal flows will be low enough when it reaches the ocean that beach closures should not occur.*

*Also, Talbert Marsh was designed with a proportionally large mudflat area that is exposed at low tide and inundated at high tide. Only a very small channel area is inundated at low tide. Birds feed, loaf and excrete on the exposed mudflat at low tides. Excretions are subsequently mobilized and contributed to the small tidal basin at rising tides and transported throughout the marsh. They are then carried out to the surf zone during a dropping tide and contributed to the ocean. In comparison, Bolsa has a relatively small mudflat area in proportion to the total wetland area. Therefore, lower concentrations of excretions are expected at Bolsa Chica.*

*There is no evidence that shows that bacteria from birds pose a threat to human health. However, without focused epidemiological studies, the potential for human health effects cannot be entirely discounted.*

*Talbert Marsh receives urban runoff directly from a large urbanized portion of Huntington Beach and Fountain Valley. Urban runoff contains bacteria that are contributed to pump stations upstream of Talbert Marsh each day. Bacteria breed in conditions present at pump stations, further increasing bacteria levels contributed to Talbert Marsh. In contrast, the Proposed Project does not include a connection to the EGGW flood control channel. Therefore, the contamination that is contributed to Talbert Marsh from outside of the system will not occur in the Proposed Project.*

To determine for the FEIR/EIS whether the bacteria problems associated with Talbert Marsh were typical of coastal wetlands, 1999 beach posting data were obtained from the Natural Resources Defense Council, and summarized as follows:

*The greatest amount of postings near wetlands were on beaches near Carpinteria Marsh and Goleta Slough in Santa Barbara County. The higher number of postings near these wetlands, compared to wetlands in the southern counties, is consistent with the overall higher number of postings and greater number of days posted in Santa Barbara County. The four postings at Carpinteria City Beach adjacent to Carpinteria Marsh were either associated with rainfall events or attributed to urban runoff. Similarly, the Goleta Beach postings were either associated with rain or urban runoff.*

*San Elijo Lagoon in San Diego County is frequently closed to the ocean. When the mouth is closed, pollutants build up inside the lagoon. Most of the 1999 beach postings at Cardiff State Beach occurred when the sandbar at the mouth of the lagoon was breached and accumulated pollutants were released to the ocean. Some beaches adjacent to wetlands, such as Carlsbad State Beach, adjacent to Agua Hedionda had no postings in 1999.*

*These data show that beaches near tidal wetlands do not have chronic beach postings. Postings on beaches near tidal wetlands are similar or lower than beaches that are not near tidal wetlands. Overall, beaches near tidal wetlands had an average of about 2 postings for 12 days in 1999 while beaches not near wetlands had an average of about 3 postings for 32 days.*

(Details of this analysis can be found in the Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project, Volume V – Responses to Comments and Comment Letters and Mitigation Monitoring Plan, Section 2.2.3, Pages 2-3 through 2-9.)

The Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project further states:

*Finally, bacteria data within wetlands were examined to determine if bacteria generated by organisms within the wetlands caused bacterial standards to be exceeded within the wetlands. Table 2-3 shows monthly bacteria data collected by the County of Orange Environmental Health Division in Bolsa Bay and the EGGW Channel between August 1997 and May 2000. These data show that, except in rain events when large amounts of pollutants are introduced to Bolsa Bay from the EGGW Channel, the bacteria standard for a single sample was exceeded on only one occasion in Inner Bolsa Bay near the pedestrian bridge when the fecal coliform standard was exceeded. In Huntington Harbour at Warner Ave. where flows from Bolsa Bay exit the wetlands, there also was only one dry weather exceedance of bacteria standards, again for fecal coliform. Thus, in spite of the large number of birds that use Bolsa Bay, bacteria concentrations in the water are usually low. These data suggest that the Talbert Marsh situation may be unusual and that wetlands would not necessarily be expected to generate high enough levels of bacteria to result in beach postings. Data on bacteria levels measured by the County of Orange Environmental Health Division at Northstar Beach at the lower end of Upper Newport Bay were also examined. Upper Newport Bay receives runoff from storm drains and San Diego Creek and also contains marinas which may contribute bacteria. However, weekly bacteria measurements between January 1999 and November 2000 indicated only one dry weather exceedance of single sample bacteria standards at Northstar Beach. Large numbers of birds use Upper Newport Bay. Again the data suggest that exceedance of bacteria standards in tidal wetlands is not typical.*

*In summary, existing information does not support a conclusion that the Proposed Project will cause or significantly contribute to high bacteria counts that necessitate additional beach closures.*

(Details of this analysis can be found in the Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project, Volume V – Responses to Comments and Comment Letters and Mitigation Monitoring Plan, Section 2.2.3, Potential Exceedance of Bacterial Standards in the Ocean from Bacteria Generated by Birds and Wildlife in the Wetlands, Pages 2-3 through 2-9.)

Subsequent to the release of the Final EIR/EIS, numerical modeling of potential water quality impacts from bird use of Bolsa Chica wetland was recently performed by Moffatt and Nichol

Engineering (Letter to State Coastal Conservancy, from Michael J. McCarthy, P.E., Moffatt and Nichol Engineers, July 18, 2001)(**Appendix D**: "Final Letter Report, Numerical Modeling of Potential Water Quality Impacts from Bird Use of the Bolsa Chica Wetland", Moffatt & Nichol, July 18, 2001). This modeling evaluated: (1) a reasonable worst case scenario of bird use of the wetlands, tidal conditions and resultant enterococci bacteria concentrations; and (2) a worst case scenario (essentially inflating the impacts of the reasonable worst case scenario by a factor of five). In summary, the modeling for scenario 1 indicated:

> *The highest predicted enterococci bacteria concentration levels for the worst case condition in the marsh and nearshore area over the entire 45-day modeling period are two orders of magnitude lower than the applicable state criteria (AB411 30-Day Geometric Mean Standard of 35 MPN/100 ml). Therefore, no beach closures would occur from bird use of the marsh under the assumptions used for this analysis. In order to each an exceedance of the criteria, the concentration of bacteria would have to be increased 170 fold in the marsh. No physical (decreased tidal prism) or biological conditions (increased bird use) are anticipated for this to occur with the proposed project.*

Furthermore, modeling for scenario 2 indicated:

> *The highest predicted enterococci bacteria concentration levels for the worst case condition in the marsh and nearshore area over the neap tide modeling period are one order of magnitude lower than the applicable state criteria (either the AB411 30-Day Geometric Mean Standard of 35 MPN/100 ml or the instantaneous standard of 104 MPN/100 ml). Therefore, no beach closures would occur from bird use of the marsh under the assumptions used for this analysis. In order to reach an exceedance of the criteria, the concentration of bacteria would have to be increased 16 fold in the marsh. No physical (decreased tidal prism) or biological conditions (increased bird use) are anticipated for this to occur with the proposed project.*

The Commission staff believes that this recent modeling effort further supports the findings contained in the consistency determination and Final EIR/EIS, and that those findings are supported by analysis of the available data.

5. Conclusion. The Water Quality staff of the Commission has reviewed the consistency determination, the public comments and letters submitted during the public comment period, the most recent water quality research, and the analysis and response to comments presented in the EIR/EIS related to this issue. The staff agrees with the conclusions presented in the consistency determination that the restoration of the Bolsa Chica wetlands will not result in significant impacts to water quality or beach closures resulting from bird use of the marsh and wetlands area. The staff believes that the conclusions of the Final EIR/EIS are supported by analysis of the available data and most recent research. Water quality along the beaches and surf zone will continue to be monitored in accordance with the requirements of AB411. Research will continue into the relationship between wetlands and beach and nearshore water quality, and the

Commission staff will continue to evaluate all applicable water quality research as it becomes available.

**E. ENVIRONMENTALLY SENSITIVE HABITAT.** The Coastal Act provides:

**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 ground water 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.*

**Section 30240**

*(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.*

*(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

The essence of this project is the creation, restoration, and substantial enhancement of important coastal biological resources. The project is designed to increase very significantly the diversity and abundance of important native species in all trophic levels and in numerous habitat types. The project is being funded by the Ports of Los Angeles and Long Beach and is, therefore, also designed to provide those entities with mitigation credits for planned development activities that will result in the fill of deep water habitats. This does not in any way diminish the value of the ecological benefits that result from the project, but is does constrain the proportional representation of the habitat types that will be created and the physical design of some elements of the project. Natural salt marshes tend to have numerous sinuous channels of a mix of sizes (orders), many of which are intertidal, and tend to have a large proportion of the acreage in middle marsh plain. The full tidal portion of this project is designed as a shallow tidal basin with a very large proportion of subtidal and low intertidal mudflat habitats; habitats that are of particular benefit to marine fishes and wading and shore birds. This project also includes large areas of mid to high pickleweed habitat that is physically separated by berms and subject only to muted tidal flows, non-tidal seasonal pond habitat, and least tern nesting islands in non-

traditional locations. These are not features that were found in the pristine salt marsh that once occurred at this location.

Attention is brought to this fact because it is a potential source of criticism, and it is reasonable to ask, "Are the unnatural design elements serious flaws in the proposed project?" In general, the Commission thinks the answer must certainly be "No." Today it would not be possible to recreate the historic saltmarsh that once existed at Bolsa Chica. Not only have there been practically irreversible physical changes (e.g., construction of the Pacific Coast Highway, Huntington Harbor, flood control structures, and a residential subdivision), and other draconian but potentially reversible alterations (e.g., dikes and fill of salt marsh for oil infrastructure and conversion of beach habitat to recreational areas), but there have been profound changes in the distribution and abundance of coastal species or populations. For example, California least terns and snowy plovers now occur in perilously low numbers and their natural beach habitats are no longer available. Similarly, Belding's savannah sparrows are much reduced in numbers and in many places now rely on marginal habitats such as the diked areas of pickleweed at Bolsa Chica that depend on rainfall for moisture. The goal of this restoration, then, is not to mimic some presumed historical landscape, but rather to create and restore as many functioning, interrelated elements of the historical ecosystem as is feasible, while preserving and enhancing some important ecological elements that are already present (e.g., seasonally ponded pickleweed and mudflat). The proposed project accomplishes this goal and is clearly the environmentally least damaging of the various reasonable design alternatives that were considered. Alternative 5, which involves irrigating and managing freshwater and seawater inputs, has few negative impacts, but it also has few ecological benefits and would minimally alter the ghost of a salt marsh ecosystem that currently exists.

The critical factor for saltmarsh restoration in southern California is a strong tidal connection to the sea. Under current conditions at Bolsa Chica the major habitat types consist of 318 acres of upland and saltgrass, 296 acres of non-tidal pickleweed, and 397 acres of perennial and seasonal ponds dependent on freshwater inputs. The proposed project would restore at least 348 acres to full tidal action and 179 acres to a muted tidal regime[1] (Table 4.5-3, EIR)(**Exhibits 17 and 18**). This will result in nearly immediate colonization by the marine invertebrates and algae that provide the basic trophic foundation that will support a diverse assemblage of marine and estuarine fishes, wading and shore birds, and open-water foragers such as terns and pelicans. It is estimated that there will be suitable cordgrass habitat for some 15 pairs of the federally endangered light-footed clapper rail, and that improvements in pickleweed habitat associated with tidal flushing will support an additional 255 pairs of Belding's savannah sparrows. If properly maintained, the constructed tern islands will likely support on the order of 220 California least terns, in addition to significant numbers of elegant, Caspian, and Forester's terns, and nesting habitat for around 68 additional pairs of snowy plovers.

There are additional opportunities for restoration associated with the 252 acres of habitat in the northeast corner of the lowlands that will probably continue to be in oil production for 15 to 20 years. The planned ocean inlet is adequately sized to provide full tidal flushing to this area. The

[1] In the text, the estimated acreages are 366.5 for full tidal and 200 for muted tidal.

current conceptual plan calls for eventual creation of a modified tidal basin which would be primarily open water and tidal mudflat habitat. The Commission staff believes consideration should be given to modifying that plan to provide additional acreage at Bolsa Chica of salt marsh habitats that are currently under-represented. In particular, this offers an opportunity to create fully tidal salt marsh broken by sinuous channels of various sizes that will complement the habitats planned for phase I of this project.

The only negative post-construction biological impacts directly resulting from this habitat restoration project are associated with habitat conversion and periodic maintenance dredging. In general, the existing areas that will be converted to tidal habitats are ruderal uplands, small areas of brackish marsh, and a small area of dune habitat that supports coastal scrub plants and coastal woolly-heads, a rare plant. The impact to coastal woolly-heads may be avoided by constructing berms or mitigated by propagating additional plants in an area where they are naturally more abundant. For dune-dependent insects, the proportion of dune habitat in the region that is being converted does not appear significant. The impacts to other vegetation are considered self-mitigating by creating tidal habitat that is more appropriate and valuable in this setting. The loss of upland foraging and roosting habitat for various species of birds will be offset by the creation of higher quality tidal habitats. Some mammals, such as the San Diego black-tailed jackrabbit will lose habitat, whereas others, such as the California salt marsh shrew, will gain habitat. Overall, the impacts do not appear significant and no species are likely to disappear from the Bolsa Chica lowlands as a result of the restoration.

About 150,000 cubic yards of material will be dredged from the tidal inlet every two years in order to maintain adequate tidal flushing of the restored area. This will be timed to avoid the period of grunion spawning. There will be ephemeral increases in water turbidity and the burial of intertidal and shallow subtidal organisms. However, these are also natural periodic phenomena and the organisms that live in habitats that are at risk are adapted to such conditions. Any impacts will be localized and recovery will be rapid.

The acute construction impacts are of greater magnitude. About 1,800,000 cy of material will be dredged as part of the construction of the full tidal basin. This will destroy the existing habitats and the associated organisms. The organisms affected are common and do not include sensitive species. This is an insignificant impact that is more than adequately mitigated by the creation of more valuable habitat that will promote a much greater diversity and abundance of organisms. Some material will be placed offshore into the ebb bar. This will have effects similar to those of maintenance dredging and will be similarly insignificant for the same reasons. A portion of beach will also be lost due to construction of jetties. The disturbed area of intertidal beach will recover quickly and the lost beach will be replaced by hard substrate that will soon develop a rocky intertidal biota.

There will also be impacts to existing habitats during staging and construction. One to one replacement of any disturbed vegetation is proposed. The vegetation that will be disturbed is primarily pickleweed and saltgrass. This is similar to the situation at San Dieguito in San Diego County where the Commission required 1:1 mitigation for seasonal salt marsh that is disturbed or converted to other tidal wetland habitat during the course of restoration.

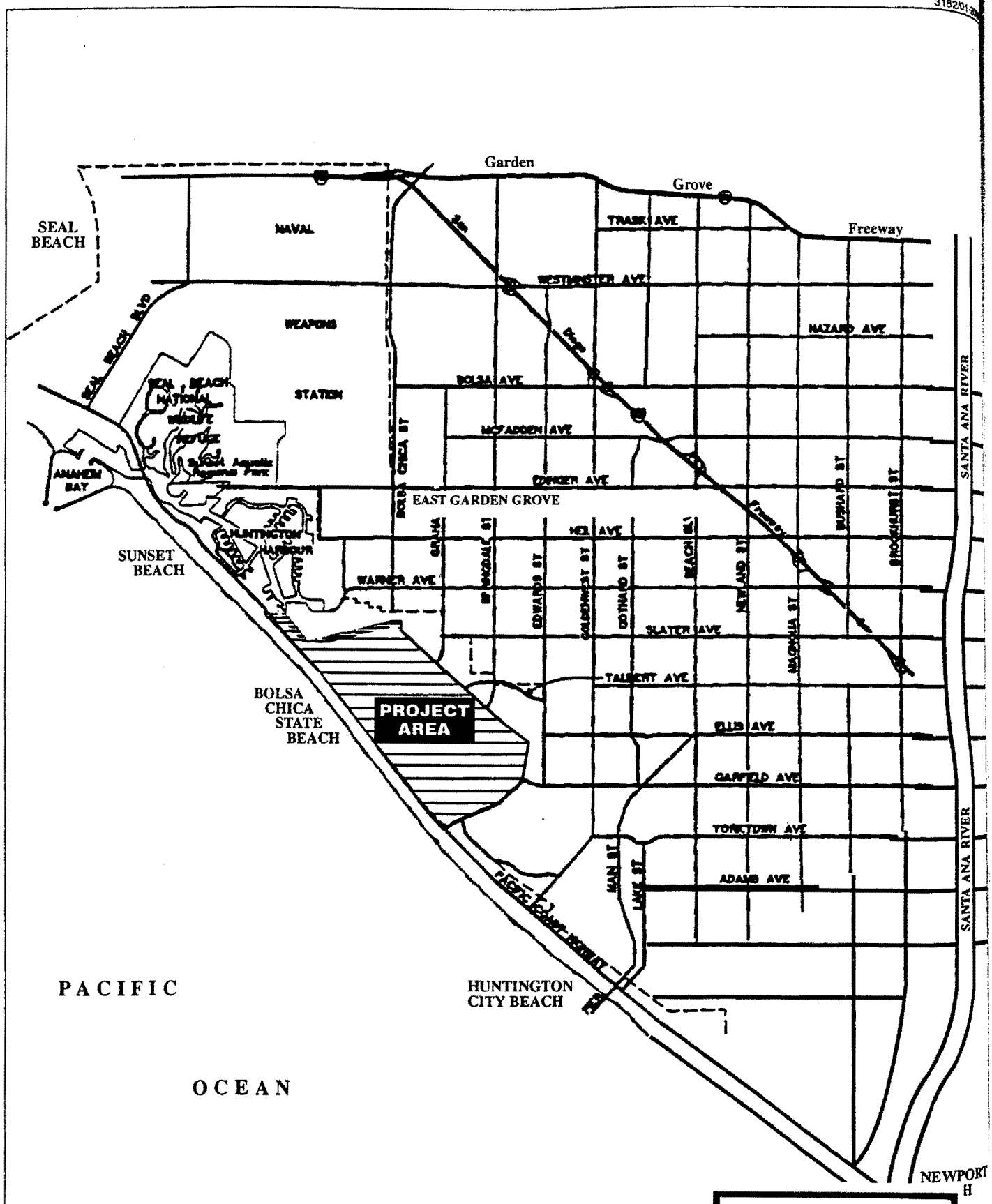
There will be several temporary impacts to bird populations. The most significant is the loss of about 60% of the existing 213 Belding's savannah sparrow territories during construction. This will be mitigated by improving undisturbed pickleweed habit through water management. Higher quality habitat supports more birds per unit area because territories are smaller. Within 5 years of the completion of the restoration, the pickleweed in tidal areas is expected to provide a substantial net gain in occupied territories.

There may also be a loss of 10 to 21 of the existing snowy plover nesting sites (30, on average) during construction. To minimize impacts, replacement nesting sites will be constructed prior to excavation and a 100-ft buffer around active nests will be maintained. After restoration, there will be a large net gain in plover nesting habitat and in the number of nesting pairs expected.

There will be short-term losses of upland and non-tidal wetland habitat for waterfowl, wading birds, shorebirds, and upland birds. However, substantial areas of similar habitat will remain during construction (e.g., the future full tidal area, the muted tidal basin, and in the area of seasonal ponds), so temporary impacts will be minimal. The long term impact of the restoration on these species will be beneficial.

Construction activities will also disturb and displace some mammals during excavation of the full tidal basin. The temporary loss of habitat for the California salt marsh shrew will be more than compensated by the net gain in salt marsh habitat as a result of the restoration. Local populations of some upland species may be smaller following the restoration, but none are expected to disappear from the Bolsa Chica lowlands.

The goal of this restoration project is to restore estuarine and salt marsh habitats within the footprint of the historical area of tidal wetlands. Without question, the overall effect will be beneficial, increasing the health, abundance and diversity of habitats and their constituent species. However, it is reasonable to question whether these benefits will be long lasting in the face of the probable rise in sea level over the next many decades. The initial effect of rising sea level will be to increase the amount of open water habitat, shift intertidal habitat landward, and reduce the amount of upland habitat. However, since the site is constrained by topography and urban development, the ultimate effect will be to lose upland and convert some intertidal habitat to open water. This will change the way in which the ecosystem functions and will benefit some groups of species over others. However, the overall effect will still be a very considerable enhancement of natural resources within the region.




MILES
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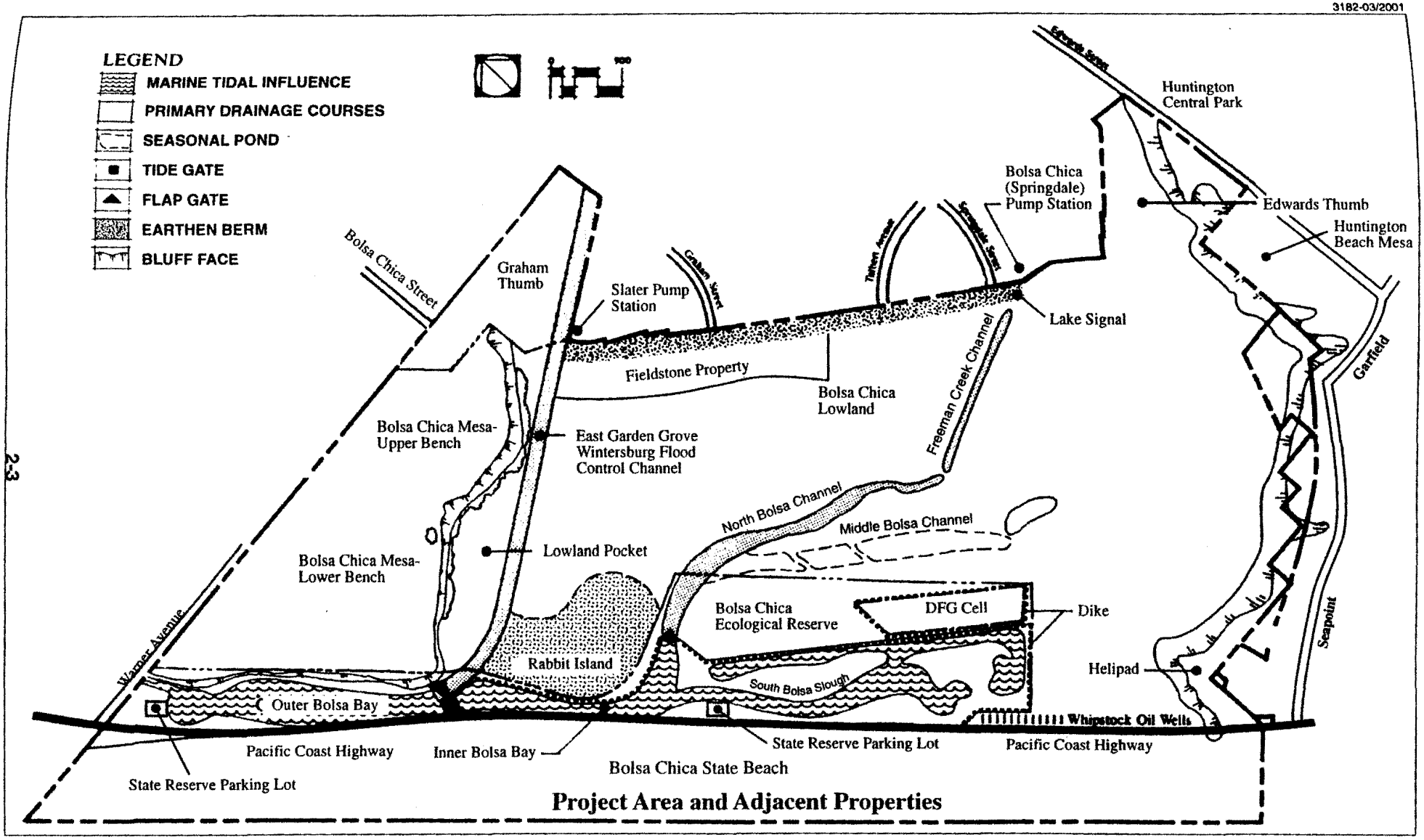
2-2

EXHIBIT NO. 1
APPLICATION NO.
CD-61-01
California Coastal Commission



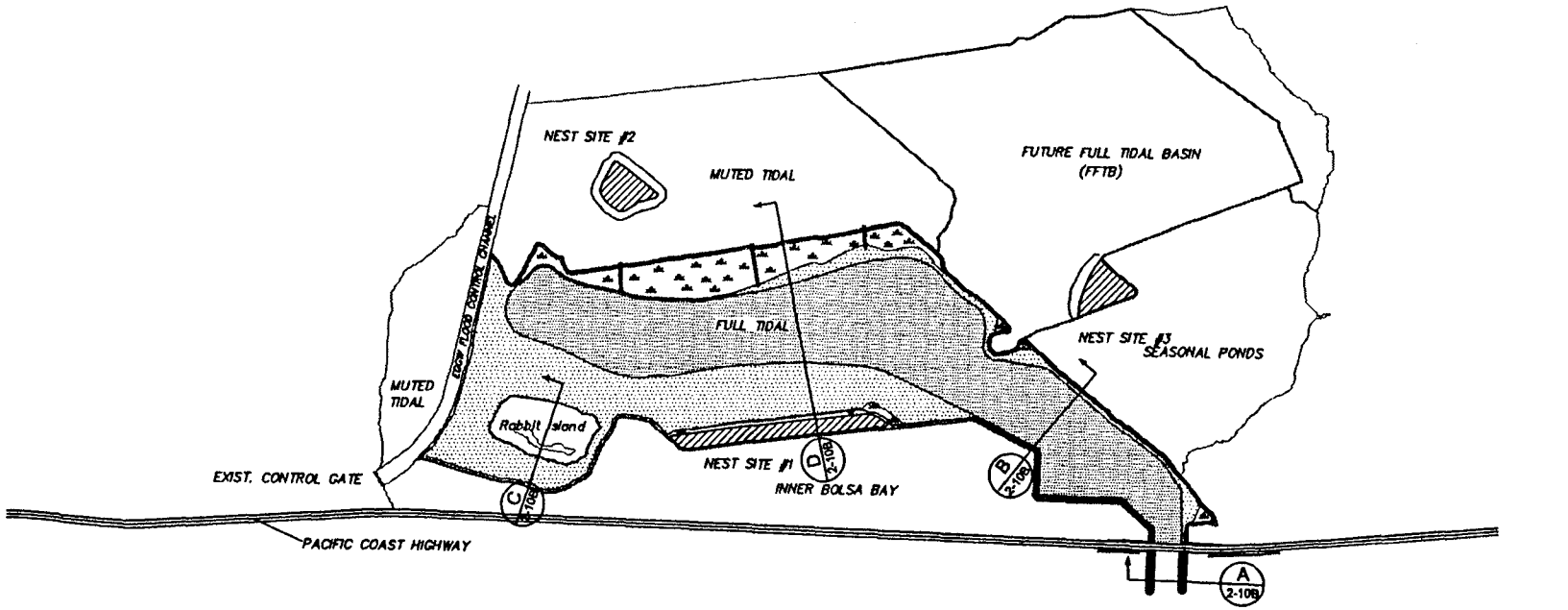

2-3



roup

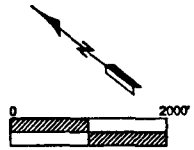
Source: County of Orange, 1993

**BOLSA CHICA EXISTING PHYSICAL FEATURES AND PLACE NAMES**
**Figure 2-2**



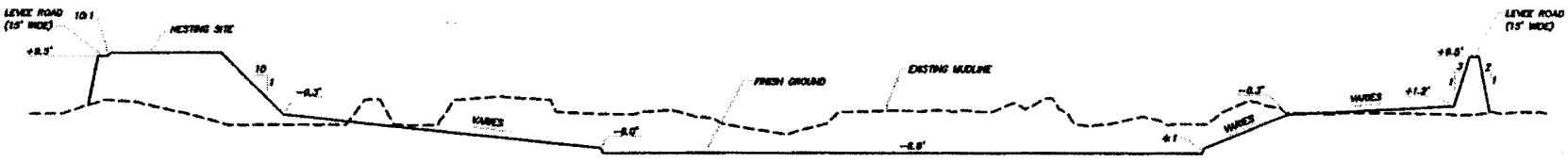

LEGEND

| Elev. Range in Feet MSL | | Area (AC) | Percent |
|---|---|---|---|
| −6.8 | −6.0 | 175.5 | 47.8 |
| −6.0 | −0.3 | 122.6 | 33.5 |
| −0.3 | +2.7 | 49.5 | 13.5 |
| higher than | +2.7 | 18.9 | 5.2 |
| | TOTAL: | 366.5 | 100.0 |




PROPOSED PROJECT
CONCEPT PLAN WITHOUT FLOOD DIVERSION
Figure 2-4A

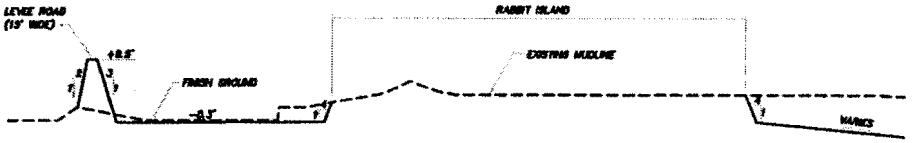
SOURCE: MOFFATT & NICHOL ENGINEERS




SECTION D 2-10A

HORIZ: 0 100 FT

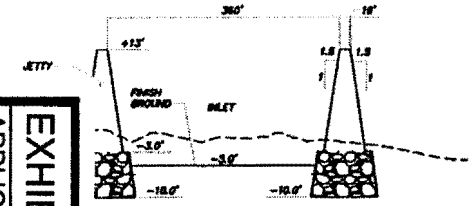
VERT: 0 10 FT




SECTION C 2-10A

HORIZ: 0 100 FT

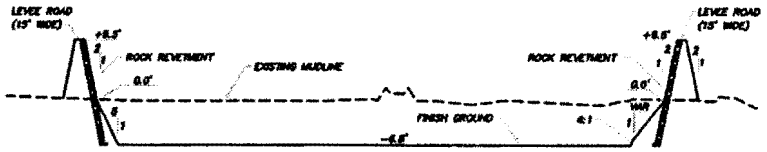
VERT: 0 10 FT




SECTION A 2-10A

HORIZ: 0 100 FT

VERT: 0 10 FT




SECTION B 2-10A

HORIZ: 0 100 FT

VERT: 0 10 FT

PROPOSED PROJECT CONCEPT PLAN WITHOUT FLOOD DIVERSION

2-10

EXHIBIT NO. 4

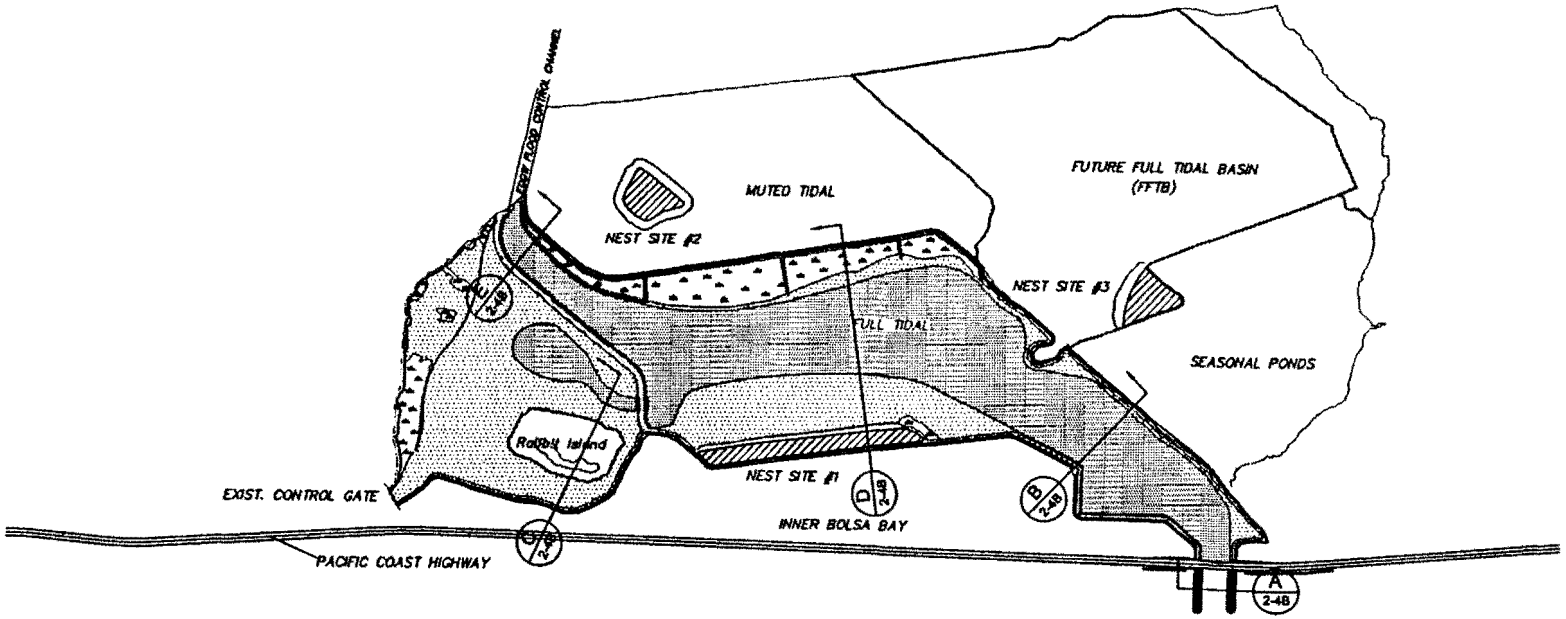
APPLICATION NO. CD-61-01

California Coastal Commission

**Table ES-4**
**Proposed Project Summary**

| | |
|---|---|
| Project Description | ➢ Would create approximately 366.5 acres of habitat receiving a full tidal range through an ocean inlet near Huntington Mesa.<br>➢ Would buy out and abandon oil wells located on a portion of the acquired property and on the adjacent State Ecological Reserve.<br>➢ Would dredge approximately 2.7 million cy to create a basin.<br>➢ Would construct a berm around the basin except where adjacent to the flood control channel levee.<br>➢ Would construct a new ocean inlet that would be approximately 360 feet wide between the crest of the jetties.<br>➢ Would construct a bridge for PCH over the inlet channel.<br>➢ Would include 200 acres of muted tidal.<br>➢ Would include a 252-acre future full tidal area.<br>➢ Would construct a French drain between the wetlands and housing development.<br>➢ 120 acres in southeastern corner of the Lowlands would be left unchanged as seasonal ponds.<br>➢ Construction would take approximately 3 years. |
| Predicted Benefits | ➢ Increased quality and quantity of open water and intertidal mudflat habitats would provide overwintering habitat for migratory shorebirds, seabirds, and waterfowl.<br>➢ A healthy and diverse aquatic community of marine and estuarine invertebrates and fishes would become established in the full and muted tidal basins.<br>➢ The full tidal basin would provide nursery habitat for the California halibut.<br>➢ Nesting habitat for the state- and federal-listed endangered California least tern and the federal-listed threatened western snowy plover would be increased. Additionally, these areas would provide nesting habitat for a variety of other water-associated birds.<br>➢ Cordgrass habitat would expand and is expected to support nesting by the state- and federal-listed endangered light-footed clapper rail.<br>➢ Pickleweed saltmarsh habitat would be enhanced.<br>➢ Nesting territory for the state-listed endangered Belding's savannah sparrow would expand.<br>➢ Increased quality of saltmarsh vegetation may improve habitat value for the salt marsh shrew.<br>➢ A diverse wetlands ecosystem would result from the preservation of nontidal habitats including seasonal ponds/sand flats and perennial brackish ponds.<br>➢ Upgrades to the Lowlands would indirectly benefit surrounding land uses by providing improved public passive use and visual enhancement.<br>➢ New and enhanced public access opportunities would result.<br>➢ The tidal inlet would enhance opportunities for recreational fishing.<br>➢ Addition of construction jobs and increases in visitors to the area could benefit the local economy.<br>➢ The tidal influence would reduce the potential for mosquito problems. |
| Potentially Significant Construction Impacts | ➢ Potentially significant (Class I) impact to water quality from discharge of sediments in the nearshore zone to prefill the ebb bar to equilibrium.<br>➢ Potentially significant (Class I) impacts to state endangered Belding's savannah sparrow from temporary loss of breeding territories during construction.<br>➢ Potentially significant (Class II) impact from loss of a portion of the Bolsa Chica State Beach parking area and beach area used during construction for staging and ocean inlet construction.<br>➢ Potentially significant (Class II) impact from temporary loss of restroom facilities near staging/inlet construction area.<br>➢ Potentially significant, adverse (Class I) impact from loss of beach use at the location of the PCH bridge and ocean inlet during holidays and weekends |

| | |
|---|---|
| | ➢ Inlet construction would result in loss of surfing use at Lots 14 and 15 and could further constrain heavily used surfing area at Lots 23 and 24, a significant, adverse (Class I) impact.<br>➢ PCH bridge and ocean inlet construction would result in a temporary degradation to the character of the site, alter the existing viewshed, and change viewers expectation of the beach, a Class I significant, adverse impact.<br>➢ Conflicts between construction traffic and local resident traffic on Seapoint Avenue would result in a potentially significant (Class II) traffic impact.<br>➢ Conflicting construction vehicle turning movements at the PCH staging area would result in a potentially significant (Class II) traffic impact.<br>➢ Construction may result in the exceedances of daily and quarterly $NO_X$ limitations, producing a potentially significant (Class I) impact.<br>➢ Construction may result in exceedances of daily and quarterly $PM_{10}$ limitations, resulting in a significant (Class II) impact.<br>➢ Traffic noise from haul trucks may cause significant, adverse (Class II) impacts to local residences along local access roads immediately adjacent to the site. |
| Potentially Significant Post-Construction Impacts | ➢ Potentially significant impact (Class I) because construction of an ocean inlet could expose the wetlands to oil in the event of an offshore oil spill.<br>➢ Potentially significant (Class II) impacts to residences from changes in groundwater flow.<br>➢ Potentially significant (Class II) impacts to grunion from placing sand on the beach during maintenance dredging of the tidal inlet.<br>➢ Potentially significant impacts (Class II) to coastal woolly-heads from introducing tidal flow to the edges of Rabbit Island.<br>➢ Jetties in the surf zone near the ocean inlet could result in a potentially significant (Class II) safety impact to surfers and swimmers.<br>➢ If maintenance dredging were performed 24 hours per day, Class II noise impacts to local residents would result. |




LEGEND

| Elev. Range in Feet MSL | | Area (AC) | Percent |
|---|---|---|---|
| -6.8 | -6.0 | 183.5 | 44.1 |
| -6.0 | -0.3 | 150.8 | 36.2 |
| -0.3 | +2.7 | 47.5 | 11.4 |
| higher than | +2.7 | 34.5 | 8.3 |
| | TOTAL: | 416.3 | 100.0 |

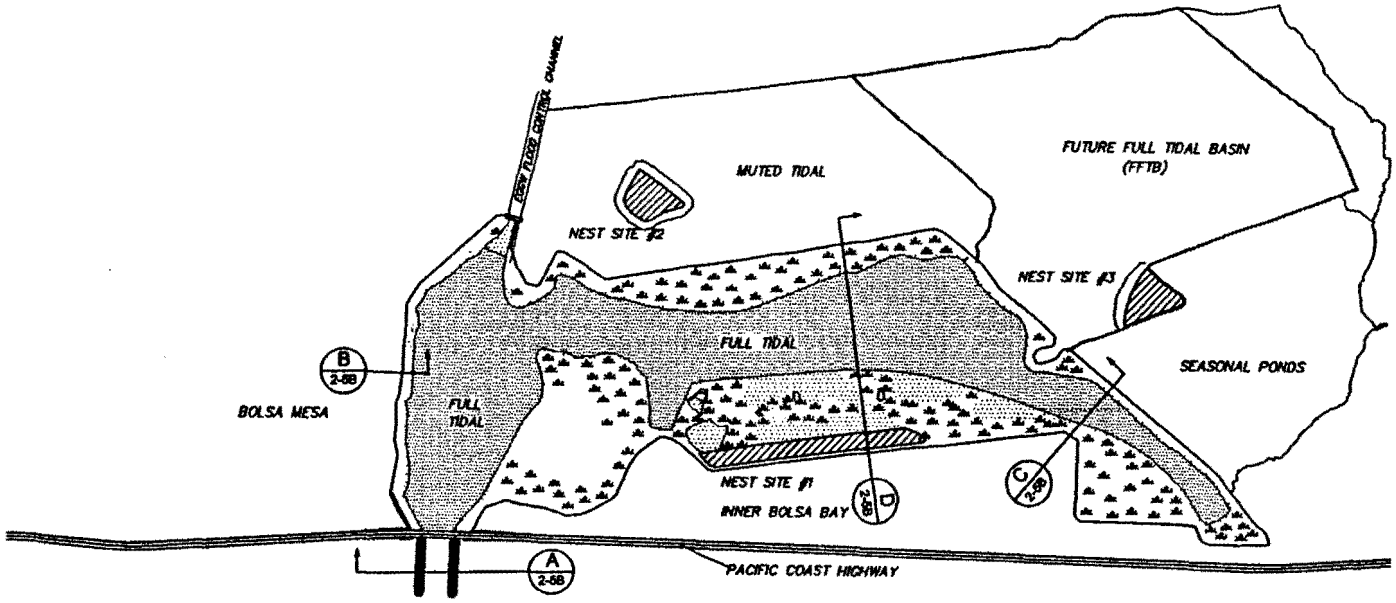
PLAN SCALE: 1" = 2000'

ALTERNATIVE 1

ALTERNATIVE 1

CONCEPT PLAN WITH EFFECTS OF SEA LEVEL RISE

EXHIBIT NO. 6
APPLICATION NO.
CD-61-01




PLAN SCALE: 1" = 2000'

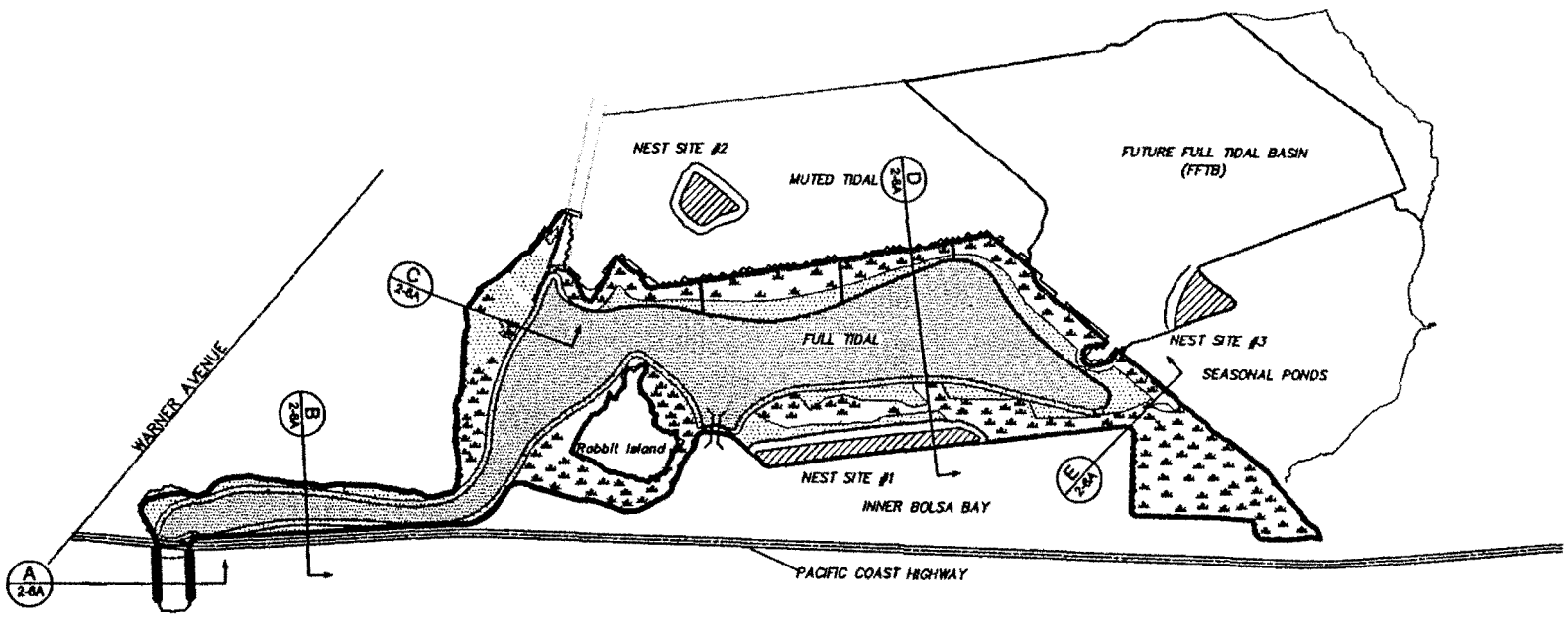
**LEGEND**

| Elev. Range in Feet MSL | | Area(AC) | Percent |
|---|---|---|---|
| -6.8 | -6.0 | 217.2 | 52.7 |
| -6.0 | -0.3 | 46.1 | 11.2 |
| -0.3 | +2.7 | 117.6 | 28.6 |
| higher than | +2.7 | 31.0 | 7.5 |
| | TOTAL: | 411.9 | 100.0 |

ALTERNATIVE 2
TIDAL INLET NEAR RABBIT ISLAND
Figure 2-7A

SOURCE: MOFFATT & NICHOL ENGINEERS

mbers Group



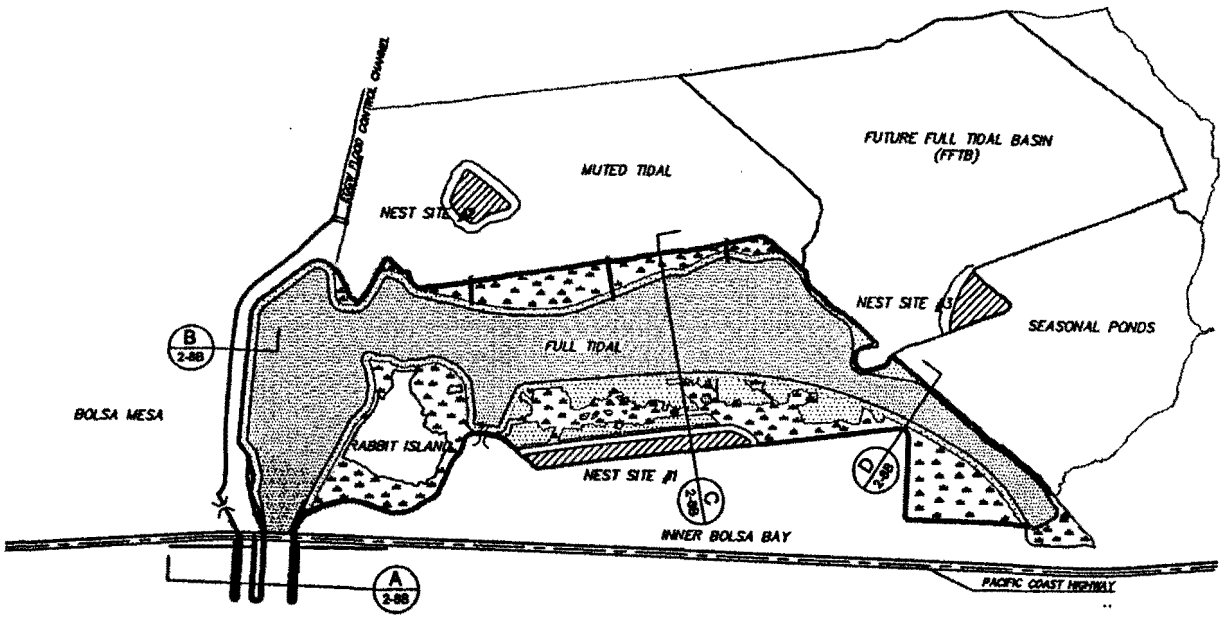

PLAN SCALE: 1" = 2000'

LEGEND

| Elev. Range in Feet MSL | | Area(AC) | Percent |
|---|---|---|---|
| lower than | -6.0 | 176.6 | 39.3 |
| -6.0 | -0.3 | 101.1 | 22.5 |
| -0.3 | +2.7 | 133.5 | 29.7 |
| higher than | +2.7 | 38.0 | 8.5 |
| | TOTAL: | 449.2 | 100.0 |

ALTERNATIVE 3
TIDAL INLET NEAR WARNER AVENUE

EXHIBIT NO. 8
APPLICATION NO.
CD-6-01




LEGEND

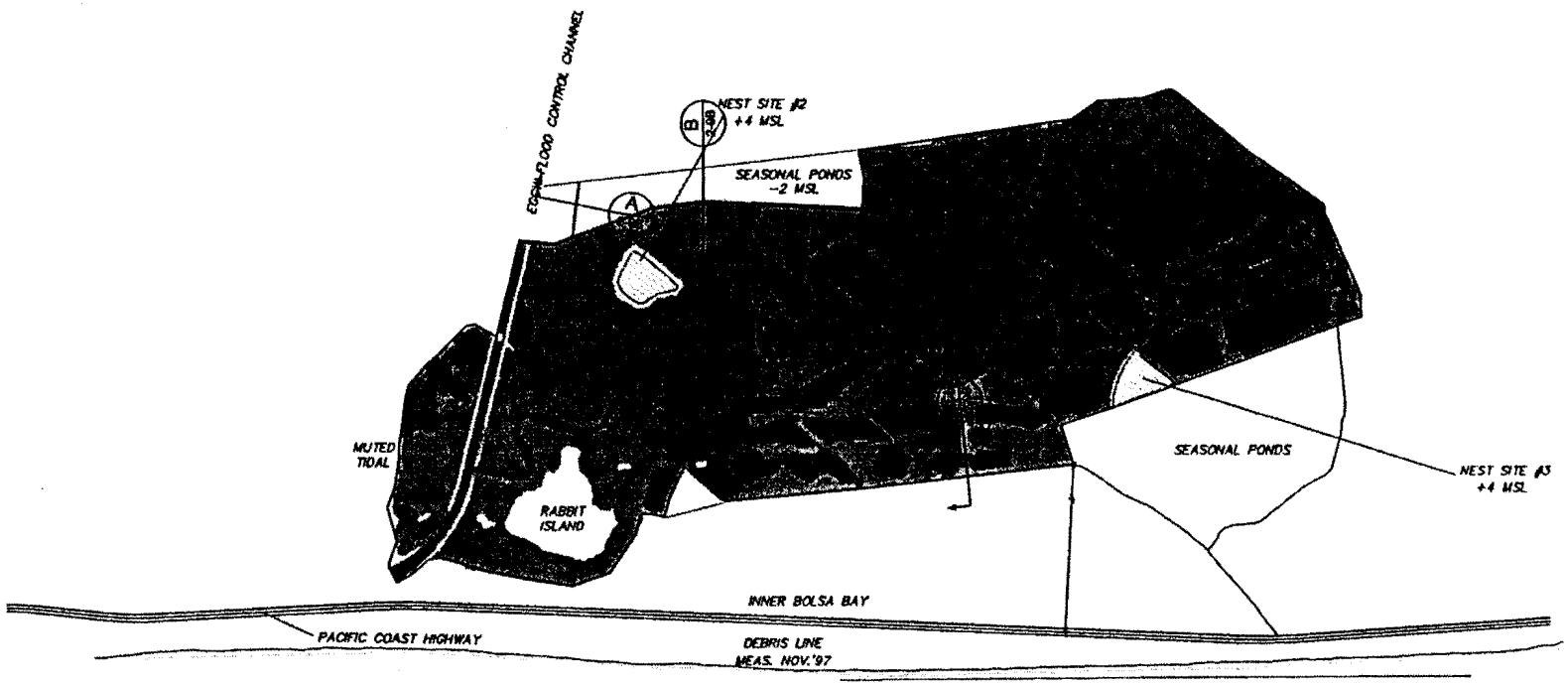
| Elev. Range in Feet MSL | | Area(AC) | Percent |
|---|---|---|---|
| -6.8 | -6.0 | 194.8 | 49.2 |
| -6.0 | -0.3 | 61.9 | 15.6 |
| -0.3 | +2.7 | 92.5 | 23.4 |
| higher than | +2.7 | 46.7 | 11.8 |
| | TOTAL: | 395.9 | 100.0 |

PLAN SCALE: 1" = 2000'

ALTERNATIVE 4
THREE JETTY PLAN

2-28

EXHIBIT NO. 9
APPLICATION NO.
CD-61-01




*LEGEND*

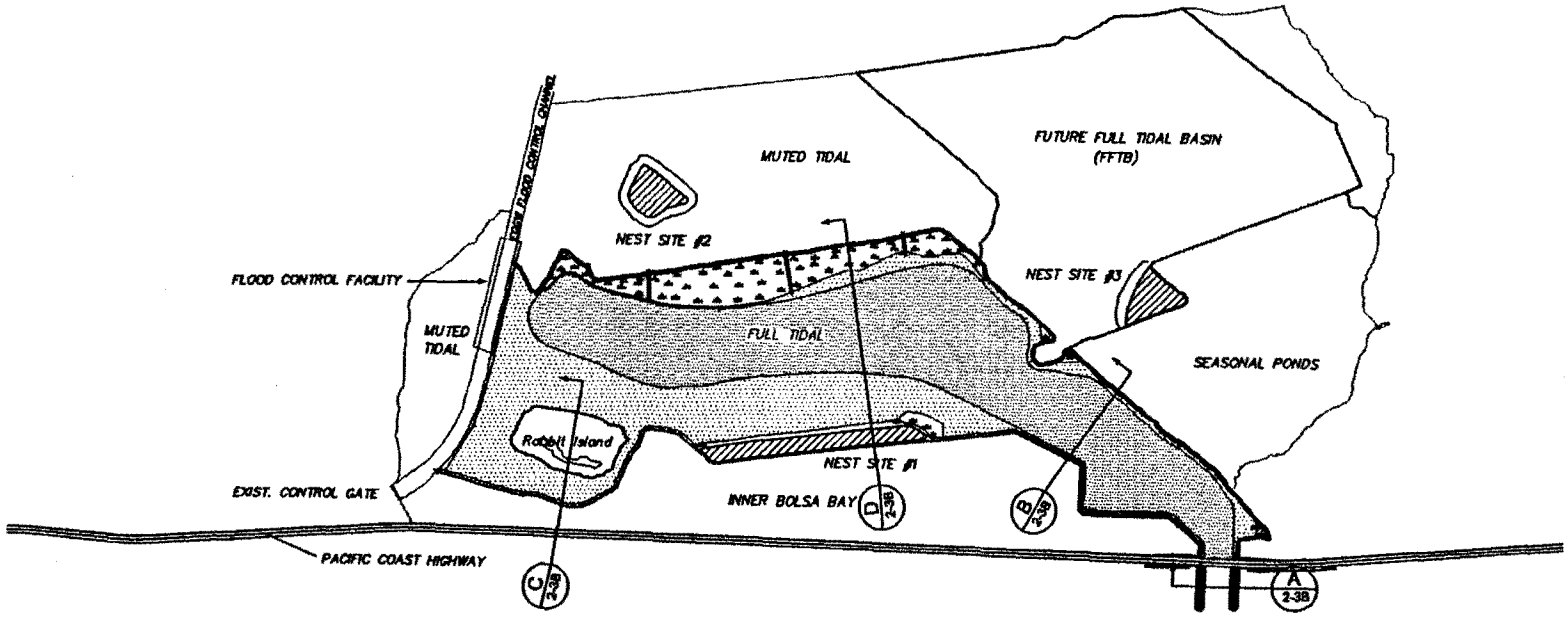
| | Elev. Range in Feet MSL | | Area (AC) | Percent |
|---|---|---|---|---|
| ■ | −6.0 | −0.3 | 327.9 | 42.5 |
| ■ | −0.3 | +2.7 | 398.0 | 51.5 |
| □ | higher than | +2.7 | 46.3 | 6.0 |
| | | TOTAL: | 772.2 | 100.0 |

*PLAN SCALE: 1" = 2000'*

ALTERNATIVE 5 -- IRRIGATION/WATER MANAGEMENT

Figure 2-10A

SOURCE: MOFFATT & NICHOL ENGINEERS




LEGEND

| Elev. Range in Feet MSL | | Area (AC) | Percent |
|---|---|---|---|
| −6.8 | −6.0 | 175.5 | 47.8 |
| −6.0 | −0.3 | 122.6 | 33.5 |
| −0.3 | +2.7 | 49.5 | 13.5 |
| higher than | +2.7 | 18.9 | 5.2 |
| | TOTAL: | 366.5 | 100.0 |

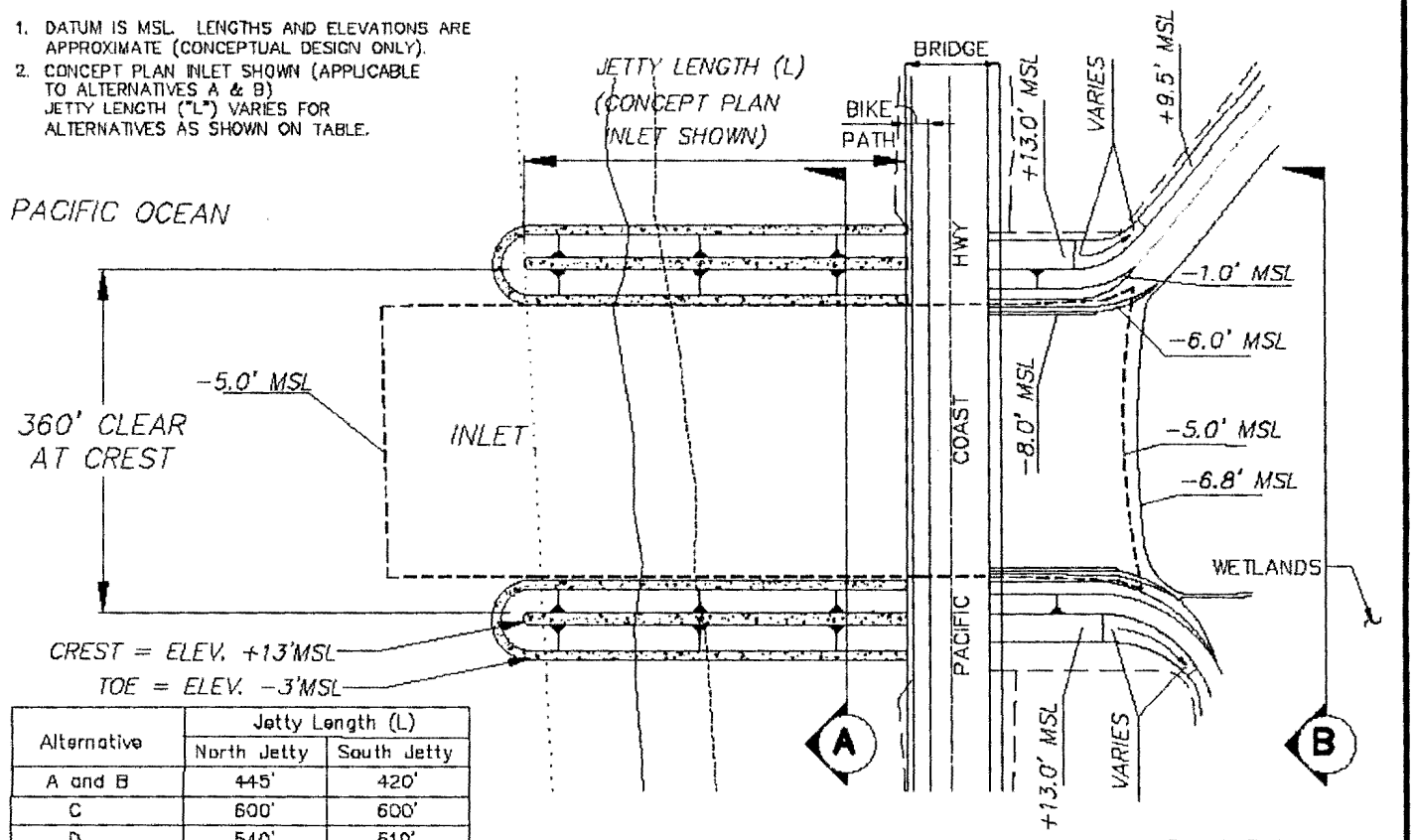
PLAN SCALE: 1" = 2000'

ALTERNATIVE 6
CONCEPT PLAN WITH PEAK FLOOD DIVERSION
Figure 2-11A

mbers Group SOURCE: MOFFATT & NICHOL ENGINEERS

NOTES:

1. DATUM IS MSL. LENGTHS AND ELEVATIONS ARE APPROXIMATE (CONCEPTUAL DESIGN ONLY).
2. CONCEPT PLAN INLET SHOWN (APPLICABLE TO ALTERNATIVES A & B) JETTY LENGTH ("L") VARIES FOR ALTERNATIVES AS SHOWN ON TABLE.




| Alternative | Jetty Length (L) | |
|---|---|---|
| | North Jetty | South Jetty |
| A and B | 445' | 420' |
| C | 600' | 600' |
| D | 540' | 510' |

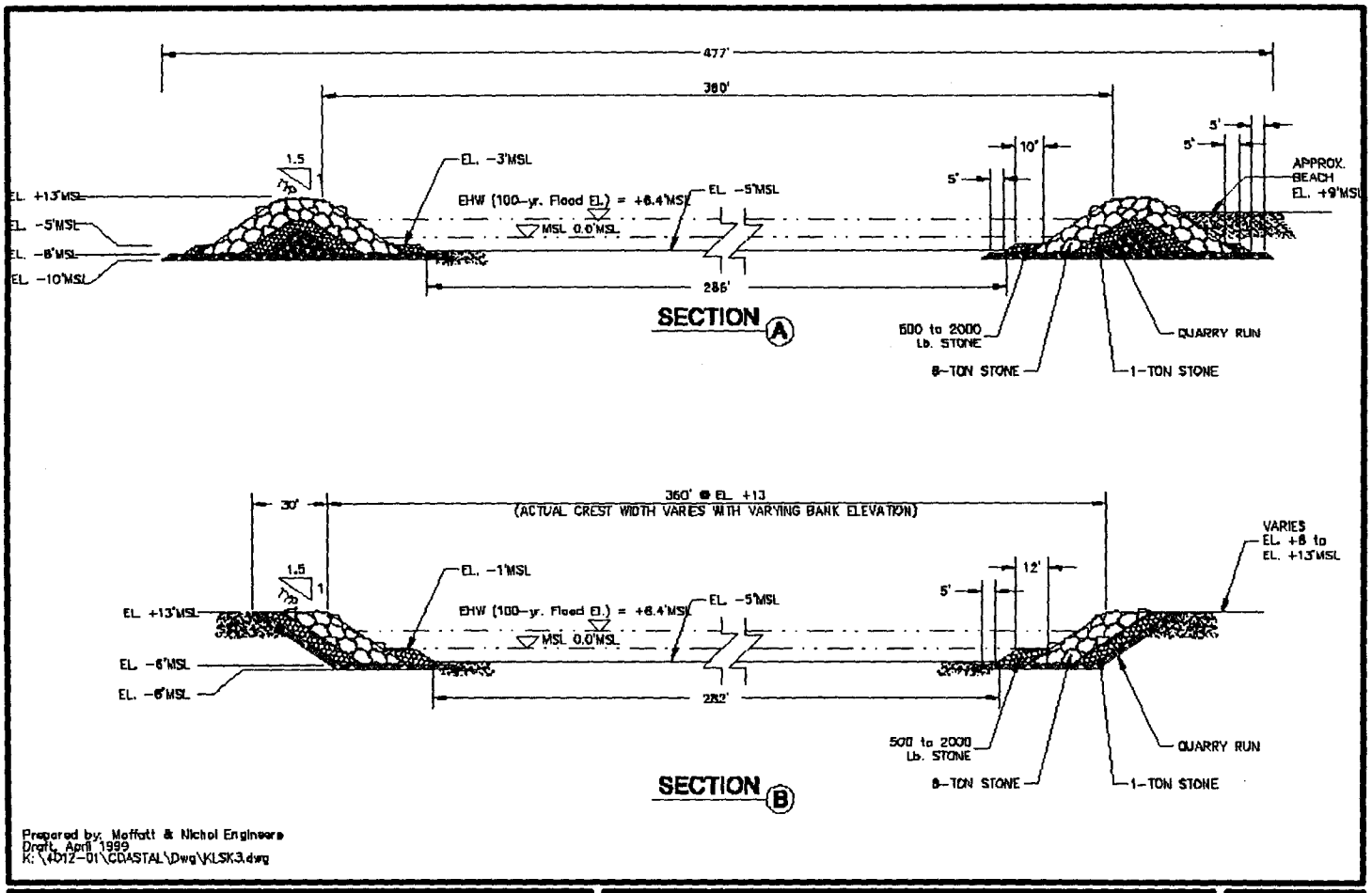
Prepared by: Moffatt & Nichol Engineers
Draft, April 1999
K:\4012-01\COASTAL\K-00\draftreport-3\figures\KAW-INL-3.dwg

**Bolsa Chica Preliminary Engineering Studies**

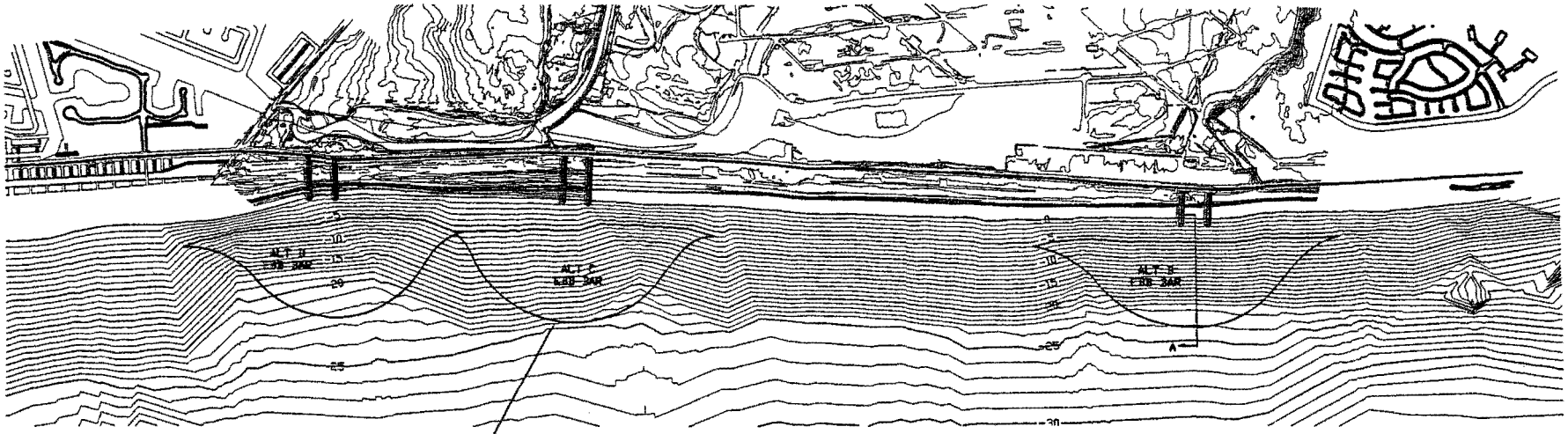
**Concept Plan Tidal Inlet**

**Figure 8-50**

EXHIBIT NO. 12
APPLICATION NO. CD-61-01
California Coastal Commission

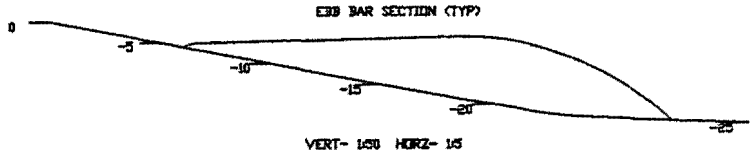



| Bolsa Chica Preliminary Engineering Studies | Typical Sections of Concept Plan Tidal Inlet | Figure 4-2 |
|---|---|---|




BOUNDRY OF AREA IMPACTED BY EBB BAR (TYP)

| | AREA (FT²) | VOLUME (CY) |
|---|---|---|
| ALT B: | 3,013,000 | 1,275,000 |
| ALT C: | 3,117,000 | 1,271,000 |
| ALT D: | 3,088,000 | 1,253,000 |




SECTION A THROUGH EBB BAR

Scale 1"=1500'

750 0 750 1500

MOFFATT & NICHOL ENGINEERS

LONG BEACH, CALIFORNIA

:hica Preliminary Engineering Studies

Approximate Footprints of Ebb Bars At Each Inlet

Figure 6-23

:wg\ebb bar.dwg

EXHIBIT NO. 14

APPLICATION NO.

CD-61-01

California Coastal Commission

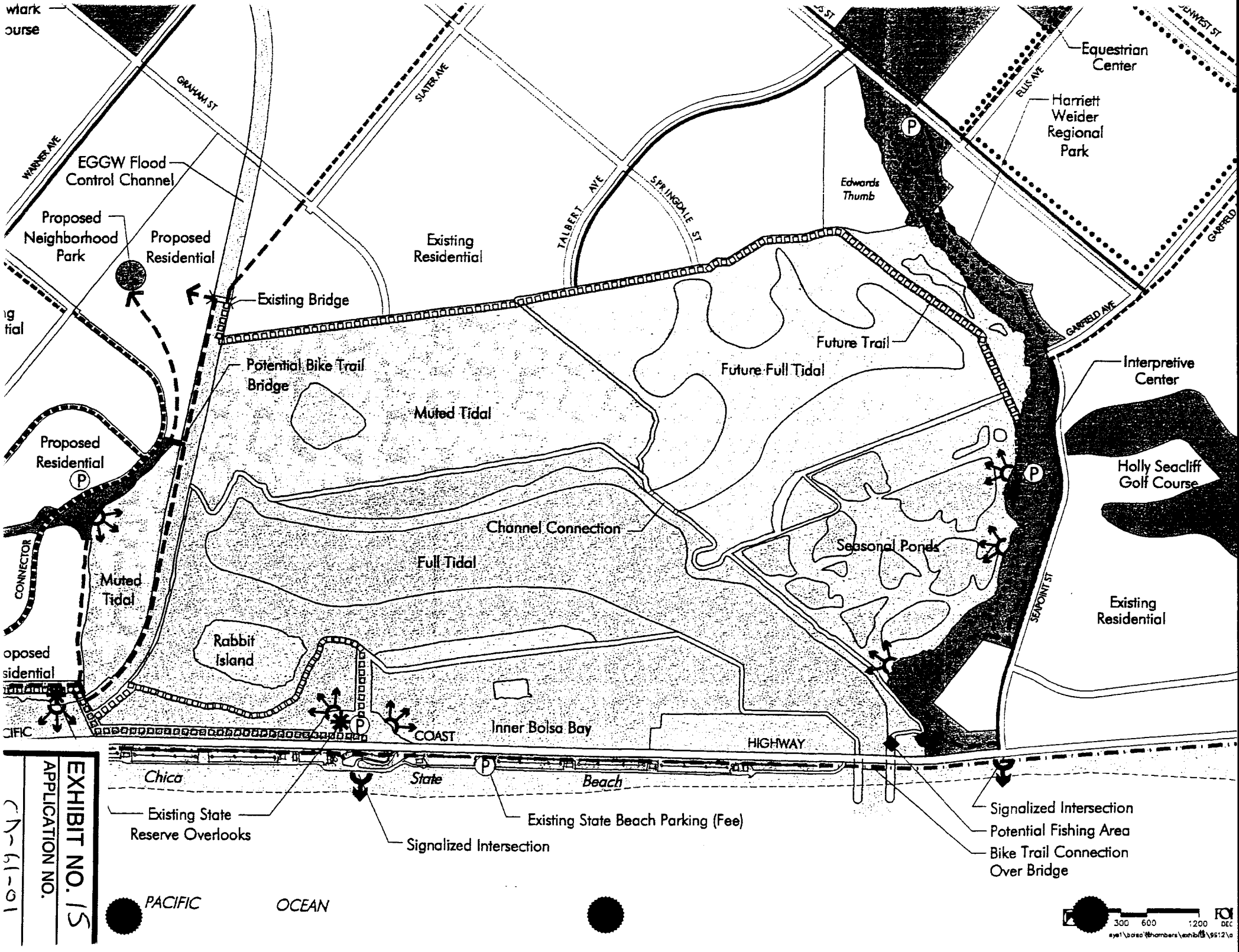
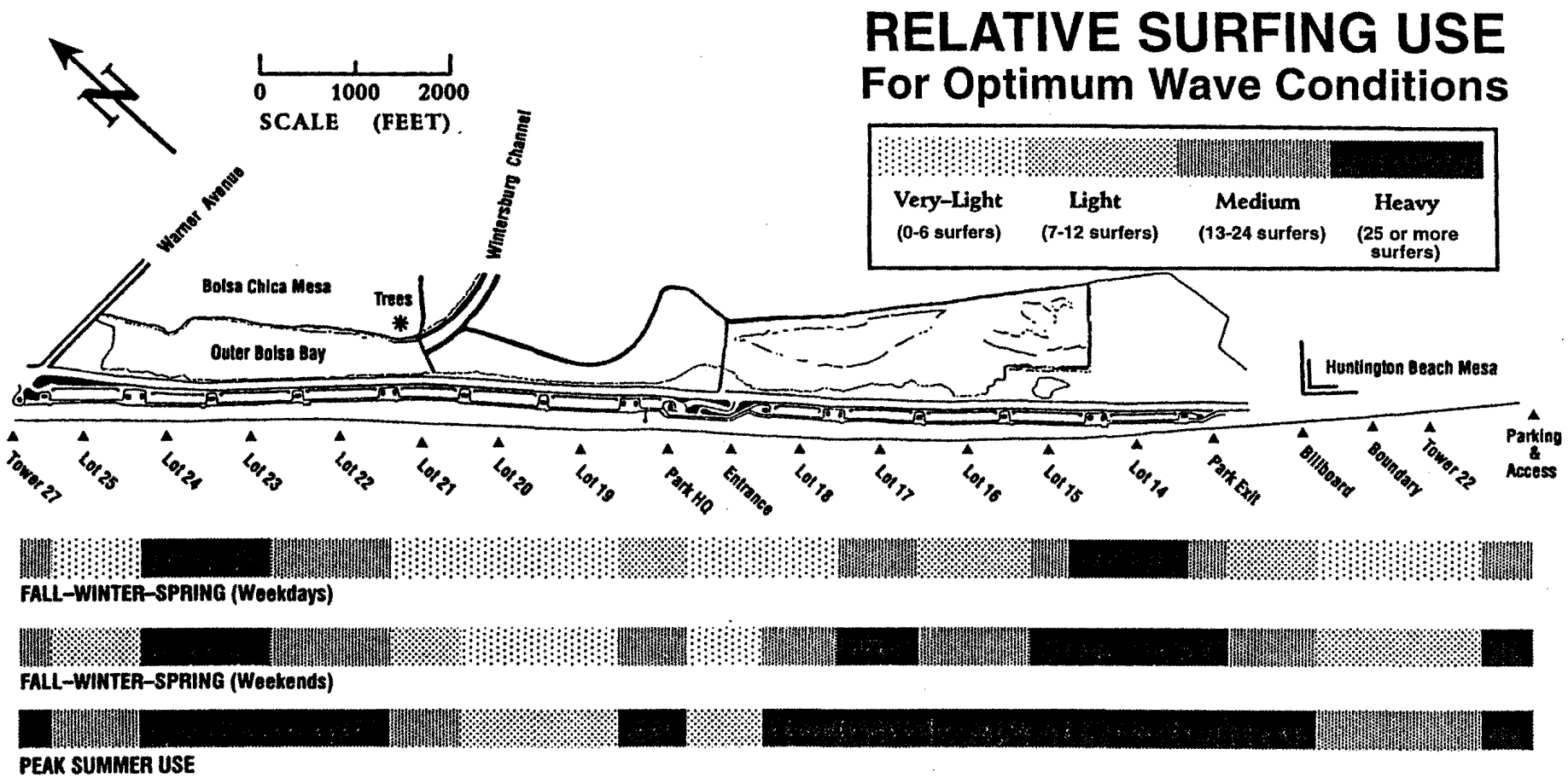



EXHIBIT NO. 15
APPLICATION NO.
A-7-61-91

# BOLSA CHICA STATE BEACH








rs Group

Source: Moffatt and Nichols Engineers 1991.

BOLSA CHICA STATE BEACH SURFING USE
Figure 3.8-1

**Table 4.5-3**
**Acres of Major Habitat Types for Each Alternative**

| | No Action | Proposed Project | 1st Sub-Alternative | 2nd Sub-Alternative | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Perennial pond | 48.8 | 19.4 | 10.2 | 10.2 | 19.4 | 19.4 | 19.4 | 19.4 | 13.4 | 19.4 |
| Managed tidal water | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35.4 | 0 |
| Muted tidal water | 0 | 1.38 | 1.38 | 1.38 | 0.01 | 0.01 | 0.01 | 0.01 | 0 | 1.38 |
| Full tidal water- violates criteria | 0 | 0 | 0 | 0 | 183.5 | 217.2 | 140.1 | 194.9 | 0 | 0 |
| Full tidal-sometimes violates criteria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 175.5 |
| Full tidal water- doesn't violate | 0 | 175.5 | 181.5 | 175.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seasonal pond/flat | 348.5 | 192.2 | 80.4 | 80.1 | 192.1 | 192.2 | 192.2 | 192.2 | 219.2 | 192.2 |
| Full tidal mudflat - violates criteria | 0 | 0 | 0 | 0 | 150.8 | 46.1 | 101.1 | 61.9 | 0 | 0 |
| Full tidal mudflat-sometimes violates | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 122.6 |
| Full tidal flat-doesn't violate criteria | 0 | 122.6 | 240.4 | 312.3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muted tidal mudflat | 0 | 42.3 | 42.3 | 42.3 | 22.7 | 23.2 | 23.2 | 23.2 | 0 | 42.3 |
| Managed tidal mudflat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 189.1 | 0 |
| Cordgrass | 0 | 30.5 | 74.5 | 78.2 | 29.5 | 50 | 55.8 | 30 | 0 | 30.5 |
| Nontidal pickleweed | 296 | 65.3 | 21 | 21 | 64.6 | 65.3 | 65.3 | 65.3 | 21.3 | 65.3 |
| Managed tidal pickleweed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 262.1 | 0 |
| Muted tidal pickleweed | 0 | 126.3 | 126.3 | 126.3 | 108.9 | 112.8 | 113.3 | 110.8 | 0 | 126.3 |
| Full tidal pickleweed | 0 | 19.1 | 20.3 | 20.3 | 18 | 67.6 | 69.5 | 62.5 | 0 | 19.1 |
| Upland and saltgrass | 318.1 | 216.9 | 213.1 | 143.9 | 222 | 217.8 | 231.5 | 234 | 271 | 216.9 |

**Table 4.5-6**
**Post-Construction Impacts, Proposed Project and Alternative 6**

| Habitat | Long-Term Loss or Gain in Habitat[1] Compared to Existing Condition | Long-Term Loss or Gain for Birds Compared to Existing Condition | Level of Impact |
|---|---|---|---|
| Full Tidal Subtidal | +175.5 acres in full tidal basin | Addition of 175.5 acres of roosting/ foraging habitat for brown pelican & 30–40 species of waterfowl, wading birds, & aerial fish foragers | Class IV |
| Full Tidal Intertidal Mudflat | +122.6 acres in full tidal basin | Addition of 122.6 acres of roosting and foraging habitat for 30–40 species of wading birds, shorebirds, aerial fish foragers | Class IV |
| Full Tidal Pickleweed | +19.1 acres in full tidal basin | Addition of 19.1 acres of nesting and foraging habitat for BSSP[1], resulting in up to 133 new BSSP[1] territories[2] | Class IV |
| Full Tidal Cordgrass | +30.5 acres in full tidal basin | Addition of 30.5 acres of potential habitat for light-footed clapper rail, resulting in up to 15 clapper rail pairs[3] | Class IV |
| Muted Tidal Pickleweed | +126.3 acres from addition of muted tidal influence to existing nontidal saltmarsh | Enhancement of 126.3 acres of existing nesting and foraging habitat for BSSP, resulting in up to 267 new (290 total) BSSP territories | Class IV |
| Muted Tidal Mudflat | +42.3 acres in muted tidal basin | Enhancement of 42.3 acres of nontidal flats for 30–40 species of wading birds, shorebirds | Class IV |
| Muted Tidal Channel | +1.38 acres in muted tidal basin | Enhancement of 1.38 acres of nontidal channel for foraging habitat for BSSP, SNPL,[4] and least tern | Class IV |
| Nontidal Pickleweed | -230.7 acres to muted tidal pickleweed | Loss of 230.7 acres of low-quality habitat for 10–20 species of waterfowl, wading birds, and upland birds, offset by creation of full tidal and muted tidal pickleweed (see above) | Class III |
| Nontidal Flats | -156.3 acres to full tidal & muted tidal basins | Loss of 156.3 acres of potential SNPL foraging habitat and of low-quality roosting/foraging habitat for 20–30 species of waterfowl, wading birds, and shorebirds, offset by creation of full tidal & muted tidal mudflat (see above) | Class III |
| Nontidal Channel | -29.4 acres to full tidal & muted tidal basins | Loss of 29.4 acres of low-quality habitat for 10–20 species of waterfowl, wading birds, & upland birds, offset by creation of full tidal subtidal (see above) and 1.4 acres of muted tidal channel | Class III |
| Nontidal Saltgrass | -26.3 acres to full tidal & muted tidal basins | Loss of 26.3 acres of low-quality foraging habitat for BSSP and less than 5 species of upland birds, offset by creation of full tidal and muted tidal pickleweed (see above) | Class III |
| Nesting Sites 1, 2, & 3 | +22 acres of upland habitat | Addition of 22 acres of nesting habitat for SNPL and least tern, resulting in up to 17– 88 SNPL nests and 88–352 least tern nests | Class IV |
| Upland | -101.2 acres to full tidal & muted tidal basins | Loss of 101.2 acres of low-quality habitat for 10–20 species of upland birds, offset by creation of higher quality habitats (see above) | Class III |
| Rabbit Island Upland | -26.4 acres of a total of 42 acres on Rabbit Island after exposure to full tidal influence | Loss of winter roosting and foraging habitat for short-eared owl; loss of winter roosting and foraging habitat for northern harrier | Class III<br>Class III |

[1] BSSP = Belding's savannah sparrow.
[2] Based on an average of 7 territories/acre at the Santa Margarita River (Zembal 1986), although a study at Anaheim Bay showed 14 territories/acre (Massey 1990).
[3] Based on a density of 0.5 clapper rail pairs/acre at Upper Newport Bay (Zembal 1991).
[4] SNPL = western snowy plover.

# APPENDIX A

1996 INTERAGENCY AGREEMENT FOR BOLSA CHICA ACQUISITION AND RESTORATION

Attachment 1.

# AGREEMENT TO ESTABLISH A PROJECT FOR WETLANDS ACQUISITION AND RESTORATION AT THE BOLSA CHICA LOWLANDS IN ORANGE COUNTY, CALIFORNIA, FOR THE PURPOSE, AMONG OTHERS, OF COMPENSATING FOR MARINE HABITAT LOSSES INCURRED BY PORT DEVELOPMENT LANDFILLS WITHIN THE HARBOR DISTRICTS OF THE CITIES OF LOS ANGELES AND LONG BEACH, CALIFORNIA

THIS AGREEMENT, made the _____ day of _____, 1996, is entered into by the UNITED STATES OF AMERICA, acting by and through the FISH AND WILDLIFE SERVICE, UNITED STATES DEPARTMENT OF THE INTERIOR ("FWS"), the NATIONAL MARINE FISHERIES SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, UNITED STATES DEPARTMENT OF COMMERCE ("NMFS"), the CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY ("USACE"), and the ENVIRONMENTAL PROTECTION AGENCY ("EPA"); by the STATE OF CALIFORNIA ("State"), acting by and through the DEPARTMENT OF FISH AND GAME ("CDFG"), the COASTAL CONSERVANCY ("CONSERVANCY"), the RESOURCES AGENCY ("RA"), and the STATE LANDS COMMISSION ("SLC"); and by the CITIES OF LONG BEACH and LOS ANGELES, acting by and through their respective BOARDS OF HARBOR COMMISSIONERS (collectively, "BOARDS").

## RECITALS

I. WHEREAS, the BOARDS are empowered by their respective State Tidelands Grants to foster the orderly and necessary development of the Ports of Los Angeles and Long Beach, consistent with the public trust for navigation, commerce, recreation, and fisheries, including the development of new land in the Harbor Districts of the Cities of Los Angeles and Long Beach by landfill, and these developments contribute significantly to the local, regional and national economies by accommodating maritime commerce; and

II. WHEREAS, the FWS and the CDFG have as their primary mandates in this matter the conservation, protection, and enhancement of fish and migratory birds and their habitats, including the planning of biological loss avoidance, minimization, and compensation; and the NMFS has as its primary mandate the conservation, protection, and enhancement of marine fisheries resources and their habitats, including the planning of biological loss avoidance, minimization, and compensation; and

III. WHEREAS, the USACE has as its primary mandate in this matter the responsibility to ensure adequate and proper mitigation of impacts associated with construction of Federally authorized projects, as well as its regulatory authority pursuant to the Clean Water Act and Rivers and Harbors Act, with permit processing procedures including the 404(b)(1) analysis and public interest review; and the EPA has as its primary mandate protecting the environment, including restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters; and

IV. WHEREAS, the CONSERVANCY has as its primary mandate in this matter the protection, acquisition, and restoration of coastal resources, planning and implementation of coastal wetland restoration projects, and promotion of coastal dependent economic development consistent with the California Coastal Act of 1976; and

V. WHEREAS, the RA has as its primary mandate in this matter the coordination and oversight of various departments, boards, and commissions related to natural resource management, including the CDFG, CONSERVANCY, and Coastal Commission; and

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VI. WHEREAS, the SLC is vested with all residual jurisdiction and authority over tidelands which have been granted to governmental subdivisions, is authorized by Public Resources Code §8625(c) to accept money into its Land Bank Fund for mitigation projects which provide open space, habitat for plants and animals, and public access, and holds title to 327.5 acres of the low-elevation lands between the Huntington Mesa and Bolsa Chica Mesa, said low-elevation lands being those generally depicted in the figure which is an enclosure to Exhibit A of this Agreement (the "Bolsa Chica Lowlands" or the "Lowlands"); and

VII. WHEREAS, port development landfills and coastal wetland restoration are subject to State and Federal environmental evaluation-pursuant to, among others, the California Environmental Quality Act, National Environmental Policy Act, and Coastal Zone Management Act and are subject to State regulation pursuant to the California Coastal Act, to Federal regulation pursuant to the Clean Water Act and the Rivers and Harbors Act, and to State and Federal regulations pursuant to the State and Federal Endangered Species Acts (collectively, "ESA"); and

VIII. WHEREAS, the BOARDS anticipate the need for the construction of new landfills that will permanently eliminate marine fish and wildlife habitat and other aquatic functions that FWS, NMFS, USACE, EPA, RA, and CDFG recommend be compensated by creation or restoration of equivalent aquatic functions and habitat values that would be maintained on a permanent basis; and

IX. WHEREAS, the parties intend that compensation for the unavoidable, authorized losses of marine habitat and aquatic functions be provided to the extent possible in advance of or concurrently with the losses of habitat and functions predicted from harbor landfills; and

X. WHEREAS, the parties concur that advance planning of appropriate compensatory mitigation requires a procedure whereby habitat gains and losses are identified, completion of mitigation is reasonably assured, and credits and debits are accounted; and

XI. WHEREAS, the parties concur that creation or restoration of habitat values and aquatic functions within the Harbor Districts to offset large-scale losses of habitat values and aquatic functions from the landfills envisioned in this Agreement within the Harbor Districts (i.e., onsite mitigation) is not feasible in that adequate areas for appropriate mitigation do not presently exist within the geographical boundaries of the Harbor Districts; and

XII. WHEREAS, the USACE, NMFS, CDFG, EPA, RA, and FWS are of the collective opinion that compensation for unavoidable significant adverse impacts upon the marine ecosystem from Harbor District projects should emphasize the creation of shallow water, tidally influenced coastal embayment habitats to the extent practical, consistent with competing ecological priorities as set out below; and

XIII. WHEREAS, allowing the BOARDS to provide monies for acquisition, restoration, and maintenance of such shallow water, tidally influenced coastal embayment habitats in order to effect mitigation for loss of such lands in the Harbor Districts due to harbor development would be consistent with regulatory mandates for environmental protection and would be consistent with State public trust restrictions on the use of Harbor District revenues so long as title to the acquired lands and any capital improvements thereon is held by the SLC to ensure that the acquired lands are used only for fish and wildlife habitat protection in perpetuity; and

XIV. WHEREAS, the Bolsa Chica Lowlands are considered a unique

public resource because they represent one of the few remaining large wetland areas in southern California, because portions of the Lowlands provide a variety of valuable habitats to a variety of fish and wildlife resources and endangered species, and because the potential to increase the Lowlands' value to fish and wildlife through restoration and enhancement to a variety of habitat types is high; and

XV. WHEREAS, given these unique resource values, there is a compelling public interest in maximizing the habitat values and aquatic functions for a variety of fish and wildlife resources at the Bolsa Chica Lowlands, including but not limited to endangered species; and

XVI. WHEREAS, the Bolsa Chica Lowlands are an appropriate location to offset future, unavoidable habitat losses within the Harbor Districts, including allowing offset credit for some creation, restoration, and enhancement of habitat types different from those affected by the Harbor Districts' projects and some deviation from accepted port mitigation practices; and

XVII. WHEREAS, implementation of a compensatory mitigation procedure at the Bolsa Chica Lowlands is in the best interests of the people of the State in that such mitigation best promotes public trust purposes by restoring lands to the character of tide and submerged lands, appropriately locating the mitigation in consideration of public trust needs, by addressing the specific impacts of the Harbor Districts' landfill projects, and by ensuring that the Lowlands will only be used for public trust purposes of fish and wildlife habitat protection in perpetuity; and

XVIII. WHEREAS, nearly all of the Bolsa Chica Lowlands not already owned by the SLC are owned by three other entities; and

XIX. WHEREAS, the Signal Bolsa Corporation, a wholly owned subsidiary of the Koll Real Estate Group, Inc., owns approximately 930 acres in the Bolsa Chica Lowlands, making it the largest of the landowners in the Lowlands, and has indicated a willingness to sell to the SLC, under certain terms and conditions, approximately 880 acres of the property which it owns in the Bolsa Chica Lowlands; and

XX. WHEREAS, should it become possible to acquire a minimum of approximately 880 acres of the unrestored Bolsa Chica Lowlands from the Signal Bolsa Corporation, the FWS, CDFG, SLC, EPA, RA, USACE, NMFS, and CONSERVANCY contemplate physically altering a portion of the Lowlands acquired from the Signal Bolsa Corporation to restore fish and wildlife habitat by restoring tidal influence, recontouring portions of the wetland, maintaining the wetland as altered, and taking other actions, as generally and conceptually described in the "Concept Plan for Fish and Wildlife Habitat Restoration at the Bolsa Chica Lowlands, Orange County, California" (the "Concept Plan"), attached hereto as Exhibit "A" and incorporated herein by this reference; and

XXI. WHEREAS, public acquisition of lands in the Bolsa Chica Lowlands which are not presently owned by the SLC would facilitate public agency implementation of the Concept Plan; and

XXII. WHEREAS, none of the parties to this Agreement independently has the necessary financial resources to acquire the properties in the Bolsa Chica Lowlands and to undertake the implementation of the Concept Plan; and

XXIII. WHEREAS, the parties find that a joint effort which combines their financial and other resources and their expertise would assist the parties in carrying out the acquisition and restoration of the Bolsa Chica Lowlands and would be mutually advantageous; and

XXIV. WHEREAS, the parties have determined that entering into this Agreement does not constitute the adoption of, or a commitment to carry out, the Concept Plan as those terms are used in the California Environmental Quality Act, Public Resources Code Section 21000, et seq. ("CEQA"), that entering into this Agreement does not constitute a major Federal action significantly affecting the human environment as those terms are used in the National Environmental Policy Act, 42 U.S.C. Section 4321, et seq. ("NEPA"), and that completion of CEQA and NEPA compliance are conditions precedent to any party being committed to carry out any obligations set forth in this Agreement for which such compliance is required; and

XXV. WHEREAS, the CONSERVANCY has the statutory authority to prepare plans, preliminary and final designs, environmental documents, and permit applications, and to undertake other activities necessary to implementation of a resource enhancement plan pursuant to Chapter 6 of Division 21 of the Public Resources Code and to the terms and conditions of this Agreement; and

XXVI. WHEREAS, the parties have determined that: (1) SLC is the appropriate agency to hold fee title to any property acquired in the Bolsa Chica Lowlands, (2) the CONSERVANCY is the appropriate agency to take the lead in preparing final plans for the physical features identified in the Concept Plan, in consultation with the other parties to this Agreement, (3) the SLC is the appropriate agency to obtain all necessary Federal and State permits and approvals for implementing the Concept Plan and is the appropriate lead State agency for preparation of CEQA documents for implementing the Concept Plan, (4) the FWS and USACE are the appropriate co-lead Federal agencies for preparation of NEPA documents for the Federal actions that will be required for construction of the physical features identified in the Concept Plan, (5) the FWS is the appropriate agency to oversee construction of the said physical features, and (6) the SLC is the appropriate agency to operate, maintain, monitor, and manage the completed project and all properties acquired in the Bolsa Chica Lowlands; and

XXVII. WHEREAS, the EPA, NMFS, CDFG, CONSERVANCY, RA, and BOARDS shall cooperate with the SLC and with the USACE and FWS in processing applications for permits and approvals for implementing the Concept Plan; and

XXVIII. WHEREAS, the RA and the U.S. Department of the Interior are deliberating on the development of a Southern California wetlands clearinghouse which could define a new approach to the restoration of Southern California's severely diminished coastal wetlands and could secure more efficient and more certain mitigation for necessary coastal development.

NOW, THEREFORE, in consideration of the mutual promises and other good and valuable consideration hereinafter set forth, the parties hereto agree as follows:

## DESCRIPTION OF THE BOLSA CHICA LOWLANDS PROJECT

SECTION 1. Short Description of Project.

(a) The Bolsa Chica Lowlands Project (the "Project") shall consist of the following components: (1) the acquisition by the SLC of as many properties in the Bolsa Chica Lowlands as possible, but not less than approximately 880 acres (the "Land Acquisition Component"), (2) the expeditious restoration of the wetlands and habitat areas in the Bolsa Chica Lowlands which are identified in the Concept Plan as the Full Tidal area (consisting of approximately 384 gross acres, inclusive of the degraded, unrestored areas within the Inner Bolsa Bay portion of the existing SLC/CDFG

Ecological Reserve (the "**Ecological Reserve**") and possibly including the most recently restored cell in the Inner Bolsa Bay portion of the Ecological Reserve) and the Managed Tidal areas (consisting of approximately 220 gross acres), subject to all necessary permits and approvals and completion of appropriate environmental analysis pursuant to Section 4 below, which restoration shall include planning, obtaining permits and approvals for, designing, and constructing the physical features identified in the Concept Plan (the "**Restoration Features Component**"), (3) monitoring activities to determine the condition of the restored habitats in the Full Tidal and Managed Tidal areas on a regular basis and the necessary operation, maintenance and management of the Full Tidal and Managed Tidal areas and their associated physical features, both during and after construction of those physical features (the "**Restoration O&M Component**"), and (4) the necessary maintenance and management of the approximately 275 gross acres which are identified in the Concept Plan as the Future Full Tidal area and of the approximately 120 gross acres which are identified in the Concept Plan as the Seasonal Ponds area (the "**Management Component**"). The Project does not intend any modification of the Outer Bolsa Bay portion of the Ecological Reserve currently under full tidal influence or of the Inner Bolsa Bay portion of the Ecological Reserve currently under muted tidal influence, except for the possible inclusion, as noted above in this subsection, of the most recently restored cell in the Restoration Features Component of the Project. Furthermore, restoration of the Future Full Tidal area as identified in the Concept Plan is not a part of the Project as defined herein. If established, and as appropriate, a Southern California wetlands clearinghouse or other mechanism could provide future mitigation opportunities for restoration and enhancement of that portion of the Bolsa Chica Lowlands which is in the Future Full Tidal area as identified in the Concept Plan.

(b) In entering into this Agreement, the parties intend, subject to Section 3 below, to carry out the Project in substantial conformance with the Concept Plan, except as future compliance with NEPA, CEQA, ESA, Section 404 (b)(1) Guidelines of the Federal Clean Water Act, and other applicable laws may require otherwise.

(c) Consistent with the goals and general description of the Project as set forth in the Concept Plan attached as Exhibit A, and subject to such modifications (if any) of the Restoration Features Component of the Project as are determined to be necessary to mitigate its adverse environmental impacts, the USACE, NMFS, EPA, FWS, and CDFG agree that the Restoration Features and Restoration O&M Components of the Project shall provide mitigation, as described in Section 14 below, for new landfills to be constructed by the BOARDS.

(d) The parties agree that the Project shall provide, in perpetuity, fish and wildlife habitats in the Bolsa Chica Lowlands consistent with the Concept Plan. Therefore, fee title to any property acquired and to the capital improvements constructed thereon, as well as to all other capital improvements constructed as part of the Project, shall be vested in the SLC and held in public trust by the SLC for the purposes of ecological restoration and preservation, scientific study, open space, and fish and wildlife habitat protection.

## THE LAND ACQUISITION COMPONENT OF THE PROJECT

SECTION 2. Lands to be Acquired.

(a) The parties acknowledge and agree that it will be necessary to purchase from the Signal Bolsa Corporation a minimum of approximately 880 acres in the Bolsa Chica Lowlands. The parties further acknowledge and agree

that the purchase price for the said 880 acres (more or less) will have to be paid, in part, with monies to be provided by the BOARDS pursuant to Sections 8(a) and 12(a) below.

(b) The parties agree that the SLC will endeavor to acquire title in fee to substantially all of the property in the Bolsa Chica Lowlands not owned by the State as of the date of this Agreement, including the property owned by the Fieldstone Corporation as of the date of this Agreement; Provided, however, that the first land to be acquired must be a minimum of approximately 880 acres of the property owned by the Signal Bolsa Corporation. Lands owned by persons or entities other than the Signal Bolsa Corporation may be acquired with Project funds only after construction of the Restoration Features Component of the Project (on the approximately 604 gross acres which are associated with that component) has been completed in accordance with Section 5 below or, if construction has not been completed, then only if, and to the extent that, the FWS determines, after consultation with the other State and Federal agencies which are parties to this Agreement, that sufficient monies would remain available after such property acquisition to complete the construction of the Restoration Features Component of the Project.

(c) The acquisition by the SLC of a minimum of approximately 880 acres in the Bolsa Chica Lowlands from the Signal Bolsa Corporation shall be subject to satisfaction of the conditions precedent and other requirements set forth in Section 13(a)(1) below.

## PLANNING, PERMITTING, AND CONSTRUCTION OF THE PROJECT

SECTION 3. Completion of Planning for the Project.

(a) On behalf of the SLC, RA, CDFG, FWS, NMFS, USACE, and EPA, the CONSERVANCY shall be responsible for preparing, or causing to be prepared, a more detailed plan of the Restoration Features Component of the Project than is set forth in the Concept Plan, which plan (the "Feasibility Plan") shall be based upon and consistent with the Concept Plan and shall be prepared at the level of detail required by the SLC, USACE, and FWS for the purposes of the NEPA/CEQA compliance process for which those agencies are responsible pursuant to Section 4 below; Provided, however, that the CONSERVANCY may not incur any expenses for, nor commence preparation of, the Feasibility Plan until the SLC has received title to a minimum of approximately 880 acres of the property owned by the Signal Bolsa Corporation in the Bolsa Chica Lowlands. The CONSERVANCY shall consult closely with the SLC, RA, CDFG, FWS, NMFS, USACE, and EPA, and shall comply with the requirements of Section 13(b) below, in conducting any studies required for, and in preparing, the Feasibility Plan.

(b) Following completion of NEPA/CEQA compliance by the SLC, USACE, and FWS pursuant to Section 4 below, the CONSERVANCY shall, on behalf of the SLC, RA, CDFG, FWS, NMFS, USACE, and EPA, prepare, or cause to be prepared, such modifications, if any, in the Feasibility Plan as may be required by the results of the NEPA/CEQA process and such preliminary engineering designs and drawings as may be required by the SLC, USACE, and FWS for the purpose of all necessary State and Federal regulatory permit applications (collectively, the "Final Plan"). The CONSERVANCY shall consult closely with the SLC, RA, CDFG, FWS, NMFS, USACE, and EPA, and shall comply with the requirements of Section 13(b) below, when preparing the Final Plan.

(c) In order to prepare the Feasibility Plan and the Final Plan, including any studies or analyses needed therefore, the CONSERVANCY may, at its option but subject to the requirements of Section 13(b)(1), contract for and utilize the services of consultants rather than utilizing its own personnel.

(d) The parties acknowledge that the final configuration of the Restoration Features Component of the Project (including, but not limited to, the location of the tidal inlet, depths in the Full Tidal Basin, and configuration of the Garden Grove-Wintersburg Flood Control Channel) will be determined through the planning, public consultation, environmental review and documentation, and permitting processes provided for by this section and Section 4, which processes will address differences between the Concept and Feasibility Plans and the separate wetlands restoration plan which has already been approved by the County of Orange.

SECTION 4. Lead Agencies for NEPA/CEQA Compliance and Permits.

(a) Utilizing the Feasibility Plan prepared by the CONSERVANCY, the SLC shall be responsible, in consultation with the FWS and USACE, for obtaining all Federal and State permits and approvals necessary for the implementation of the Restoration Features Component of the Project. The SLC shall be the lead State agency for compliance with CEQA. The FWS and the USACE shall be co-lead Federal agencies for compliance with NEPA for Federal actions associated with implementation of the Restoration Features Component of the Project. The SLC, FWS, and USACE agree to prepare, or cause to be prepared, and to process joint NEPA and CEQA documents, including any supplemental CEQA/NEPA documentation that may be required during or after construction of the Restoration Features Component of the Project. In carrying out these responsibilities, the SLC, FWS, and USACE shall consult closely with the RA, CDFG, CONSERVANCY, EPA, and NMFS and shall comply with the requirements of Section 13(b) below.

(b) In preparing the required NEPA/CEQA documents and the required permit applications, including any supporting studies and analyses, the SLC, FWS, and USACE may each, at its option but subject to the requirements of Section 13(b)(1), contract for and utilize the services of consultants rather than utilizing its own personnel.

SECTION 5. Construction of the Restoration Features Component of the Project.

(a) On behalf of and in consultation with the SLC, RA, CDFG, CONSERVANCY, NMFS, EPA, and USACE, the FWS shall be responsible for performing, or causing the performance of, any sediment sampling, archaeological surveys, or other technical studies, or any supplemental NEPA documentation, required before or during construction as a condition of any approvals or permits for the Project or because of changed circumstances; for preparing, or causing the preparation of, final designs and specifications; and for constructing, or causing the construction of, the Restoration Features Component of the Project. The FWS shall be obligated to construct the Restoration Features Component of the Project in substantial conformance with the Final Plan and in conformance with any Federal or State permits or approvals issued for that component.

(b) In carrying out the activities required of it by subsection (a) of this section, the FWS may, at its option but subject to the requirements of Section 13(b)(1), contract for any necessary services (including, but not limited to, construction management), rather than providing the same with its own personnel. Such contracts may, at the FWS's option, be with the SLC or CONSERVANCY.

(c) The FWS's obligation to initiate and proceed with construction of the Restoration Features Component of the Project is expressly conditioned upon completion of all necessary NEPA/CEQA documentation and findings; approval of the Final Plan by the FWS, USACE, NMFS, and EPA; the obtaining of

all necessary permits and approvals; and compliance with all legally imposed conditions of the permits and approvals. Furthermore, the FWS shall have no obligation to initiate construction, or thereafter award any given construction contract, unless and until it determines, in its sole discretion, that the monies remaining for the Project at the time are sufficient to complete construction or, if applicable, cover the amount of a given contract. If the FWS determines pursuant to the preceding sentence to not proceed with construction or the award of any given contract, then any monies for the Project which remain unexpended at that time shall be handled in accordance with Section 14(b) below.

(d) The SLC shall grant to the FWS, pursuant to a license or other permission to enter upon its property, or pursuant to a short term lease, the right to enter upon and occupy the property for the purpose of constructing the Restoration Features Component of the Project, any such license, other permission to enter, or lease being upon mutually agreeable terms and conditions as between the SLC and the FWS.

SECTION 6. Project Schedule. All parties hereto shall perform their obligations hereunder with all due diligence so as to facilitate progress and completion of the Project in substantial conformance with the Concept Plan, as refined by the Final Plan. All parties desire that the implementation of the Project shall be undertaken in an expeditious manner, with actual construction of the Restoration Features Component of the Project anticipated to be initiated not later October 1, 1999, and anticipated to be substantially completed within three years of the time actual construction is initiated.

## OPERATION AND MAINTENANCE OF THE PROJECT

SECTION 7. Project Operation, Maintenance and Management.

(a) To the extent that monies are available from the Maintenance Account pursuant to Section 13(c) below, the SLC shall be responsible for effecting the Restoration O&M and Management Components of the Project for the primary purpose of preserving in perpetuity fish, wildlife, and wetland habitat values and aquatic functions. The parties acknowledge and agree that the SLC may enter into an agreement or agreements with another agency or entity (including, but not limited to, long-term leases of Project lands and features) in order to effect the said components of the Project.

(b) If the SLC elects to effect the said components of the Project by entering into an agreement or agreements with another agency or entity, it must first offer to the CDFG and FWS the opportunity to enter into such agreement or agreements, including a long-term lease of Project lands and features. If both the CDFG and the FWS decline to enter into such an agreement or agreements with the SLC, or if mutually satisfactory terms cannot be agreed to after good faith negotiations, then the SLC may enter into an agreement or agreements with a third party approved by the RA, CDFG, CONSERVANCY, FWS, EPA, NMFS, and USACE.

(c) If the SLC enters into such an agreement with the FWS, then the FWS hereby covenants that it shall manage all lands acquired for the Project, and all physical features associated therewith, as a unit of the National Wildlife Refuge System pursuant to Title 50 of the Code of Federal Regulations and the FWS and the CDFG agree to cooperate in their management and maintenance of, respectively, the Project and the Ecological Reserve.

## FUNDING FOR THE PROJECT

SECTION 8. Sources of Funding for the Project.

(a) Each BOARD will provide the sum of $33,375,000, which sum shall constitute the entirety of each BOARD's financial obligation under this Agreement. Each BOARD will deposit this sum with the SLC in accordance with Section 12(a) below, less any amount, not to exceed $50,000 for each BOARD, advanced by a BOARD to the SLC for the purpose of defraying the SLC's costs of negotiating a contract with the Signal Bolsa Corporation for the purchase of its property by the SLC.

(b) The CONSERVANCY will provide a discretionary grant of matching funds in the amount of $1,000,000. The said $1,000,000 shall be deposited by the CONSERVANCY in accordance with Section 12(a) below.
The parties understand and agree that this grant cannot be used to pay for mitigation required for the landfill in the outer harbor areas of the BOARDS' Harbor Districts, but rather will be utilized to assure acquisition, to assure preparation of the Feasibility Plan and/or the Final Plan, and/or to assure restoration of wetlands in the Bolsa Chica Lowlands not included in the Full Tidal and Managed Tidal areas as identified in the Concept Plan.

(c) The parties acknowledge that, as of the date of this Agreement, the monies to be provided by the BOARDS and the CONSERVANCY, including future interest earnings thereon over time, may not be sufficient to fully fund the acquisition of all properties in the Bolsa Chica Lowlands as well as the other three components of the Project, depending upon the results of further engineering studies. Therefore, additional sources of funding will be actively sought for the Project by the State and Federal agencies which are parties to this Agreement in advance of the decision points identified in Section 13(a)(1).

(d) Nothing in this Agreement shall be construed to prohibit the CONSERVANCY, USACE, the BOARDS, or any other agencies or entities from funding restoration of any portion of the Bolsa Chica Lowlands that does not provide mitigation for the BOARDS' projects (e.g., the Future Full Tidal area as identified in the Concept Plan).

SECTION 9. Management of Monies Received for the Project.

(a) All monies received for the Project, except for those obligated and encumbered by a Federal agency in accordance with Section 12(c), shall be deposited with the SLC and then immediately placed by the SLC into the SLC's Land Bank Fund. All monies so received, and all interest earnings thereon, shall be held by the SLC for the benefit of the parties to this Agreement and the SLC shall administer and disburse all such monies and interest earnings only in accordance with the requirements and limitations of this Agreement.

(b) The parties acknowledge that monies for the Project which are deposited in the SLC's Land Bank Fund will be commingled with monies from numerous State funds and accounts and managed and invested by the State Treasurer. The SLC agrees that the SLC and the State Treasurer shall manage and invest the monies deposited with the SLC for the Project at no cost to the parties or to the Project.

## ACTIONS TO BE SOUGHT FROM THE CALIFORNIA COASTAL COMMISSION

SECTION 10. Initial Federal Consistency Determination.

(a) In accordance with the requirements of section 307(c) of the Federal Coastal Zone Management Act (16 U.S.C. §1456(c)) and of Subpart C, Part 930, Chapter IX, Title 15 of the Code of Federal Regulations (15 CFR §§930.30 et seq.), the FWS and/or the USACE shall prepare and present to the California Coastal Commission (the "Coastal Commission") for its consideration an initial Federal consistency determination for the Project, which initial determination shall be based upon the Concept Plan. Concurrently therewith, the BOARDS shall submit to the Coastal Commission for its action such amendments to their existing Port Master Plans as they deem necessary in order to obtain Coastal Commission approval of the 454 acres of mitigation credits to be granted to the BOARDS pursuant to Sections 14 and 15 of this Agreement. The said consistency determination and amendments to the Port Master Plans shall be presented to the Coastal Commission for consideration at its October, 1996, meeting unless the Signal Bolsa Corporation advises the SLC, FWS, and BOARDS in writing that it has no objection to the said matters being presented to the Coastal Commission at its November, 1996, meeting or at its January, 1997, meeting.

(b) If the Coastal Commission acts to express its disagreement with this initial Federal consistency determination or fails to act on it at all prior to November 16, 1996, or if the Coastal Commission acts to express its agreement with this initial Federal consistency determination prior to November 16, 1996, but does not approve the amendments to the BOARDS' Port Master Plans prior to this date, then this Agreement shall automatically terminate on November 30, 1996, and no party hereto shall have any further obligations hereunder; Provided, however, that if the initial Federal consistency determination and the amendments to the BOARDS' Port Master Plans are not presented to the Coastal Commission until its January, 1997, meeting, then the foregoing November 16 and November 30, 1996, dates shall be automatically extended to January 11, 1997, and January 25, 1997, respectively.

SECTION 11. Subsequent Federal Consistency Determination. The parties acknowledge that a second Federal consistency determination will need to be submitted to the Coastal Commission based upon the Final Plan. The FWS and/or the USACE shall be responsible for preparing and submitting this second determination to the Coastal Commission at the appropriate time.

## DEPOSITS AND DISBURSEMENTS OF MONIES FOR THE PROJECT

SECTION 12. Deposits of Monies.

(a) If the Coastal Commission acts to express its agreement with the initial Federal consistency determination and to approve the accompanying amendments to the Ports' Master Plans by the deadlines set forth in Section 10(b) above, and if both BOARDS determine, each in their sole discretion acting in accordance with Section 13(a)(1)(F) below, that the Coastal Commission's actions and findings reflect the Coastal Commission's approval of the use of mitigation credits for the BOARDS' landfills consistent with the conditions of this Agreement, then, and only then, the BOARDS and CONSERVANCY shall be obligated to deposit with the SLC the sums specified in Section 8(a) and 8(b), respectively, within three business days after the date upon which the last of the conditions set forth in subparagraphs (A), (B), (C), (E), and (F) of Section 13(a)(1) below is satisfied.

(b) All sources of other non-Federal monies shall, if and when received, be deposited with the SLC, unless otherwise agreed by the SLC and the entity providing the monies. All sources of other non-Federal monies deposited with the SLC shall be placed by it in its Land Bank Fund and managed by it in accordance with the requirements of Section 9 above.

(c) If any Federal funding is forthcoming, it shall either be deposited with and managed by the SLC in accordance with the requirements of Section 9 above or obligated and encumbered by the involved Federal agency for direct expenditure by that Federal agency on the Project.

SECTION 13. Disbursements from the SLC's Land Bank Fund. Monies deposited into the SLC's Land Bank Fund pursuant to this Agreement from all sources shall be disbursed and used only as follows:

(a) Land Acquisition Component of the Project. Subject to the requirements of Section 1(d), Section 2, and paragraph (1) of this subsection (a), the SLC may use monies deposited in its Land Bank Fund pursuant to this Agreement for the acquisition of any lands in the Bolsa Chica Lowlands.

(1) The SLC may not use any monies from the Land Bank Fund for the purchase of all or any portion of the Signal Bolsa Corporation's property in the Bolsa Chica Lowlands unless and until:

(A) The FWS, USACE, NMFS, and EPA have each advised the other parties to this Agreement in writing prior to December 16, 1996, that each of them has determined, in its sole discretion after consultation with the other Federal agencies to this Agreement, that the acquisition of land from the Signal Bolsa Corporation in the Bolsa Chica Lowlands should be consummated and the planning, environmental review, and regulatory permitting processes for the Project commenced in accordance with Sections 3 and 4 above,

(B) The RA, CDFG, and CONSERVANCY have each advised the other parties to this Agreement in writing prior to December 16, 1996, that each of them has determined, in its sole discretion after consultation with the other State agencies to this Agreement, that the acquisition of land from the Signal Bolsa Corporation in the Bolsa Chica Lowlands should be consummated and the planning, environmental review, and regulatory permitting processes for the Project commenced in accordance with Sections 3 and 4 above,

(C) The SLC has advised the other parties to this Agreement in writing prior to December 16, 1996, that it is prepared to take title to the lands which the Signal Bolsa Corporation is requiring be purchased and that the Signal Bolsa Corporation is prepared to sell to the SLC a minimum of approximately 880 acres,

(D) The Coastal Commission has acted to express its agreement with the initial Federal consistency determination, to approve the amendments to the Ports' Master Plans, and to adopt findings which reflect the Coastal Commission's approval of the use of the mitigation credits for the BOARDS' landfills, consistent with the conditions of this Agreement, which findings and actions must be satisfactory to both BOARDS, each acting in its sole discretion,

(E) Sixty (60) days have elapsed from the date of the Coastal Commission's final action on the initial Federal

consistency determination and on the amendments to the Ports' Master Plans, and

(F) The SLC has received written notification from each BOARD (which notification shall be provided by the sixty-fifth day after the Coastal Commission's final action on the initial Federal consistency determination and on the amendments to the Ports' Master Plans or by the fifth business day after the last of the notifications required by subparagraphs (A), (B), and (C) of this paragraph (1) is given, whichever is later) advising that each has determined, in its sole discretion, that the Coastal Commission's actions are satisfactory to it, that all other pre-conditions to the vesting of the mitigation credits have been satisfied or are being waived by it, and that the SLC should proceed to close the transaction.

(2) If all of the Federal and State agencies do not, prior to December 16, 1996, determine pursuant to paragraphs (1)(A) and (1)(B)immediately above to proceed, then this Agreement shall automatically terminate on the said date and no party hereto shall have any further obligations under this Agreement.

(b) Restoration Features Component of the Project.

(1) If, and only if, title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has vested in the SLC and $5 million has been transferred into the Maintenance Account in accordance with subsection (c) of this section, then all monies remaining in or subsequently deposited to the Land Bank Fund pursuant to this Agreement, and the interest earnings thereon, shall be available to the SLC, FWS, USACE, and the CONSERVANCY to cover the costs incurred by each of them in carrying out the activities for which they are responsible pursuant to Sections 3, 4, and 5 of this Agreement in accordance with the following:

(A) It is understood and agreed that the CONSERVANCY, SLC, USACE, and FWS will obtain the contractual services of planning consultants, consulting engineers, construction management firms, construction contractors, and other necessary consultants and contractors to accomplish the activities for which each of them is responsible. The costs of all such contractual services incurred by the CONSERVANCY, SLC, USACE, and FWS shall be paid for out of the monies in the SLC's Land Bank Fund that are available for the Restoration Features Component of the Project.

(B) With respect to the activities for which the CONSERVANCY is responsible pursuant to Section 3, its direct staff costs (including benefits), reasonable overhead costs associated with such direct staff costs, costs of materials and supplies, costs of liability insurance, and costs of defending against any litigation filed against the CONSERVANCY by reason of its actions pursuant to Section 3, not to exceed $500,000 unless the other State and Federal parties to this Agreement agree to a larger amount, shall be paid for out of the monies in the SLC's Land Bank Fund that are available for the Restoration Features Component of the Project.

(C) With respect to the activities for which the SLC, USACE, and FWS are responsible pursuant to Sections 4 and 5, each of those parties direct staff costs (including benefits), reasonable overhead costs associated with such direct staff costs, and costs of materials and supplies shall be paid for out of the

monies in the SLC's Land Bank Fund that are available for the Restoration Features Component of the Project.

(D) Expenditures by the SLC, FWS, USACE, and the CONSERVANCY from the SLC's Land Bank Fund for implementation of the Restoration Features Component of the Project shall be made in accordance with an annual work program and budget prepared by each agency and agreed to by the other State and Federal parties to this Agreement. The SLC, FWS, USACE, and the CONSERVANCY shall provide the other State and Federal parties with quarterly reports of their respective expenditures while the Restoration Features Component of the Project is being implemented, with a final accounting of expenditures to be made by the SLC, FWS, USACE, and the CONSERVANCY upon completion each of the activities for which they are responsible pursuant to Sections 3, 4, and 5 above.

(E) Unless the Federal and State parties agree to the contrary, all contracts entered into by the SLC, USACE, FWS, and the CONSERVANCY for the purpose of implementing the Restoration Features Component of the Project using monies deposited to the Land Bank Fund shall contain a clause which provides that all work under the contract can be suspended by the SLC, USACE, FWS, or CONSERVANCY for a period of 60 days without penalty and a clause which provides that the contract is terminable by the SLC, USACE, FWS, or CONSERVANCY on no more than thirty (30) days notice without any further obligation other than to pay for non-cancellable costs incurred by the contractor prior to the date of notice to terminate and for services already provided.

(2) For the purposes of paragraph (1) of this subsection (b), the CONSERVANCY, FWS, or USACE may each enter into an agreement with the SLC to specify the details of transferring funds from the SLC's Land Bank Fund to each of them in a manner that best meets the administrative needs of the SLC and the other involved agency.

(3) One hundred eighty days after construction of the Restoration Features Component of the Project is completed, any monies remaining in the Land Bank Fund for the Project, except for the monies previously placed in the Maintenance Account (including any accrued interest earnings thereon) and except for monies otherwise encumbered, not to exceed $3,000,000, shall be transferred by the SLC to the Maintenance Account to become part of the principal in the said account unless all of the Federal and State parties to this Agreement agree to an alternative disposition of the remaining monies; Provided, however, that if any construction or litigation claims have been proffered or are reasonably expected to be lodged, then no monies shall be transferred by the SLC to the Maintenance Account until the claims have been resolved. If the remaining monies exceed $3,000,000, then the amount in excess of $3,000,000 shall be available, upon the mutual written agreement of the Federal and State parties to this Agreement, for the restoration of the Future Full Tidal area described in the Concept Plan.

(c) Restoration O&M and Management Components of the Project.

(1) If, and only if, title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has vested in the SLC, then not later than ten business days after the vesting of title, $5,000,000 shall be placed by the SLC in a separate Maintenance Account within the SLC's Land Bank Fund, to be permanently reserved as the principal of the Maintenance Account and managed for the production of investment income for the purposes of, and in accordance with, this subsection (c).

(2) Monies in the Maintenance Account shall be disbursed and used only for the expenses associated with the Restoration O&M and Management Components of the Project, as follows:

(A) Commencing at the end of the first year following the creation of the Maintenance Account, and each year thereafter, a sufficient portion of the interest earnings from the year shall be added to the principal of the Maintenance Account to cover the effects of any inflation which occurred during the year, as measured by the Consumer Price Index.

(B) From the date on which title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has vested in the SLC, accrued interest earnings from the Maintenance Account which remain after the requirements of subparagraph (A) of this paragraph (1) have been met may be used by the SLC, or the agency which has entered into an agreement with the SLC to manage the Project, for such operation, maintenance, monitoring, and management of the Project's lands and physical features as is necessary to maintain the Project's habitat values and aquatic functions, including removal of any blockage that may occur in the ocean inlet.

(C) Throughout the first, second, third, fifth, and tenth years following completion of the Restoration Features Component of the Project, the SLC, or the agency which has entered into an agreement with the SLC to manage the Project, shall carry out biological monitoring to document the fish and wildlife values and aquatic functions of the Project, with all costs of said monitoring to be covered with accrued interest earnings from the Maintenance Account. Such monitoring shall be carried out in accordance with a plan developed by the SLC, or the agency which has entered into an agreement with the SLC to manage the Project, and approved by the NMFS, FWS, EPA, USACE, and CDFG and shall include success criteria and at least an annual report for each of the years that are monitored which describes the results of each year's monitoring.

(D) The carrying out of the Restoration O&M and Management Components of the Project (including biological monitoring), and expenditures therefor from the Maintenance Account, shall be made in accordance with an annual work program and budget prepared by the SLC, or the agency which has entered into an agreement with the SLC to manage the Project, and agreed to by the NMFS, FWS, EPA, USACE, and CDFG. The SLC, or other managing agency, shall provide NMFS and CDFG with quarterly reports of: (i) its expenditures for restoration activities through the quarter in which construction of the Project is completed, (ii) its expenditures for operation, maintenance, monitoring, and management of the Project through year ten following completion of the full tidal basin and ocean inlet portions of the Project, and (iii) any withdrawals of the principal in the Maintenance Account, made in accordance with paragraph (4) of this subsection (c), including the justification therefor.

(3) Any accrued interest earnings which are not reinvested or withdrawn and expended in accordance with paragraph (2) of this subsection (c) shall remain available for future expenditure in accordance with the said paragraph (2), unless the State and Federal parties to this Agreement agree to add all or a portion of such excess interest earnings to the principal of the Maintenance Account.

(4) Account principal (i.e., the original $5,000,000 and interest earnings added thereto over time) shall be available for expenditure only for the purpose of ensuring the preservation of fish, wildlife and wetland habitat values and aquatic functions in the event of a natural disaster or other catastrophic event of a non-recurring nature which would otherwise significantly reduce or eliminate such values and functions.

(d) Expenditures of monies made available for the Project shall be deemed to be made from the following sources:

(1) For the purposes of acquiring the initial 880 acres (more or less) from the Signal Bolsa Corporation, $1,000,000 of the purchase price shall be deemed to come from the monies provided by the CONSERVANCY in accordance with Section 8(b), with the balance coming in prorata shares from all other sources of monies available at the time of closing.

(2) For the purposes of reimbursing costs incurred by the CONSERVANCY, SLC, FWS, and USACE in carrying out their respective responsibilities pursuant to Sections 3, 4, and 5, reimbursement of such costs shall be deemed to come in prorata shares from all sources of monies available for activities undertaken pursuant to Sections 3, 4, and 5.

(e) All records, invoices, vouchers, ledgers, correspondence, and other written documents of any kind developed during the course of the Project which document the expenditure by any party of monies for the Project, whether from the Land Bank Fund or otherwise, shall be retained for a period of four (4) years following the year in which an expenditure was made and shall be available to the extent provided under applicable law (such as the Public Records Act and Federal Freedom of Information Act), for audit by any party to this Agreement.

(f) If this Agreement or a related project results in litigation in which any party to this Agreement is challenged, each party shall bear its own legal fees and expenses, except as provided in Section 13(b)(1)(B) with respect to the CONSERVANCY.

## GRANTING, VESTING, AND USE OF MITIGATION CREDITS

SECTION 14. Mitigation Credits Created by Project.

(a) Implementation of the Restoration Features and Restoration O&M Components of the Project are expected to create habitat values and aquatic functions, as determined in Exhibit B, sufficient to offset 454 acres of landfill in the outer harbor areas of the Harbor Districts. This is based on implementation of the Concept Plan as described in Exhibit A. The Concept Plan calls for a new ocean inlet and habitat areas subject to full tidal action in the following approximate proportions: not less than 50 percent below -3 feet Mean Lower Low Water (MLLW), 35 percent between -3 and +2.5 feet MLLW, and 15 percent between +2.5 and +5.5 feet MLLW.

(b) Even if it turns out that implementing the Restoration Features and Restoration O&M Components of the Project in accordance with the Final Plan as developed pursuant to Sections 3 and 4 will not generate sufficient habitat values and aquatic functions to create all 454 acres of landfill mitigation credit, or even if it turns out that the funding for construction of the Restoration Features Component of the Project proves to be insufficient and construction is terminated in accordance with Section 5(c) above with the

result that sufficient habitat values and aquatic functions are not generated so as to create all 454 acres of landfill mitigation credit, the 454 credits shall still remain vested in the BOARDS for their use in accordance with Section 15.

(1) If either of these events occurs, the USACE, FWS, NMFS, CDFG, EPA, SLC, RA, and CONSERVANCY shall (with good faith, due diligence, to the extent feasible and consistent with CEQA, NEPA, and other applicable laws, and to the extent that monies made available pursuant to this Agreement remain available in the SLC's Land Bank Fund after funding the Project) identify, plan, design, and implement an alternative tidal restoration project for the Bolsa Chica Lowlands or an appropriate tidal restoration project or projects at a location or locations other than the Bolsa Chica Lowlands, but still within the Southern California Bight, in order to generate sufficient additional credits. Prior to the expenditure of monies from the Land Bank Fund for this purpose, the parties agree that the lands to be restored at such other location or locations will either be acquired by the SLC or be made subject to a public trust easement in favor of the State of California, acting by and through the SLC.

(2) Furthermore, if either of these events occurs, the Federal and State parties to this Agreement shall, with good faith and due diligence, agree on an allocation of all or a portion of the principal then existing in the Maintenance Account for the operation and maintenance of any tidal restoration project or projects undertaken at a location or locations other than the Bolsa Chica Lowlands, but still within the Southern California Bight.

SECTION 15. Use of Mitigation Credits by the BOARDS.

(a) If the BOARDS have deposited the sum called for by Section 8(a), and if title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has vested in the SLC in accordance with this Agreement, then the BOARDS shall be entitled thereafter to immediately use up to 454 acres of outer harbor landfill mitigation credits to offset impacts of permitted projects. Half of said credits are allocated to each of the two BOARDS, and neither BOARD shall use more than its allocation of credits without express written permission of the other BOARD. One acre of inner harbor landfills (inner and outer harbor areas are shown in Exhibit C) shall be debited from this account at half the rate of outer harbor landfills since the inner harbor has less habitat value per acre than the outer harbor. Should biological surveys indicate that revision of the inner harbor definition shown in Exhibit C is warranted, then the BOARDS, CDFG, NMFS, and USACE may mutually agree to modify Exhibit C accordingly. Each BOARD shall maintain complete records and produce on demand for the other parties a current account of credits expended and remaining. If either BOARD is prevented from using its credits or has credits in excess of its landfill needs, then such BOARD may sell and transfer such credits to the other for the prorated cost of the credits being sold.

(b) The BOARDS covenant and agree that they will undertake port projects which affect fish and wildlife resources only after fee title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has been acquired by the SLC in accordance with this Agreement. The USACE, FWS, EPA, NMFS, and CDFG acknowledge and agree that some BOARD projects may involve impacts to fish and wildlife resources occurring in advance of compensatory mitigation being effected through implementation of the Restoration Features Component of the Project, although the USACE, FWS, EPA, NMFS, and CDFG anticipate that the BOARDS will use the mitigation credits to be generated by the Restoration Features Component of the Project over a number of years. So long as port projects involving fills are not in wetlands as defined in

FWS/OBS 79/31 and have received the required authorizations, the USACE, FWS, EPA, NMFS, and CDFG agree that the BOARDS shall be entitled to use all of the mitigation credits identified in subsection (a) of this section when and as set forth in subsection (a) of this section. This paragraph does not prevent the Ports from carrying out projects which affect fish and wildlife resources which have been mitigated by otherwise available mitigation.

(c) Projects within the Harbor Districts that may be regulated by any party to this Agreement, and which may require compensatory mitigation of marine habitat losses, shall be considered when submitted by the BOARDS. Nothing in this Agreement shall alter or replace the obligation of the FWS, USACE, EPA, NMFS, and CDFG to follow the normal procedures and requirements for processing permits for projects proposed by the BOARDS. If a port landfill project for which BOARDS are seeking permits has followed said normal procedures and is otherwise approvable, the FWS, USACE, EPA, NMFS, and CDFG acknowledge that the biological mitigation credits established by this Agreement will constitute acceptable compensatory mitigation, provided a positive balance of credits established herein exists.

(d) The FWS, USACE, EPA, NMFS, and CDFG (the "Agencies") agree that they have had their respective counsel review this Agreement, the applicable laws and regulations within their respective jurisdictions, the authorities which govern dredge and fill projects in coastal waters, and, as to the Port of Los Angeles (POLA), the "Deep Draft Navigation Project EIR/EIS" and related documentation. Based on this review and consistent with the above paragraphs, the Agencies concur that deposit by the BOARDS of the sums called for by Section 8(a) and acquisition by the SLC of title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands in accordance with this Agreement satisfy all applicable requirements for the vesting of these credits in, and the use of these credits by, the BOARDS in accordance with subsections (a) and (b) of this section. All the Agencies concur that the mitigation credits which POLA receives will fulfill the requirements for up to 227 acres for Phase II of POLA's Pier 400 project, as discussed in the above referenced Deep Draft Navigation Project EIR/EIS, so long as the Coastal Commission and other permit agencies issue permits for such Phase II Pier 400 development. The Agencies further agree that such permit may not be denied solely on the basis that POLA intends to use the mitigation credits received pursuant to this Agreement to mitigate the Phase II Pier 400 landfill.

## MISCELLANEOUS PROVISIONS

SECTION 16. Endangered Species Considerations. All parties agree that construction of the Project will be scheduled and completed taking into account any State or Federal endangered species which may utilize the Project area. Terms and conditions of a Biological Opinion for the Project, prepared pursuant to section 7 of the Federal Endangered Species Act (16 U.S.C. Sec. 1531 et seq.), shall be implemented.

SECTION 17. Effective Date, Term, and Termination/Withdrawal.

(a) This Agreement shall not take effect unless and until it is executed by all ten parties hereto. It shall be dated and take effect as of the latest date upon which it is executed as among the signatories hereto.

(b) This Agreement shall remain in full force and effect until automatically terminated pursuant to the terms hereof or by agreement of all the parties hereto.

(c) If any governmental agency, excluding the BOARDS, but including,

but not limited to, one of the other parties to this Agreement, any trial court (whether or not the trial court's final decision is appealed), or any new or existing legislation prevents either or both BOARDS from using the credits granted by this Agreement in the manner provided by this Agreement (including provisions of Section 14), then the affected BOARD shall be entitled, upon written notice to the other parties, to withdraw from this Agreement and recover its prorata share, less the cost of any non-cancellable obligations, of the unexpended balance of monies remaining in the SLC's Land Bank Fund (including the Maintenance Account). Such withdrawal will only be allowed to occur prior to the award of contracts for the major construction elements (defined as a value of at least $5,000,000) of the Restoration Features Component of the Project or of any BOARD landfill that would have been mitigated by the Restoration Features and Restoration O&M Components of the Project.

(1) If only one BOARD withdraws from this Agreement, then the other BOARD shall have the right to purchase all of the mitigation credits of the withdrawing BOARD by paying directly to the withdrawing BOARD, within 45 calendar days of the other BOARD'S withdrawal, an amount of money equal to the amount to which the withdrawing BOARD is entitled pursuant to paragraph (3) of this subsection (c), in which event the monies of the withdrawing BOARD shall remain in the SLC's Land Bank Fund to be credited to the remaining BOARD and this Agreement shall terminate with respect to the rights and obligations of the withdrawing BOARD, but shall otherwise continue in full force and effect. However, if one BOARD withdraws from this Agreement but the other BOARD does not purchase the withdrawing BOARD'S mitigation credits within the aforementioned 45 day period, then this Agreement shall automatically terminate on the 46th day, unexpended monies deposited with the SLC by each BOARD shall be, subject to paragraph (3) of this subsection (c), immediately returned by the SLC in an amount proportionate to their respective contribution, and neither BOARD shall be allowed any mitigation credits.

(2) If the BOARDS give simultaneous written notices of their withdrawal from this Agreement, or if one BOARD has previously withdrawn and its mitigation credits have been purchased by the second BOARD which thereafter gives written notice of its withdrawal from this Agreement, then this Agreement shall automatically terminate 30 days after receipt of such notices by the SLC, unexpended monies deposited with the SLC by each BOARD (or credited to the second BOARD if it has purchased the first BOARD'S mitigation credits) shall be, subject to paragraph (3) of this subsection (c), immediately returned by the SLC in an amount proportionate to their respective contribution, and neither BOARD shall be allowed any mitigation credits.

(3) In the event a BOARD withdraws from this Agreement pursuant to this subsection (c), then the monies to which a BOARD is entitled shall be limited to that BOARD'S prorata share of the unexpended balance of monies, including interest earnings thereon, which remain as of, and for which no non-cancellable obligations have been incurred as of, the date a BOARD'S notice is received by the SLC.

(d) If a BOARD withdraws from this Agreement as authorized by subsection (c) of this section after acquisition from the Signal Bolsa Corporation of the approximately 880 acres of the Bolsa Chica Lowlands, and if, because of such acquisition, the withdrawing BOARD'S share of the monies used for the said acquisition cannot be returned to or reimbursed to that BOARD, then the Federal and State parties to this Agreement shall negotiate in good faith with the withdrawing BOARD to attempt to reach a mutually acceptable means of making the withdrawing BOARD whole, which may include, but are not limited to, (i) reallocation of mitigation credits, (ii) alternate

mitigation projects, and/or (iii) other forms of consideration.

SECTION 18. Substantial Conformance. The term "in substantial conformance", whenever used in this Agreement, shall mean not differing in any way that results in a reduction in the habitat values and aquatic functions anticipated from the Project and not in conflict with the requirements of State and Federal law.

SECTION 19. Disclaimers.

(a) By participating in this Agreement, no party waives or yields to any other party to the Agreement any regulatory authority or duty that is necessary to the proper exercise of that party's discretion or otherwise imposed by law.

(b) Nothing in this Agreement shall be deemed a waiver of the attorney-client privileges of any party.

SECTION 20. Notices.

(a) Any communications or notices required by this Agreement shall either be mailed by United States first class mail, postage prepaid, and addressed as follows, or transmitted by facsimile as follows:

Executive Director
Port of Los Angeles
P.O Box 151
425 S. Palos Verdes St.
San Pedro, CA 90733
Fax: 310-547-4643

Executive Director
Port of Long Beach
P.O. Box 570
925 Harbor Plaza
Long Beach, CA 90802
Fax: 310-495-4925

Field Supervisor
U.S. Fish and Wildlife Service
2730 Loker Ave. W.
Carlsbad, CA 92008
Fax: 619-431-9624

Regional Director
National Marine Fisheries Service
501 W. Ocean Blvd, Suite 4200
Long Beach, Ca 90802
Fax: 310-980-4018

District Engineer
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box 2711
911 Wilshire Blvd.
Los Angeles, CA 90053-2325
Fax: 213-452-4214

Director, Water Management Division
Attention: Wetlands Section
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105
Fax: 415-744-2499

Executive Officer
California Coastal Conservancy
1330 Broadway
Oakland, CA 94612
Fax: 510-286-0470

Secretary for Resources
California Resources Agency
1416 Ninth St., Suite 1311
Sacramento, CA 95814
Fax: 916-653-8102

Regional Manager
California Department of Fish and Game
330 Golden Shore, Suite 50
Long Beach, CA 90802
Fax: 310-590-5113

Executive Officer
California State Lands Commission
100 Howe Avenue, Suite 100 South
Sacramento, CA 95825-8202
Fax: 919-574-1810

(b) Each party hereto shall be responsible for advising the other parties in writing and in a timely fashion of any changes to the above titles,

addresses, and faxogram telephone numbers, and of any further subsequent changes. Until notice of such changes is received, all communications and notices shall be deemed to have been properly sent if sent to the last known title and address or faxogram telephone number for a party.

SECTION 21. Executed Counterparts. The signature pages of this Agreement are being executed in counterparts. When all parties have signed, all executed counterparts taken together shall constitute one and the same instrument. The FWS shall be responsible for receiving and retaining the originally executed signature pages of each party, for dating the Agreement as of the latest date upon which it is executed as among the signatories hereto, and for providing a copy of the dated and executed Agreement to each of the parties.

IN WITNESS WHEREOF, the parties have entered into this Agreement effective as of the date first written above.

[Two signature pages follow]

CITY OF LOS ANGELES, acting by and through its Board of Harbor Commissioners

Date _____ EXECUTIVE DIRECTOR

CITY OF LONG BEACH, acting by and through its Board of Harbor Commissioners

Date _____ EXECUTIVE DIRECTOR

RESOURCES AGENCY, STATE OF CALIFORNIA

Date _____ SECRETARY

CALIFORNIA DEPT. OF FISH AND GAME

Date _____ DIRECTOR

CALIFORNIA STATE LANDS COMMISSION

Date _____ EXECUTIVE OFFICER

CALIFORNIA COASTAL CONSERVANCY

Date _____ EXECUTIVE OFFICER

U.S. ARMY CORPS OF ENGINEERS

Date _____ DISTRICT ENGINEER

NATIONAL MARINE FISHERIES SERVICE, NOAA

Date _____ REGIONAL DIRECTOR

U.S. FISH AND WILDLIFE SERVICE

Date _____ REGIONAL DIRECTOR

ENVIRONMENTAL PROTECTION AGENCY

Date _____ REGIONAL ADMINISTRATOR

[End of signature pages]

# EXHIBIT A

## CONCEPT PLAN
## FOR FISH AND WILDLIFE HABITAT RESTORATION
## AT THE BOLSA CHICA LOWLANDS,
## ORANGE COUNTY, CALIFORNIA

Bolsa Chica Restoration Goals:

The goal of the Concept Plan for the Bolsa Chica Lowlands Project (the "Project") is to provide for the retention of existing fish and wildlife resources and, to the extent desirable and feasible, the enhancement thereof. Further, it is intended that the ecosystem resulting from the implementation of the plan be naturalistic, biologically diverse, productive, and estuarine in nature. That is, it shall be predominantly salt water influenced, but incorporating biologically beneficial freshwater influence. In addition, the acreage of waters and wetlands in the lowland shall not be diminished.

Specific Objectives of the Concept Plan:

The specific objectives of the Concept Plan for the Bolsa Chica Lowlands Project are that:

@ **overwintering habitat value for migratory shorebirds, seabirds, and waterfowl** shall not be diminished and shall be enhanced where feasible.

@ **nesting habitat for migratory shorebirds and seabirds** shall not be diminished and shall be expanded where feasible.

@ **habitat value for estuarine fishes** shall not be diminished and shall be expanded and diversified where feasible.

@ **nesting and foraging conditions for State and Federal endangered species** shall not be adversely impacted. Also, implementation of the plan shall especially contribute to the recovery of these species: light-footed clapper rail, California least tern, western snowy plover, and Belding's savannah sparrow.

@ the **mix of habitat types** shall include perennial brackish ponds, seasonal ponds/salt flats, pickleweed dominated flats, cordgrass dominated intertidal zone, unvegetated intertidal mudflat, subtidal seawater volume with low residence times.

@ **modifications to the hydraulic regime**, necessary to achieving the above objectives, shall emphasize minimalized requirements for manipulations and maintenance, no degradation of existing flood protection levels.

@ interests of contiguous property owners will be protected.

@ once completed, **maintenance and management** of the area shall be to maximize native, estuarine fish and wildlife habitat value of the Bolsa Chica Lowlands in perpetuity, to include active removal and exclusion of detrimental, nonnative biota.

@ allowable **public uses** shall include passive and non-intrusive recreation activities, focused on peripheral areas, interpretive foci, and trails.

@ total removal of **oil extraction activities** and their past effects shall be conducted in a phased, cost effective, and environmentally sensitive manner.

@ monitoring and evaluation of the success of biological objectives shall be conducted.

Description of Concept Plan for the Bolsa Chica Lowlands Project:

No change is contemplated to the full tidal part of the Ecological Reserve (i.e., Outer Bolsa Bay ) or the muted tidal portion of the Ecological Reserve (i.e., Inner Bolsa Bay), except for the degraded, unrestored areas within Inner Bolsa Bay and except for the possible inclusion in the Full Tidal area (see below) of the most recently restored cell in the Inner Bolsa Bay portion of the Ecological Reserve. No rerouting of the Garden Grove-Wintersburg Flood Channel is contemplated although relocating the existing flapgate outlet about 0.5 miles upstream is contemplated. An area of about 120 acres in the southeasterly corner of the Bolsa Chica Lowlands is also contemplated to be left unchanged and is depicted on the enclosed figure as Seasonal Ponds.

Reestablishing additional areas of full tidal habitat in the Bolsa Chica Lowlands is considered highly desirable for biological diversity and productivity reasons. Bolsa Chica was historically full tidal and had its own ocean inlet. Improving tidal influence is widely recognized as the principle method of restoring missing components of this coastal wetland ecosystem. However, engineering and biological constraints are expected to limit the size and location of contemplated tidal restoration. Some of the areas planned for full tidal restoration already have existing wetlands values, the loss of which will be compensated either through enhancing these values when full tidal action is restored (designated Full Tidal areas), or by introducing managed tidal waters into other areas of the site (designated Managed Tidal areas).

Preliminary engineering indicates that significant increases in the tidal prism (the volume of seawater between the high and low tides) necessary to achieve the biological benefits in the lowland cannot be conveyed through the existing channels of outer Bolsa Chica, through Huntington Harbor and Anaheim Bay without damaging tidal flats and incurring erosion and safety problems. Therefore, an ocean inlet, to reestablish the historic connection to the sea, is contemplated. Avoidance of further beach erosion or water quality problems, encouragement of human recreational access, retention of public safety access, and the public transportation thoroughfare requirements are related factors to be considered in contemplating reestablishment of a Bolsa Chica ocean inlet, with any adverse impacts thereto to be fully mitigated.

The enclosed figure depicts a contemplated ocean inlet connecting to an area shown as Full Tidal (approximately 384 gross acres). Levee reinforcements are contemplated to be necessary primarily along the inland side of this area, as the Ecological Reserve dike and flood channel levees may already be sufficient for the purpose. A full tidal range (extreme tides are about +7.5 to -1.5 feet Mean Lower Low Water, MLLW) would be expected in this entire area. Most of this area, but for the upland sand dune area known as Rattlesnake Island, already lies between +3 and -3 feet MLLW. Excavation within the contemplated Full Tidal area would be the minimum necessary to achieve: an inlet bottom depth and subtidal slough (shown as a thin dashed line) about -4 feet MLLW. The areas adjacent to this shallow subtidal slough would become intertidal mudflats and vegetated saltmarsh, especially cordgrass. Some deposition of dredge spoil in these areas may be appropriate in order to achieve sufficient acreage at tidal elevations suitable for cordgrass (+2.5 to +4 feet MLLW). Oil wells, water injection wells, well pads and access roads would all be removed from within the Full Tidal area.

Two adjacent areas depicted on the enclosed figure as Managed Tidal (about 220 gross acres) are not contemplated to be physically modified directly but would have seawater readmitted to them in an intermittent or very muted manner through culverts or water control structures through the reinforced levee or

flood channel levee. Pickleweed dominated saltmarsh and shallow saltponds-saltflats are the contemplated habitat types. Existing pickleweed in this managed tidal area as well as the tidal and muted tidal portions of the Ecological reserve would remain intact and well exceed 200 acres in extent. Oil well pads and roads could be removed or revegetated upon inactivation of the wells in this area.

The remaining area depicted on the enclosed figure is labelled as Future Full Tidal (about 275 gross acres). This area includes the highest concentrations of active oil wells but much of the lowest elevations in the lowland. It is therefore contemplated that upon depletion of the oil field in 15-20 years and removal of the wells and any contamination, it may be feasible to simply breach the dike and allow a large portion of it to become slough, tidal flats, and saltmarsh without extensive earthwork. Such maintenance and management of this area is part of the Project (i.e., the Management Component of the Project as defined in Section I(a) of the body of the Agreement). However, potential future restoration of this area is not part of the Project and is not a basis for the mitigation credits to be granted to the BOARDS.

Enhancement of suitable nesting areas for Belding's savannah sparrow would be achieved in the Managed Tidal areas, while other existing valuable areas would be retained intact in the Seasonal Pond area and in the muted tidal portion (i.e., Inner Bolsa Bay) of the Ecological Reserve (except for the possible inclusion in the Full Tidal area of the most recently restored cell in the Ecological Reserve). Seasonal pond habitats in all areas (not just in the Seasonal Ponds area depicted on the attached map) would not be less than 150 acres. Significant enhancement of suitable nesting habitat for the light-footed clapper rail would be achieved in the cordgrass expansion part of the Full Tidal area. Nesting area for the California least tern and western snowy plover would be achieved by creation and retention of sparsely vegetated sandflat and saltflat areas protected from disturbance or water inundation.

## EXHIBIT B

## EXPLANATION OF THE PROPOSED HABITAT VALUE TRADEOFF RATIO

Habitat evaluations of Los Angeles/Long Beach outer harbor landfills impacts and tidal wetland mitigation have been previously completed. Subsequently, landfill projects and their mitigation projects have been permitted and undertaken, in consideration of these habitat evaluations. Specifically, Port of Long Beach Pier J landfill is now complete and its mitigation at Anaheim Bay is also complete, including the required biological follow-up monitoring. In addition, a portion of the Port of Los Angeles Pier 400 landfill has been permitted and is under construction, just as its mitigation at Batiquitos Lagoon is permitted and under construction.

The mitigation goal for outer harbor landfills has been and continues to be "no net loss of in-kind habitat value". This means that mitigation habitats may be a different type than that filled, provided it offsets the habitat value for the evaluation species of the filled habitat. Therefore, while the mitigation goal requires a value for value (1:1) tradeoff, the variable habitat benefits of different types of offsetting mitigation works can result in greater or less than acre for acre tradeoffs.

In the case of the Pier J-Anaheim Bay evaluation and project, restoration of tidal flow to non-tidal areas equally offsets the habitat values eliminated by the Pier J landfill and resulted in an acreage tradeoff ratio of 1.32 acres of landfill for each acre of mitigation (inversely, 0.76 acres of mitigation for each acre of landfill). Since the outer LA/LB Harbor biological baseline habitat value is considered to be the same as that established by the baseline studies and the previous habitat evaluations, and since the Anaheim Bay mitigation project type (tidal restoration near the ocean) is similar to the concept type contemplated for Bolsa Chica and its biological benefits have been verified through follow-up investigations, the same habitat evaluation and tradeoff ratio is adopted in this agreement. The complete "Anaheim Bay-Pier J" habitat evaluation report is available upon request. The habitat value of one acre of this type of mitigation is higher than the habitat value of an acre of outer harbor water area deeper than 20 feet, so that less than one acre of mitigation is needed to offset one acre of harbor landfill. That is, for each acre of Bolsa Chica restored to full tidal influence near the ocean, 1.32 acres of outer harbor landfill shall be considered mitigated.

Aquatic habitats of the main channels and interior slips of both Los Angeles and Long Beach Harbors (the Inner Harbor) have been documented to be of lower fish and bird diversity and abundance than the outer harbor (from the seaward edge of Terminal Island to the main breakwaters). Consequently, offsetting an acre of inner harbor landfill habitat loss has required less (half) compensation than an acre of outer harbor habitats deeper than 20 feet.

The Concept Plan contemplates about 344 acres of full tidal habitats, which would offset the habitat value loss of about 454 acres of outer harbor landfill (more inner harbor landfill acres). For example, 1.0 acres of restoration offsets 1.32 acres of outer harbor or 2.64 acres of inner harbor. Conversely, 1.0 acres of outer harbor landfill cost 0.76 acres of mitigation; an inner harbor landfill acre costs about 0.38 mitigation acres.

| Harbor Landfills | | Bolsa Chica Restored Full Tidal Habitat |
|---|---|---|
| Port of Los Angeles: | | |
| Outer harbor | 227 acres | 172 acres |
| Port of Long Beach: | | |
| Inner harbor | 60 acres | 23 acres |
| Outer harbor | 197 acres | 149 acres |
| **TOTALS** | **484 acres** | **344 acres** (mitigated by restoring) |

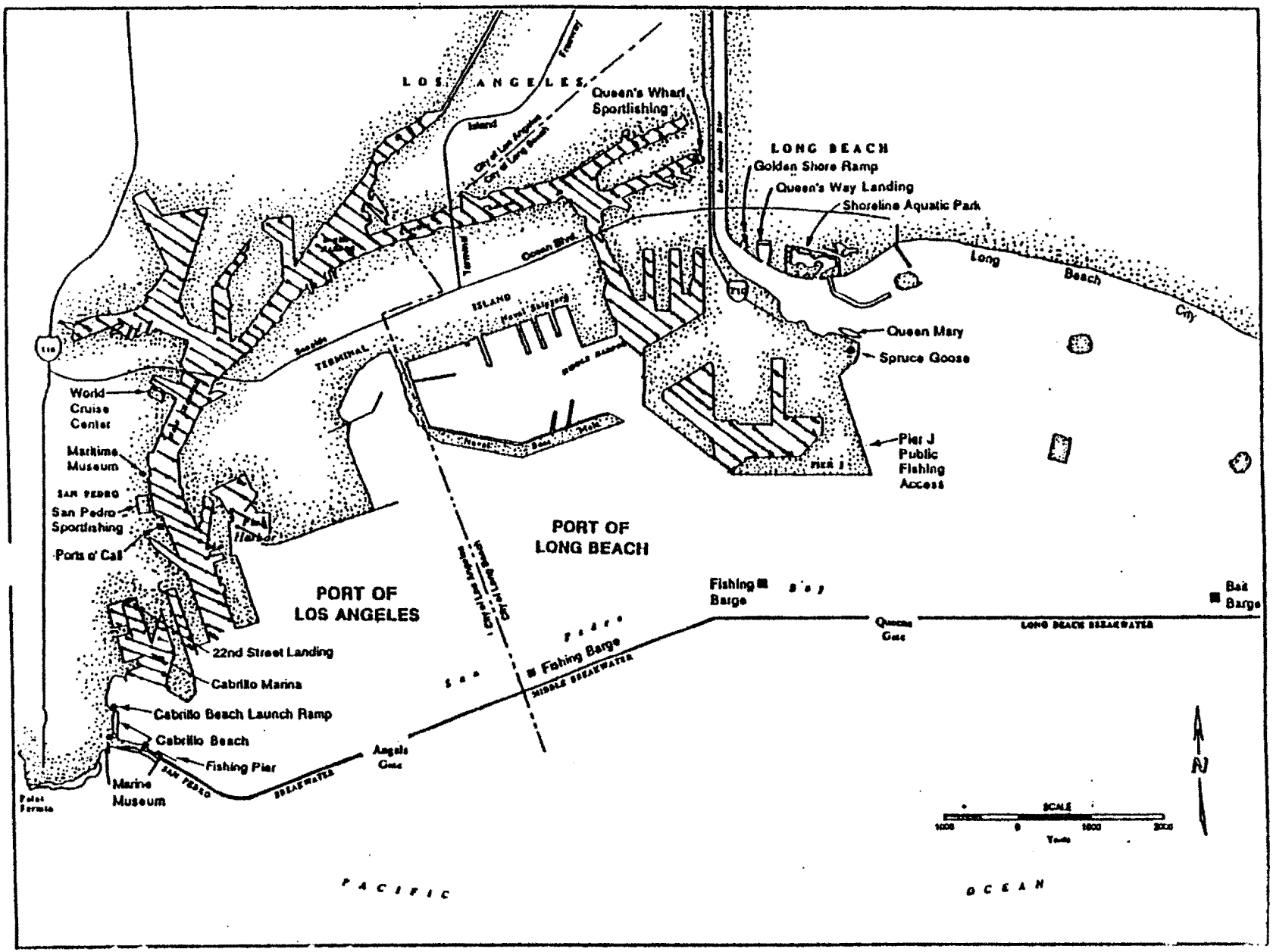


EXHIBIT C INNER HARBOR AREAS (CROSS HATCHED)

# APPENDIX B

CD-115-96 ADOPTED STAFF REPORT AND RECOMMENDATION FOR BOLSA CHICA LOWLAND ACQUISITION AND CONCEPTUAL WETLAND RESTORATION PLAN

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor

CALIFORNIA COASTAL COMMISSION
[redacted]EMONT, SUITE 2000
[redacted]FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

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# STAFF REPORT AND RECOMMENDATION ON CONSISTENCY DETERMINATION

Consistency Determination
No. CD-115-96
Staff: LJS-SF
File Date: September 12, 1996
45th Day: October 27, 1996
60th Day: November 11, 1996
Commission Meeting: Oct. 8, 1996

FEDERAL AGENCY: U.S. Fish and Wildlife Service

DEVELOPMENT LOCATION: Bolsa Chica Lowlands, Orange County (Exhibit 1)

DEVELOPMENT DESCRIPTION: Bolsa Chica Lowland Acquisition and Conceptual Wetland Restoration Plan.

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## EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (Service) has submitted a consistency determination which outlines an acquisition and conceptual wetland restoration project (Project) for the Bolsa Chica Lowlands, located inland of Pacific Coast Highway on the northern Orange County coastline. The Service proposes to participate in an interagency effort (detailed in the Project Agreement document) to purchase and restore at least 880 acres of wetland habitat in the Bolsa Chica Lowlands. The State Lands Commission (SLC) would acquire fee title to a minimum of 880 acres of property currently owned by the Koll Real Estate Group (KREG). A negotiated interagency Concept Plan for wetland restoration (included as a part of the Project Agreement) calls for the Service to construct an ocean inlet, restore approximately 384 acres to full tidal wetlands supporting intertidal and subtidal habitat, restore approximately 220 acres to managed tidal wetlands supporting saltmarsh, saltponds, and saltflats, retain approximately 275 acres as an active oil production field, and provide public access and recreational opportunities where appropriate and consistent with the protection of fish and wildlife resources and habitats.

Acquisition and restoration activities will be funded primarily by the Ports of Los Angeles and Long Beach, which will receive mitigation credits for future landfill construction in their jurisdictions. (The analysis of mitigation credits generated by the proposed Project and their use as compensation for future port landfills is found in the staff report and recommendation on two Port Master Plan Amendments appearing later on the Commission's October 8 agenda.) An additional $1 million for acquisition will be provided by the California State Coastal Conservancy (Conservancy). Additional funding to eliminate a potential $16 million shortfall in the acquisition and restoration project budget is currently being sought by the Federal and State agencies that are signatories to the Project Agreement. Should this current shortfall persist, then the Service will determine, in accordance with the Project Agreement, that the acquisition and restoration of the Koll property at Bolsa Chica will not go forward. In addition, should questions regarding the extent and funding for remediation of potential environmental contaminants on the site not be adequately resolved, the Service will likewise determine that the Project should not go forward.

The Project plan is conceptual in nature and is the first step in a phased federal consistency review process for the U.S. Fish and Wildlife Service's proposed wetland restoration project at the Bolsa Chica Lowlands. The Service acknowledges that upon completion of an environmental impact statement/report and selection of a final restoration plan, it will submit a more detailed consistency determination to the Commission for restoration and construction activities at the Bolsa Chica lowlands. However, the current submittal does contain sufficient information to enable the Commission to determine that this phase of the plan is consistent with the applicable policies of the California Coastal Management Program (CCMP).

The proposed Project would significantly restore and enhance wetland habitats and fish and wildlife resources within the Bolsa Chica lowlands consistent with the wetland protection, marine resources, and environmentally sensitive

habitat policies of the CCMP (Sections 30230, 30231, 30233, and 30240 of the Coastal Act). The Project includes construction of an ocean inlet to reintroduce seawater to the central portion of the lowlands, an essential component for wetland restoration and enhancement activities, and is consistent with the shoreline structure and development policies of the CCMP (Sections 30235, 30251, and 30253 of the Coastal Act). The Project includes a commitment to provide public access and recreational opportunities consistent with the protection of fish and wildlife resources and habitats, and a commitment to protect existing public access and recreational activities at Bolsa Chica State Beach. The project is therefore consistent with the public access and recreation policies of the CCMP (Sections 30210, 30211, 30212, 30213, 30220, and 30221 of the Coastal Act).

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STAFF SUMMARY AND RECOMMENDATION:

I. Staff Note. This consistency determination is an integral part of a much larger puzzle intended to achieve an overall "solution" to several issues of major significance and consequence to the Commission, local government, property owners, the public and other public agencies. Among these issues are two primary objectives: (1) the long-term protection, restoration, and enhancement of habitat resources and values in the lowlands and appropriate buffer zones of the Bolsa Chica area of Orange County; and (2) the identification and provision of effective and legally adequate mitigation (i.e., compensation) measures to enable the industrial and economically vital Ports of Los Angeles and Long Beach to expand port facilities through appropriate ocean area fill projects to meet future commercial needs of California and the Nation - the essence of "environmentally sustainable economic development." Although Commission staff is not privy to all the details of the historical evolution of the strategy to address the issues and achieve these objectives, staff was contacted after considerable work had been done and asked to participate in a cooperative effort to bring about an "overall solution."

One aspect of the strategy was the preparation and execution of an interagency Project Agreement (Agreement) among key public agencies. The Commission was asked by U.S. Department of Interior officials to become a party to this Agreement. Staff rejected this request on the basis that in view of the Coastal Commission's Coastal Act responsibilities, it would not be appropriate to join in any Agreement that would commit the agency to a particular course of action relative to port mitigation requirements and relative to a number of major land use issues that the Commission must ultimately address through its regulatory and planning procedures and requirements. At the same time, staff made clear that an important Coastal Commission objective and responsibility is to take whatever actions are appropriate to identify and implement solutions to complex and significant coastal management issues and problems whenever possible. Accordingly, Commission staff recommended the approach that includes the preparation of the consistency determination now before the Commission as well as the two Port Master Plan amendments and the Coastal Conservancy Enhancement Plan appearing later on the agenda.

An essential part of the strategy designed by the architects of the Agreement to achieve an "overall solution" for the Bolsa Chica Lowlands involves the

transfer of the lowlands to public ownership and the provision of the ways and means to ensure the restoration, enhancement, and maintenance of an ecosystem of habitat values in the lowlands that includes wetland restoration. The principal means of achieving this goal is through the payment of funds by the Ports of Los Angeles and Long Beach into accounts established for acquisition and restoration purposes in return for the mitigation credits required by public agencies, such as the Commission, as compensation for the loss of subtidal and ocean water habitat in the ports due to new fill projects. Staff recognizes that the approach envisioned in its recommendations both in this consistency determination and the two Port Master Plan amendments represents a significant departure from past practice by the Commission in dealing with port fill mitigation requirements under the Coastal Act. However, longstanding and seemingly intractable problems require creative solutions and thinking, especially in the context of contemporary fiscal, legal, and economic realities. Toward that end, staff believes the approach recommended for adoption by the Commission entails a very real likelihood of achieving a "win-win" situation that ensures multiple benefits and that staff recommends be found to be consistent with Coastal Act policies.

Nevertheless, the Commission's discretion to find "solutions" is limited by the policies of the Coastal Act. An example of a "solution" that does not fully implement Coastal Act policies is the establishment of mitigation "credits" under the Coastal Act for port fill projects through the payment of funds into an account solely for future land acquisition, with no assurance that habitat restoration, enhancement, and maintenance will ever occur. Because land acquisition does not result in restoration of marine habitat and resources, it does not result in mitigation as required under the Coastal Act. Lost living marine resources do not grow in bank accounts. Actual and adequate habitat restoration, enhancement, and maintenance must be integral parts of any mitigation bank approach for new port fill projects if those fills are to be found consistent with Coastal Act policies. In this instance, Port funds will be allocated towards land acquisition and restoration activity. The "new" approach staff is recommending in this case is to approve the use of mitigation credits under circumstances that acknowledge that habitat values to compensate for lost marine habitat and resources will not be provided prior to or concurrent with the actual construction of port landfill projects.

The approach staff is recommending here, together with its recommendations relative to the two Port Master Plan amendments, necessarily includes the following essential elements that must be met before any port landfill mitigation credits actually become available for purposes of meeting Coastal Act requirements and before new port landfill projects relying on these mitigation credits can proceed to construction.

1. The overall mitigation "package" is such that the Commission can be certain that the restoration, enhancement, and maintenance of the identified habitat values, in terms of type, general location, and extent, will actually be provided within a reasonable period of time. Toward that end, the following elements were identified by staff as being essential.

2. All of the Bolsa Chica Lowlands that are to be restored, enhanced, and maintained, and the restoration, enhancement, and maintenance of which is to serve as mitigation for the identified new port fill projects, must have been conveyed to a public agency and must be in public ownership.

3. The Commission must have taken a legal action that gives at least conceptual approval (i.e., this consistency determination) to a habitat restoration plan for the affected Bolsa Chica Lowlands that identifies, generally, the type of habitat values to be provided, where, when, and how.

4. Sufficient funds are deposited into an irrevocable account for the purpose of ensuring the implementation of the habitat restoration and enhancement plan and the appropriate monitoring and maintenance to ensure the continuing viability of the habitat values that are identified and provided as compensation for lost port habitat values.

5. Restrictions or safeguards are in place to ensure that the habitat values and area that serves as mitigation for port fill projects are not subsequently used to provide mitigation for any other project that may require mitigation. This is to avoid "double counting" of habitat resources for mitigation purposes.

Finally, the staff has scheduled this consistency determination prior to the two Port Master Plan amendments in order to achieve the third element described above. Accordingly, if for any reason the Commission defers action on this matter or fails to approve it, the two Port Master Plan amendments would be postponed for future consideration after the Commission has acted upon a restoration plan for the lowlands, the implementation of which is directly related to port mitigation credits.

The plan described in the consistency determination and before the Commission today is a conceptual restoration plan and represents the first step in a phased process that will culminate in: (1) the selection of a final restoration plan, through the preparation of an Environmental Impact Statement/Report, for the acquisition and restoration of the Bolsa Chica Lowlands; and (2) Coastal Commission action on a consistency determination from the Service for the final restoration plan. Notwithstanding the present funding shortfall to implement the acquisition and restoration activities, and the uncertainty regarding clean-up costs for potential environmental contaminants at the site, the conceptual plan now before the Commission contains adequate information regarding project objectives and the habitat values that will arise from the restoration project. As a result, the Commission staff has determined that at this time, the restoration plan would be consistent with the resource protection policies of the Coastal Act.

Finally, the staff reports and recommendations on the two Port Master Plan amendments that follow this consistency determination on the October 8 Commission hearing agenda address the adequacy of the proposed conceptual restoration plan as compensatory mitigation for future port landfills. Commission action on the amendments is necessary at this time (that is, prior to property acquisition using Port funds) in order to assure the Ports that the proposed mitigation credit account is consistent with the Coastal Act. The staff report and recommendation on the State Coastal Conservancy Enhancement Plan for the Bolsa Chica Lowlands that follow this consistency determination on the October 8 Commission agenda addresses the same Concept Plan for wetland restoration that is contained in the consistency determination. Commission action on the Enhancement Plan is necessary for the Conservancy to contribute funding to the acquisition effort.

II. Project Description. The U.S. Fish and Wildlife Service (Service) has submitted a consistency determination for a land acquisition and conceptual wetland restoration project (Project) for an 880-acre portion of the Bolsa Chica Lowlands, located inland of Pacific Coast Highway on the northern Orange County coastline (Exhibits 1-4). The entire 1,300-acre Lowlands is comprised of mostly saltmarsh and seasonal ponds, with active oil wells, access roads, and associated production facilities located over large portions of the area. The 1,300-acre Lowland is currently owned by the Koll Real Estate Group (KREG) (930 acres), the State of California (the 306-acre Department of Fish and Game Ecological Reserve at Inner Bolsa Bay), the Metropolitan Water District (25 acres; this land is proposed to be transferred to the State), and the Fieldstone Company (42 acres)(Exhibit 5).

The proposed Project arises from an Interagency Agreement ("Agreement to Establish a Project for Wetlands Acquisition and Restoration at the Bolsa Chica Lowlands in Orange County, California, for the Purpose, Among Others, of Compensating for Marine Habitat Losses Incurred by Port Development Landfills Within the Harbor Districts of the Cities of Los Angeles and Long Beach, California") signed recently by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, Army Corps of Engineers, California Department of Fish and Game, State Lands Commission, State Coastal Conservancy, Resources Agency, Port of Los Angeles, and Port of Long Beach (Exhibit 8).

A. Project Schedule. The Project, as defined in the aforementioned Interagency Agreement, calls for: (1) the State Lands Commission (SLC) to acquire fee title to a minimum of 880 acres of KREG property in the lowlands; (2) the Service to implement a wetland restoration project (as detailed in the Interagency Agreement's "Concept Plan for Fish and Wildlife Habitat Restoration at the Bolsa Chica Lowlands, Orange County, California") on the lowlands; and (3) monitoring, maintenance, and management of the restored wetland by the SLC or an agency or entity selected by the SLC.

The consistency determination explains the timeline contained in the Interagency Agreement for completion of the KREG property acquisition. The Agreement states that:

> ... the four Federal agencies and four State agencies which are parties to the Agreement must, each in its sole discretion prior to December 16, 1996, make a determination as to whether or not the acquisition by the SLC of the approximately 880 acres of KREG property should be consummated. If all eight parties determine to proceed, and if the Coastal Commission at its October 1996 meeting has taken final action concurring in this Consistency Determination and approving certain amendments to the Ports' Master Plans, then, pursuant to Section 12(a) of the Agreement, each Port will be obligated to deposit $33.375 million, and the State Coastal Conservancy ("Coastal Conservancy") will be obligated to deposit $1 million, with the SLC before the end of December 1996. In turn, the purchase of the KREG property will be consummated prior to the end of the month, with the 454 mitigation credits vesting in the Ports at that time for their immediate use in accordance with Section 15 of the Interagency Agreement.

If the purchase is consummated, then detailed planning for the Project will be commenced by the Coastal Conservancy. Following additional public review of the conceptual wetland restoration Project contained in this consistency determination, completion of an Environmental Impact Statement/Report, adoption of a specific restoration alternative, Coastal Commission action on a consistency determination for the final plan, and completion of final design of the restoration project, the Service would construct a wetland restoration project on approximately 384 acres of the Bolsa Chica Lowlands (the "Full Tidal" area illustrated in Exhibit 2).

The consistency determination includes a proposed implementation schedule for the Project (Exhibit 6):

> If the purchase of the KREG property is consummated at the end of December, 1996, then commencing immediately in 1997, and in accordance with Sections 3 and 4 of the Interagency Agreement, the Coastal Conservancy would refine the Concept Plan for the Project into a more detailed Feasibilty Plan. Concurrently, the SLC, Service, and Corps of Engineers would commence the necessary state and Federal environmental review (i.e., CEQA and NEPA) processes for the Project. At the completion of the environmental review processes, the Coastal Conservancy would make any modifications in the Feasibility Plan required by the results of those processes and prepare such preliminary engineering designs as may be required for the necessary state and Federal regulatory permit applications (collectively, the "Final Plan" for the Project). The SLC would be responsible, as the owner of the land upon which restoration would be undertaken, for obtaining all necessary state and Federal regulatory permits for the construction of the Restoration Features Component of the Project.
>
> Section 6 of the Interagency Agreement anticipates that the above-described planning, environmental review, public involvement, and permitting processes, and the second Federal consistency determination, will take approximately two and one half years to complete. Thus, it is anticipated that actual construction of the Restoration Features Component of the Project will commence not later than October, 1999. Construction is then expected to take three years (i.e., be completed in the fall of 2002).

The Interagency Agreement states that the SLC will be responsible for the long-term operation and management of the Project, but acknowledges that it may enter into an agreement with another agency or entity for this purpose. The California Department of Fish and Game and the Service have a "first right of refusal" to enter into an agreement to manage the Lowlands on SLC's behalf. If the Service enters into such an agreement, then the Project lands would be managed as a unit of the National Wildlife Refuge System. If the Department of Fish and Game enters into such an agreement, the Project lands would be added to the existing Ecological Reserve, which is managed by the Department.

Funding for long-term operation, maintenance and monitoring of the Project is assured by the Interagency Agreement through the creation of a $5 million Maintenance Account funded by the Ports but managed by the SLC. More specific details regarding the monitoring and performance standards required for the

restoration project will be generated during the development of the final restoration plan, and the Commission will review those details as part of the second consistency determination to be submitted for the final plan. However, due to the significant magnitude and complexity of the proposed restoration effort at Bolsa Chica, and the provision for release of mitigation credits to the Ports prior to the commencement of restoration work, the Commission does support the current Project Agreement proposal that requires up-front funding by the Ports of an independent account, to be held by the State Lands Commission (and managed by the State Lands Commission or another agency or entity agreeable to the Project Agreement signatories), for monitoring, maintenance, and management of the project. This provision should ensure an adequately funded, scientific, and independent evaluation of: (1) the degree of success of all facets of the restoration project, and (2) the need for any remedial actions to ensure the maintenance in perpetuity of habitat values once restoration is deemed complete and successful.

B. Funding. The Service states in the consistency determination that:

> Funding for the Project ... will be provided primarily by the Harbor Departments of the Cities of Los Angeles and Long Beach ("Ports"). Pursuant to Section 14 of the Interagency Agreement, it is the Restoration Features Component and Restoration O & M Component of the Project (and only these two components) which are expected to create habitat values and aquatic functions sufficient to offset 454 acres of landfill in the outer harbor area of the Ports. Pursuant to Section 15 of the Agreement, the Ports will be entitled to use these 454 acres of "mitigation credits" as soon as they have deposited their monies with the SLC and title to a minimum of approximately 880 acres in the Bolsa Chica Lowlands has vested in the SLC.

The Project calls for the Ports of Los Angeles and Long Beach to convey a total of $66,750,000 to accounts identified in the interagency Project Agreement to fund the acquisition of a minimum of 880 acres of lowland property owned by the Koll Company, and the proposed restoration project on the approximately 384-acre Full Tidal area of the Bolsa Chica Lowlands. Approximately 344 acres of the 384-acre Full Tidal area would be restored to full tidal influence (comprised of intertidal and subtidal habitat) and it is this acreage which is the basis for calculating the 454 acres of port mitigation credits (the remaining 40 acres consist of that part of Rabbit Island above full tidal influence)(Exhibit 7).

As of September 12, 1996, the firm sources of funding for the Project are as follows:

| | |
|---|---|
| Ports of Los Angeles and Long Beach | $66,750,000 |
| State Coastal Conservancy | 1,000,000 |
| Interest (estimated) | 6,000,000 |
| TOTAL | $73,750,000 |

The Service reports that interest earnings would accrue due to the fact that the Ports and the Coastal Conservancy would be required to deposit their funds in December 1996. However, construction is not expected to commence until October 1999 and would take three years to complete. As a result, these

funds, less the purchase price for the KREG property, can be invested for a period of time. The Service assumed a conservative rate of return of 5.5 percent (compounded annually) to calculate the interest income.

As of September 12, 1996, the Service's estimates of Project costs are as follows:

| | |
|---|---|
| Purchase price of KREG property | $25,000,000 |
| Planning, env. review, permitting | 2,200,000 |
| Legal fee contingency for Conservancy | 500,000 |
| Construction of Restoration Features | 56,700,000 |
| Maintenance Account | 5,000,000 |
| TOTAL | $89,400,000 |

The current Project costs are based upon the following assumptions or requirements:

1. The purchase price for the KREG property has not yet been established. The $25 million figure is being used for planning purposes. The actual purchase will not exceed the appraised fair market value, as determined by the SLC.

2. The "Planning..." line item includes the costs of all pre-construction planning, environmental compliance, and permitting; final engineering design and specifications are included in the "Construction" line item.

3. The litigation contingency is required by the Interagency Agreement.

4. The construction cost estimate was prepared in April 1995 and included three years of inflation with a construction start date in summer 1998. With the start date now delayed until fall 1999, a fourth year of inflation was added.

5. The Maintenance Account is required by the Interagency Agreement.

The Service states in the consistency determination that based on the above figures, there exists today a potential funding shortfall for the Project of as much as $16 million. This problem is being addressed as follows:

Project construction costs are being examined to provide more accurate (and hopefully lower) estimates.

Less expensive alternatives to oil well buyout and abandonement costs are being examined.

Additional sources of funding are being sought.

However, the Service states in its consistency determination that:

In order to provide reasonable assurances that resoration of the lowlands can be accomplished in accordance with the Concept Plan, the Service will require that the estimated costs for for the Project (which estimated costs will assume only the acquisition of the KREG property and will include $5 million for the Maintenance Account, and, if applicable, the cost of insurance for contaminants clean-up and the cost of contaminants clean-up to standards more stringent than the remediation standards agreed to by third parties) not significantly exceed the funding which is committed for the Project and which is reasonably likely to become available for the Project as of the date that the determination required by Section 13(a)(1)(A) of the Interagency Agreement must be made. If this condition cannot be met, then the Service will determine, in accordance with Section 13(a)(1)(A) of the Interagency Agreement, that the acquisition of the KREG property should not go forward. This would cause the Interagency Agreement to be terminated, in which event the Project would not go forward, the Ports would not receive any mitigation credits, and funds would be returned to the submitting party.

C. Environmental Contaminants. In addition to the funding shortfall for Project acquisition and restoration, the issue of environmental contaminants is also unresolved at the present time. The Service reports that the Bolsa Chica Lowlands lie within the Huntington Beach Oil Field and that the 880 acres proposed to be acquired from KREG are subject to two oil and gas leases, the present operator of which is CalResources. The lowlands have been an operating oil field for over 50 years and some soil and water contamination by petroleum hydrocarbons and perhaps by other kinds of chemicals is to be expected. Remediation of documented contamination has been undertaken by CalResources. However, the knowledge of the existing nature and extent of contamination throughout the Project site is not complete. A contaminants survey on the site is presently underway (funded by the Service, the Coastal Conservancy, the National Fish and Wildlife Foundation, KREG, and CalResources) and is scheduled for completion in mid-October 1996.

The consistency determination states that in order to provide reasonable assurances that restoration of the lowlands can be accomplished in accordance with the Concept Plan contained in the Interagency Agreement, the Service will require either that:

1. No significant contamination be found to exist based upon the results of the currently on-going contaminants survey being performed by Tetra Tech, or

2. KREG, CalResources, or operators prior to CalResources, or some combination thereof, have entered into a legally binding agreement with the SLC by which one or more of them agree to be responsible for the remediation of all contaminants, known or unknown as of this point in time, with the standards for remediation to be those required by any applicable regulatory authorities or, in the absence thereof, as may otherwise be agreed upon, or

3. KREG, CalResources, or operators prior to CalResources, or some combination thereof, have entered into a legally binding agreement with the SLC by which one or more of them agree to be responsible for

> the remediation of all known contaminants (based upon the results of the currently ongoing contaminants survey), with the standards for remediation to be those required by any applicable regulatory authorities or, in the absence thereof, as may otherwise be agreed upon, and the SLC, as the buyer, has been able to obtain an insurance policy covering the future remediation of presently unknown contaminants, should such ever be encountered, the costs of such insurance to be a Project cost....

The consistency determination additionally states that:

> If at least one of these three conditions cannot be met, then the Service will determine, in accordance with Section 13(a)(1)(A) of the Interagency Agreement, that the acquisition of the KREG property should not go forward. This would cause the Interagency Agreement to be automatically terminated, in which event the Project would not go forward, the Ports would not receive any mitigation credits, and funds would be returned to the submitting party. Furthermore, if the remediation standards to which KREG, CalResources, or operators prior to CalResources, or some combination thereof, are subject or to which they have otherwise agreed are not as stringent as are required for the purposes of the wetlands restoration to be effected by the Project, then the Service will require that the estimted cost of the increment of clean-up above and beyond the agreed upon remediation standards be included as a Project cost when reaching the [go/no-go] decision required by the [Interagency Agreement].

D. Restoration Plan. This consistency determination covers only the acquisition of lowland properties and the conceptual restoration plan, and does not propose a final restoration plan or any construction or restoration work at Bolsa Chica at this time. The Service is submitting the conceptual Project plan for Commission review at this time in order to provide the Commission and other interested parties a description of the Service's restoration objectives at Bolsa Chica, and to provide evidence that the property acquisition and wetland restoration plan justifies the provision of landfill mitigation credits to the Ports of Los Angeles and Long Beach (as described in the Project Agreement).

The consistency determination states that:

> The goal of the Bolsa Chica restoration plan is to provide for the retention of existing fish and wildlife resources, and as much as desirable and feasible, the enhancement thereof. Further, it is intended that the ecosystem resulting from the implementation of the plan be naturalistic, biologically diverse, productive, and estuarine in nature. That is, it shall be predominately salt water influenced but incorporating biologically beneficial freshwater influence. In addition, the acreage of waters and wetlands in the lowlands shall not be diminished.

The specific objectives of the conceptual Bolsa Chica restoration plan are that:

1. Overwintering habitat value for migratory shorebirds, seabirds, and waterfowl shall not be diminished and shall be enhanced where feasible.

2. Nesting habitat for migratory shorebirds and seabirds shall not be diminished and shall be expanded where feasible.

3. Habitat value for estuarine fishes shall not be diminished and shall be expanded and diversified where feasible.

4. Nesting and foraging conditions for State and Federal endangered species shall not be adversely impacted. Also, implementation of the plan shall especially contribute to the recovery of these species: light-footed clapper rail, California least tern, western snowy plover, and Belding's savannah sparrow.

5. The mix of habitat types shall include perennial brackish ponds, seasonal ponds/salt flats, pickleweed dominated flats, cordgrass dominated intertidal zone, unvegetated intertidal mudflat, and subtidal seawater volume with low residence times.

6. Modifications to the hydraulic regime, necessary to achieving the above objectives, shall emphasize minimalized requirements for manipulations and maintenance, and no degradation of existing flood protection levels.

7. The interests of contiguous property owners will be protected.

8. Once completed, maintenance and management of the area shall be to maximize native, estuarine fish and wildlife habitat value of the Bolsa Chica lowland, in perpetuity, to include active removal and exclusion of detrimental, nonnative biota.

9. Allowable public uses shall include passive and non-intrusive recreation activities, focused on peripheral areas, interpretive foci, and trails.

10. Total removal of oil extraction activities and their past effects shall be conducted in a phased, cost effective, and environmentally sensitive manner.

11. Monitoring and evaluation of the success of biological objectives shall be conducted.

The conceptual restoration plan is illustrated in Exhibits 2 and 3. No changes to the full tidal part of Outer Bolsa Chica Bay or the muted tidal part of Inner Bolsa Chica Bay (the State Ecological Reserve) are contemplated due to the existing and highly valued biological resources found in these areas (located outside the properties proposed for purchase by the Service). Similarly, an approximately 120-acre area in the southeastern corner of the lowlands designated as seasonal ponds will remain unchanged due to existing habitat values.

The conceptual plan proposes to reestablish full tidal circulation to a significant portion of the Bolsa Chica Lowlands in order to increase biological diversity and productivity. The consistency determination states that:

> Bolsa Chica was historically full tidal and had its own ocean inlet. Improving tidal influence is widely recognized as the principle method of restoring missing components of this coastal wetland ecosystem. However, engineering and biological constraints are expected to limit the size and location of contemplated tidal restoration. Some of the areas planned for full tidal restoration have some existing wetland values, the loss of which will be compensated either through enhancing these values when full tidal action is restored (designated Full Tidal areas), or by introducing managed tidal waters into other areas of the site (designated Managed Tidal areas).

The conceptual plan includes the construction of an ocean inlet at the southern end of the lowlands. The Service states that:

> Preliminary engineering indicates that significant increases in the tidal prism (the volume of seawater between the high and low tides) necessary to achieve the biological benefits in the lowland cannot be conveyed through the existing channels of outer Bolsa Chica, through Huntington Harbour and Anaheim Bay without damaging tidal flats and incurring erosion and safety problems. Therefore, an ocean inlet, to reestablish the historic connection to the sea, is contemplated, albeit in a different location from the historic location. At Bolsa Chica State Beach, further beach erosion or water quality problems will be avoided and human recreational access, public safety access, and the public transportation thoroughfare requirements will be fully protected. Bank protection measures, such as rip rap, may be necessary in places.

The consistency determination contains a description of the proposed modifications to and the habitat types to be restored within the Bolsa Chica Lowlands:

> The enclosed figure [Exhibits 2 and 3 of the staff report] depicts a contemplated ocean inlet connecting to an area shown as Full Tidal (approximately 384 gross acres). Levee reinforcements are contemplated to be necessary primarily along the inland side of this area, as the Ecological Reserve dike and flood channel levees may already may be sufficient for the purpose. A full tidal range (extreme tides are about +7.5 to -1.5 feet Mean Lower Low Water, MLLW) would be expected in this entire area. Most of this area, but for the upland sand dune area known as Rabbit Island, already lies between +3 and -3 feet MLLW. Excavation within the contemplated Full Tidal area would be the minimum necessary [approximately 1.7 million cubic yards] to achieve an inlet bottom depth and subtidal slough about -4 feet MLLW. (That is, at extreme low tide this subtidal area could be waded across.) The areas adjacent to this shallow subtidal slough would become intertidal mudflats and vegetated saltmarsh, especially cordgrass. Some deposition of dredge spoil in these areas may be appropriate in order to achieve sufficient acreage at tidal elevations suitable for cordgrass (+2.5 to +4 feet MLLW), essential habitat for the endangered light-footed clapper rail. Oil wells, water injection wells, well pads and access roads would all be removed from within the Full Tidal area.

Two adjacent areas depicted on the enclosed figure [Exhibits 2 and 3 of the staff report] as Managed Tidal (about 220 acres) are not contemplated to be physically modified directly but would have seawater readmitted to them in an intermittent or very muted manner through culverts or water control structures through the reinforced levee or flood channel levee. Pickleweed dominated saltmarsh and shallow saltponds-saltflats are the contemplated habitat types. Existing pickleweed in this managed tidal area as well as the tidal and muted tidal portions of the Ecological Reserve would remain intact and will exceed 200 acres in extent. Oil well pads and roads could be removed or revegetated upon inactivation of the wells in this area.

The remaining area depicted on the enclosed figure [Exhibits 2 and 3 in the staff report] is designated as Future Full Tidal (about 275 gross acres). This area includes the highest concentrations of active oil wells but much of the lowest elevations in the lowland. It is therefore contemplated that upon depletion of the oil field in 15-20 years and removal of the wells and any contamination, it may be feasible to simply breach the dike and allow a large portion of it to become slough, tidal flats, and saltmarsh without extensive earthwork. Maintenance and management of this area is part of the Management Component of the Project. However, potential future restoration of this area is not part of the Project and is not a basis for the mitigation credits to be granted to the Ports.

Enhancement of suitable nesting areas for Belding's savannah sparrow would be achieved in the Managed Tidal areas, while other existing valuable areas are retained intact in the Muted Tidal and Seasonal Pond areas. Seasonal pond habitats in all areas would not be less than 120 acres. Significant enhancement of suitable nesting habitat for the light-footed clapper rail would be achieved in the cordgrass expansion part of the Full Tidal area. Nesting area for the California least tern and western snowy plover would be achieved by creation and retention of sparsely vegetated sandflat and mudflat areas protected from disturbance or water inundation.

No rerouting of the Garden Grove-Wintersburg Flood Control Channel has been contemplated although relocating the existing flapgate outlet about 0.5 miles upstream may be considered [this would assist in the delivery of tidal waters into the proposed "managed tidal" area located north of the flood control channel]. The rerouting of this flood channel is generally viewed as providing little biological benefit to the restored wetland. On the other hand it may convey contamination and trash from urban runoff into the restored tidal wetland and into the nearshore zone where surfers and beach users are expected to be present. Nevertheless, during the preparation of the EIR/S, it will be considered for its public safety benefits

Preliminary engineering also indicates that a barrier to groundwater encroachment into the existing houses along the easterly edge of the lowland may be necessary. Further studies of this potential problem are expected to resolve the need for such a barrier, as well as the location and type of barrier that would need to be constructed.

III. Status of Local Coastal Program. The standard of review for federal consistency determinations is the policies of Chapter 3 of the Coastal Act, and not the Local Coastal Program (LCP) of the affected area. If the LCP has been certified by the Commission and incorporated into the CCMP, it can provide guidance in applying Chapter 3 policies in light of local circumstances. If the LCP has not been incorporated into the CCMP, it cannot be used to guide the Commission's decision, but it can be used as background information. The Bolsa Chica LCP has been certified by the Commission but not incorporated into the CCMP.

IV. Federal Agency's Consistency Determination. The U.S. Fish and Wildlife Service has determined the project to be consistent to the maximum extent practicable with the California Coastal Management Program.

V. Staff Recommendation:

The staff recommends that the Commission adopt the following resolution:

A. Concurrence.

The Commission hereby concurs with the consistency determination made by the U.S. Fish and Wildlife Service for the proposed acquisition and conceptual wetland restoration project for the Bolsa Chica Lowlands, finding that the project is consistent to the maximum extent practicable with the California Coastal Management Program.

VI. Findings and Declarations:

The Commission finds and declares as follows:

A. Environmentally Sensitive Habitats and Resources. The proposed conceptual plan includes provisions for restoration and enhancement of wetland resources. The Coastal Act provides:

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 ground water 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.

Section 30233.

(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:

...

(7) Restoration purposes.

(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.

(c) In addition to the other provisions of this section, diking, filling, or dredging in existing estuaries and wetlands shall maintain or enhance the functional capacity of the wetland or estuary. Any alteration of coastal wetlands identified by the Department of Fish and Game, including, but not limited to, the 19 coastal wetlands identified in its report entitled, "Acquisition Priorities for the Coastal Wetlands of California", shall be limited to very minor incidental public facilities, restorative measures, nature study, commercial fishing facilities in Bodega Bay, and development in already developed parts of south San Diego Bay, if otherwise in accordance with this division.

Section 30240.

(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.

(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

The concern that the Commission has over the protection of wetland resources is in part based on the ecological importance of this habitat type. Wetlands provide highly diverse and productive habitat to a wide variety of plants and animals. The wetlands of the Bolsa Chica lowland are important resources to the state and the nation, and comprise one of the largest remaining coastal wetland complexes in southern California. The lowland complex is comprised of a mix of habitat types as illustrated in Exhibit 4: pickleweed, brackish marsh, salt grass, cord grass, open water/channel non-tidal, open water/bay, open water/flat unvegetated, and uplands. The biological health and productivity of those habitat types varies widely across the lowlands from poor to excellent, with most of the area in need of significant restoration and enhancement.

The Service notes that although the 1,300-acre lowland area is significantly diminished from its historic size and value, sections of the lowland still possess high biological value, despite the presence of oil extraction activities within the lowland. Due in part to its large size, the potential for ecosystem enhancement, and its regional significance, the Service believes that stemming further habitat loss and restoring and enhancing fish and wildlife habitats at Bolsa Chica is both highly feasible and desirable.

The consistency determination includes a summary description of wetland values present at Bolsa Chica:

> Although badly abused when compared to its condition of a century ago, the Bolsa Chica wetland complex is not "dying" and some parts of it continue to have superb biological value. (Part of the Bolsa Chica Ecological Reserve, Inner Bolsa, should be considered as a magnificently successful biological enhancement project, having been restored to muted tidal influence in 1978 after many decades of being diked off from the sea's influence.)
>
> The biological values of the tidally influenced parts of the State's Ecological Reserve, especially fish and birds are well known and recognized, in part because of the high visibility provided by public access opportunities. Outer Bolsa is particularly reknowned for the diversity and numbers of shorebirds utilizing its tidal mudflats, whereas Inner Bolsa is especially valuable for providing suitable conditions for thousands of breeding seabirds, as well as the food supply for a high diversity of fish eating birds. (The muted tidal waters of Inner Bolsa sustain a relatively low diversity of fishes but some of them are extremely abundant, at times.)
>
> The seasonal ponds and wetlands of the privately owned parts of the Bolsa Chica lowland are less visible and not publicly accessible, but some documentation of biological values indicates particular areas have particular value. For example, the State listed endangered Belding's savannah sparrow nests in some pickleweed areas but not others (FWS 1989). Similarly, the Federally listed threatened western snowy plover nests and rears young in some of the salt flats and around some of the ponds of the Bolsa Chica lowland. Some non-tidal areas of Bolsa Chica are heavily used by shorebirds and waterfowl, especially during the migratory season and when high tide levels inundate the tidal mudflats of outer Bolsa Chica (Guthrie et al. 1993, FWS 1982).

The Commission recognizes that the Service's conceptual wetland restoration plan (Project) submitted for consistency review is the first step in a phased review of the proposed restoration of the Bolsa Chica lowlands. The Service acknowledges that further consistency review by the Commission will be necessary after a detailed, final restoration plan is selected upon completion of an Environmental Impact Statement/Report. Therefore, the Commission is only evaluating whether the submitted Project plan is consistent with the applicable Chapter 3 policies of the Coastal Act, and is not making any final determination on restoration plans or activities at the Bolsa Chica lowlands.

Several of the restoration activities proposed in the Project plan (described in Section II of this staff report) would constitute filling, dredging, and diking of wetlands, and the Commission must evaluate these proposed activities using the three tests of Section 30233 of the Coastal Act. The first test requires that the Commission find that the proposed activities are an allowable use. Section 30233(a)(7) describes projects that are for restoration purposes as an allowable use. The Service states that the purpose of the proposed Project is to restore and enhance the wetlands of the Bolsa Chica lowlands in order to protect fish and wildlife resources and habitat, and that the biological diversity and value of the restored wetland complex will be significantly improved over present conditions. Therefore, the Commission finds that the dredging, diking, and filling proposed in the Project plan are for restoration purposes, and thus are an allowable use pursuant to Section 30233(a)(7).

The second and third tests require the Commission to find that the proposed Project is the least damaging feasible alternative and includes feasible mitigation, respectively. In order to assess the Project plan's consistency with these tests, the Commission will use policies of Section 30230, 30231, 30233(c), and 30240 to determine if the Project, at a minimum, maintains the biological productivity and functional capacity of the habitat. The Commission must then consider whether the Project will result in any adverse effects on the environment and whether those effects can be avoided by project alternatives and/or mitigation.

The Commission finds that the Project plan will lead to the enhancement and restoration of functional capacity and biological productivity of the lowlands, and the phased abandonment and removal of oil extraction activities and equipment. Implementation of the Project will convert an area that has been diked off and isolated from tidal waters into a contiguous complex of subtidal, intertidal, and salt marsh/flat/pond habitats. The return of tidal influences to both the proposed "Full Tidal" and "Managed Tidal" areas (at differing degrees) will in turn greatly improve the diversity and productivity of plant and animal species using these areas. In addition, the Project plan calls for the retention of seasonal ponds at the southeast corner of the lowlands and the protection of those species dependent on this habitat type. As noted in the Project plan, some of the areas planned for full tidal restoration possess some existing wetland values, and as a result, any losses will be fully compensated either through enhancing these values when full tidal action is restored, or by introducing managed tidal waters into other areas of the lowlands. The Commission concurs with the Service's finding that the Project plan will enhance species diversity and use of the lowlands by wetland-dependent species, and thus enhance the biological productivity of the area.

The expected improvements to species diversity and utilization indicate that the Project will also enhance the functional capacity of the Bolsa Chica lowlands. However, to fully determine if the functional capacity will be enhanced, the Commission must evaluate the wetland's ability to be self-sustaining. The Service proposes to reintroduce tidal waters to the central portion of the lowlands (the proposed "Full Tidal" area) by constructing an ocean inlet at the southern end of the lowlands. In addition, tidal waters will be readmitted through culverts or water control structures to areas

designated "Managed Tidal." By manipulating the current hydrologic regime, modifying portions of the lowland topography, and replanting wetland vegetation in order to mimic a more natural, tidally-influenced coastal wetland, the Bolsa Chica lowlands should become self-sustaining. The Project plan does not call for the rerouting of the Garden Grove-Wintersburg Flood Control Channel, which could generate significant changes to the hydrology of the Bolsa Chica Lowlands. However, the Project plan does state that due to potential public safety and flood control concerns, this issue will be addressed during the preparation of the EIS/R and the final restoration plan. Lastly, because of the complexity of wetland restoration, the Project plan includes provisions for monitoring, maintenance, and remediation activities in order to ensure that the restoration project achieves its objectives.

The Commission finds that implementation of the Project plan would enhance the biological productivity and functional capacity of the Bolsa Chica lowlands and would lead to a significant improvement to wetland habitats and fish and wildlife resources within the lowlands. The Commission also finds that implementation of the Service's conceptual restoration plan would improve the quality and quantity of habitat, and will not be environmentally damaging. Because the Project will not have significant adverse effects on the environment, additional alternatives analysis and mitigation requirements, pursuant to Section 30233(a) of the Coastal Act, are not required to find the proposed filling, dredging, and diking consistent with the marine resource policies of the Coastal Act.

In conclusion, the proposed Project plan for restoration of the Bolsa Chica lowlands includes provisions for substantial restoration and enhancement of wetlands and fish and wildlife resources. The Commission recognizes that the proposed Project is conceptual in nature and will require additional consistency review upon completion of a final restoration and construction plan. However, the Commission finds that the Project plan outlines wetland restoration activities that would beneficially affect coastal resources in a manner that is consistent with the marine resource and habitat protection policies of the California Coastal Management Program (Sections 30230, 30231, 30233, and 30240 of the Coastal Act).

B. Shoreline Structures and Development. The Coastal Act provides:

Section 30235. Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.

Section 30251. The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas,

and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

Section 30253. New development shall:

(1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.

(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs....

The proposed Project plan for wetland restoration calls for the construction of an ocean inlet to reintroduce tidal waters to the central portion of the Bolsa Chica lowlands. Construction of the inlet will require dredging, excavation, dredge material disposal, two jetties, a revetment, and shore protection measures. The Project plan states that:

The wetland restoration plan will neither create nor contribute to significant erosion of the beach. All suitable sand excavated would be placed on the ocean beach, as would sand excavated from the inlet channel during maintenance. Bank protection measures, such as rip rap, may be necessary inside the inlet structure. Such structural features will be fully considered during EIR/S preparation and final consistency determination.

The Project plan also states that:

The scenic and visual qualities of coastal areas will be protected through the restoration of the Bolsa Chica wetlands. The Project, and public ownership of the Lowlands, will assure that the scenic and visual qualities associated with coastal wetlands will be maintained. Additionally, a goal of the Project is the removal, over time, of all oil extraction activities which will enhance the scenic and visual qualities of the site.

Because of the conceptual nature of the subject plan, the Commission is unable at this time to fully evaluate the the aforementioned activities and structures for consistency with the referenced Coastal Act policies. The Service acknowledges in its consistency determination that additional consistency review will be necessary once a final restoration plan is selected after completion of the environmental impact statement/report for the restoration project.

However, the Commission is able to find at this time that an ocean inlet will be required for successful wetland restoration of the Bolsa Chica lowlands at the scale envisioned in the Project plan. The Service states that the volume of seawater necessary to achieve the restoration objectives in the lowlands

cannot be conveyed through existing channels through Anaheim Bay, Huntington Harbour, and outer Bolsa Bay without damaging existing tidal flats and causing erosion, and, as a result, construction of an ocean inlet is required. The Commission agrees. The Commission also concurs with the Service that at the conceptual Project plan level, an ocean inlet can be constructed and maintained at the proposed location without generating significant, adverse effects on other coastal resources (namely sand supply, beach erosion, visual resources, and public safety) through appropriate design, monitoring, and mitigation (i.e., sand management, beach nourishment). However, the Commission will have the opportunity to review in a subsequent consistency determination the specifics of the ocean inlet, its associated features, and any mitigation measures necessary to bring this component of the Project into consistency with the Coastal Act. Therefore, the Commission finds that the proposal in the Service's Project plan for an ocean inlet to reintroduce tidal waters to the Bolsa Chica lowlands for the purposes of wetland restoration and enhancement is consistent with the shoreline structure and development policies of the California Coastal Management Program (Sections 30235, 30251, and 30253 of the Coastal Act).

C. Public Access and Recreation. The Coastal Act provides:

Section 30210. 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:

(1) 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.

Section 30221. Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and forseeable future demand for public or commercial recreational activities that could be accomodated on the property is already adequately provided for in the area.

The consistency determination states that:

> The primary emphasis of the Project is the conservation of fish and wildlife resources and habitats. However, environmental interpretation and education and related public access and facilities will be an integral part of further planning for the Project. The expected focus will be on suitability and location for trails and kiosks, although construction, location, operations and maintenance of an interpretive center may be considered if additional funding sources are identified.
>
> The Project area is not suitable for intensive recreational uses. The goal of the Project is to restore a currently degraded wetland ecosystem to a productive, biologically diverse ecosystem. As such, intensive recreational uses would be in conflict with the goals of habitat restoration. Trails and interpretive kiosks will be considered as a means of meeting the public access and recreational policies of the California Coastal Act. Waterborne recreation will be considered only where consistent with the primary purpose of fish and wildlife resource conservation. The inlet channel and jetties are not intended to be navigable, but are intended to be designed and implemented to retain and protect the existing recreationaluses of the State Beach Park. Public access and State Beach safety and maintenance vehicle access would be retained across the inlet channel, separate from the Pacific Coast Highway Bridges.

Currently, public access and recreation are not available on the privately-owned lands in the Bolsa Chica lowlands. The Project plan for the Bolsa Chica lowlands includes provisions for public access and recreation within the constraints of protecting fish and wildlife resources and habitats. In addition, the Project calls for the retention and protection of existing public recreational uses of Bolsa Chica State Beach. During the development of the final restoration plan (including plans for construction of the ocean inlet and jetties), efforts to minimize and mitigate the loss of sandy beach from these structures will be focused on avoiding significant, adverse effects on public access to and recreational use of Bolsa Chica State Beach. The Commission recognizes that the proposed Project is conceptual in nature and will require additional consistency review upon completion of a final restoration and construction plan. However, the Commission finds that the Project plan contains a commitment to include features that would enhance public access and recreational opportunities in the Bolsa Chica lowlands, and protect existing public access to and recreational use of Bolsa Chica State Beach. Therefore, the Commission finds that the Project plan is consistent with the public access and recreation policies of the California Coastal Management Program (Sections 30210, 30211, 30212, 30213, 30220, and 30221 of the Coastal Act).

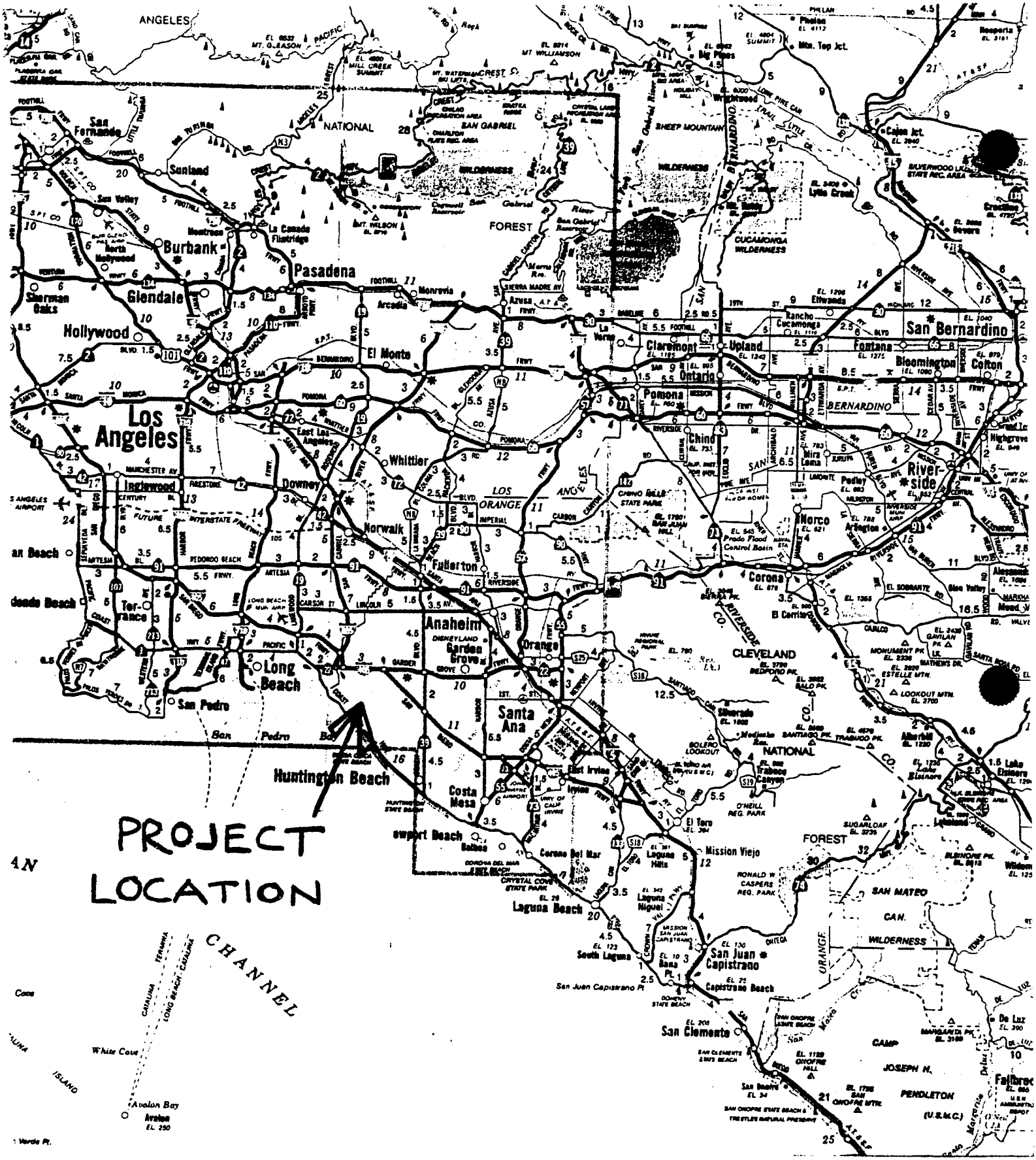
SUBSTANTIVE FILE DOCUMENTS:

1. Agreement to Establish a Project for Wetlands Acquisition and Restoration at the Bolsa Chica Lowlands in Orange County, California, for the Purpose, Among Others, of Compensating for Marine Habitat Losses Incurred by Port Development Landfills Within the Harbor Districts of the Cities of Los Angeles and Long Beach, California (1996). (The "Concept Plan for Fish and Wildlife Habitat Restoration at the Bolsa Chica Lowlands in Orange County, California" is Exhibit A to the "Agreement")

2. California Department of Fish and Game Determination of the Status of the Bolsa Chica Wetlands, April 1982.

3. Adopted Revised Findings on Bolsa Chica Land Use Plan Amendment No. 1-95/Implementing Actions Program as approved by the Commission on June 12, 1996.

6637p




| EXHIBIT NO. 1 |
| --- |
| APPLICATION NO. |
| CD-115-96 |
| California Coastal Commission |

# Bolsa Chica Conceptual Restoration Plan

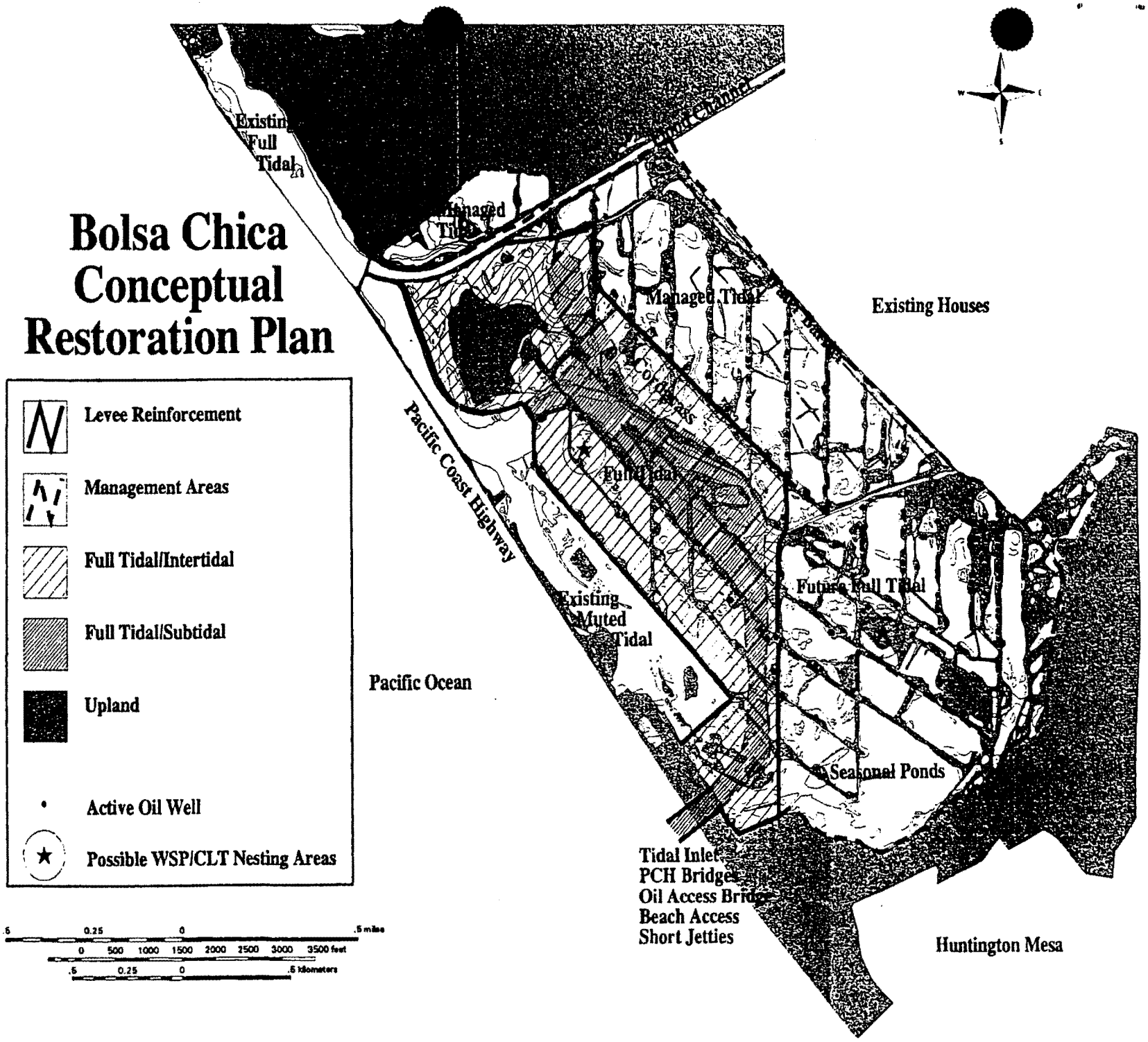
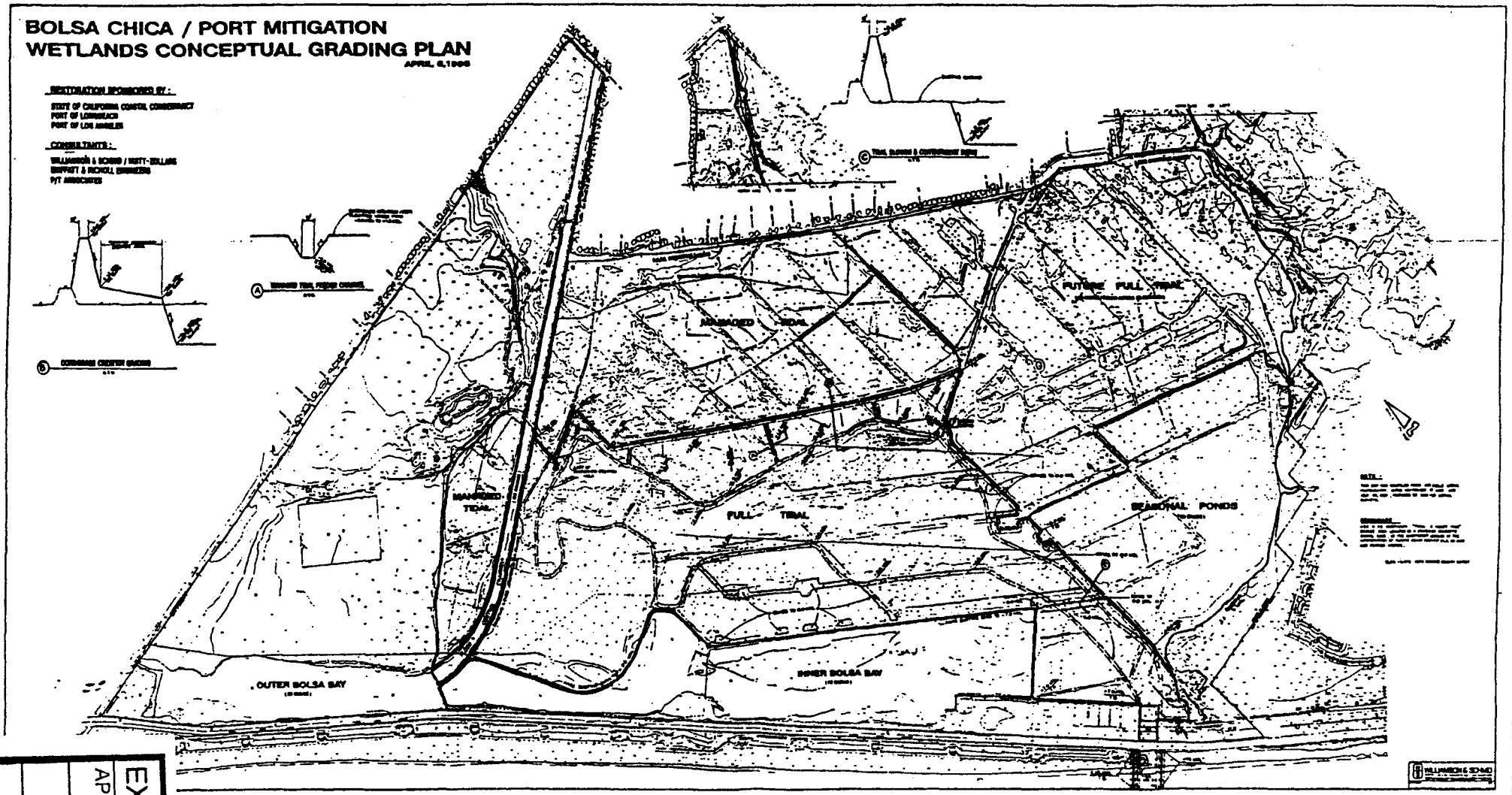
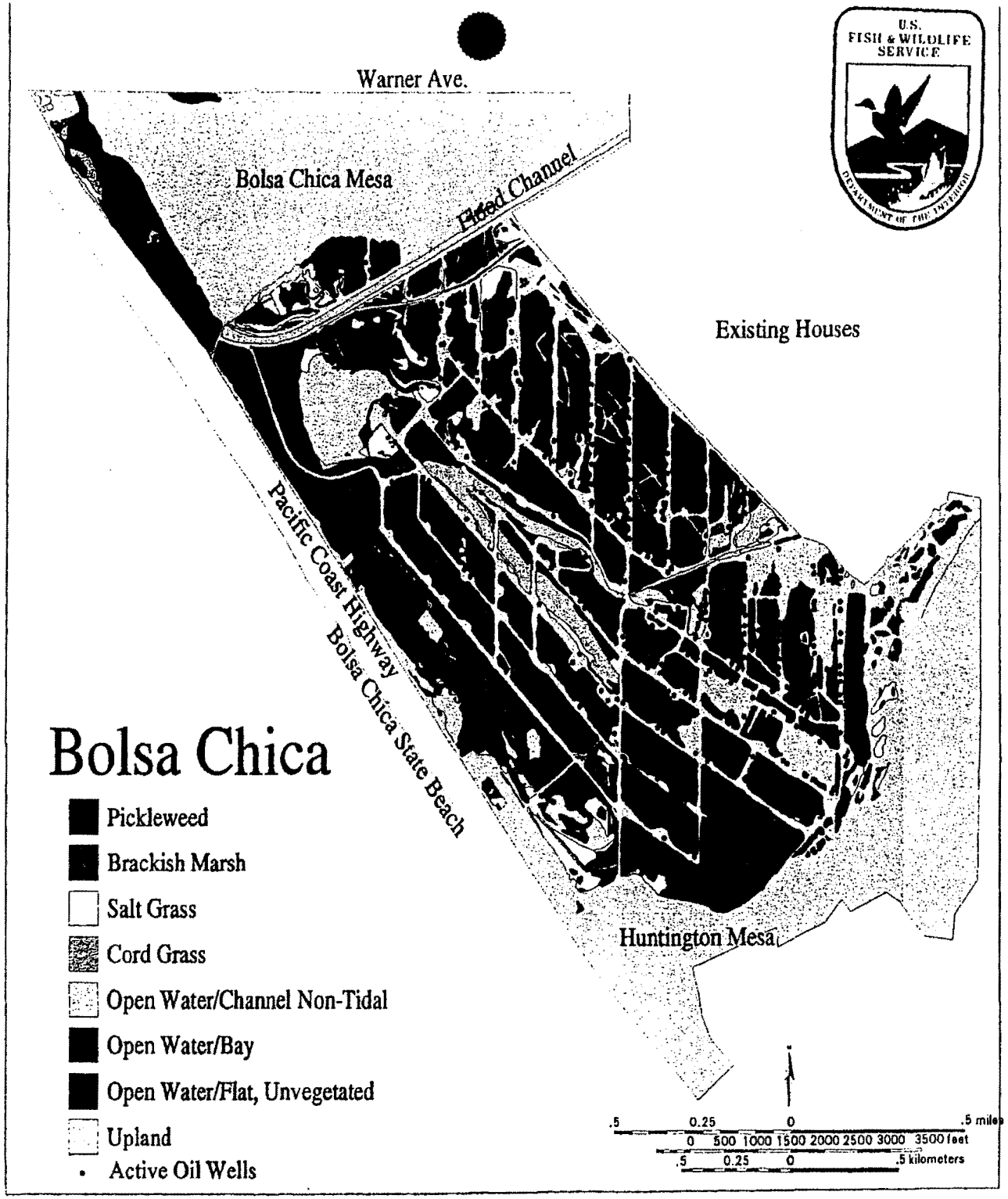


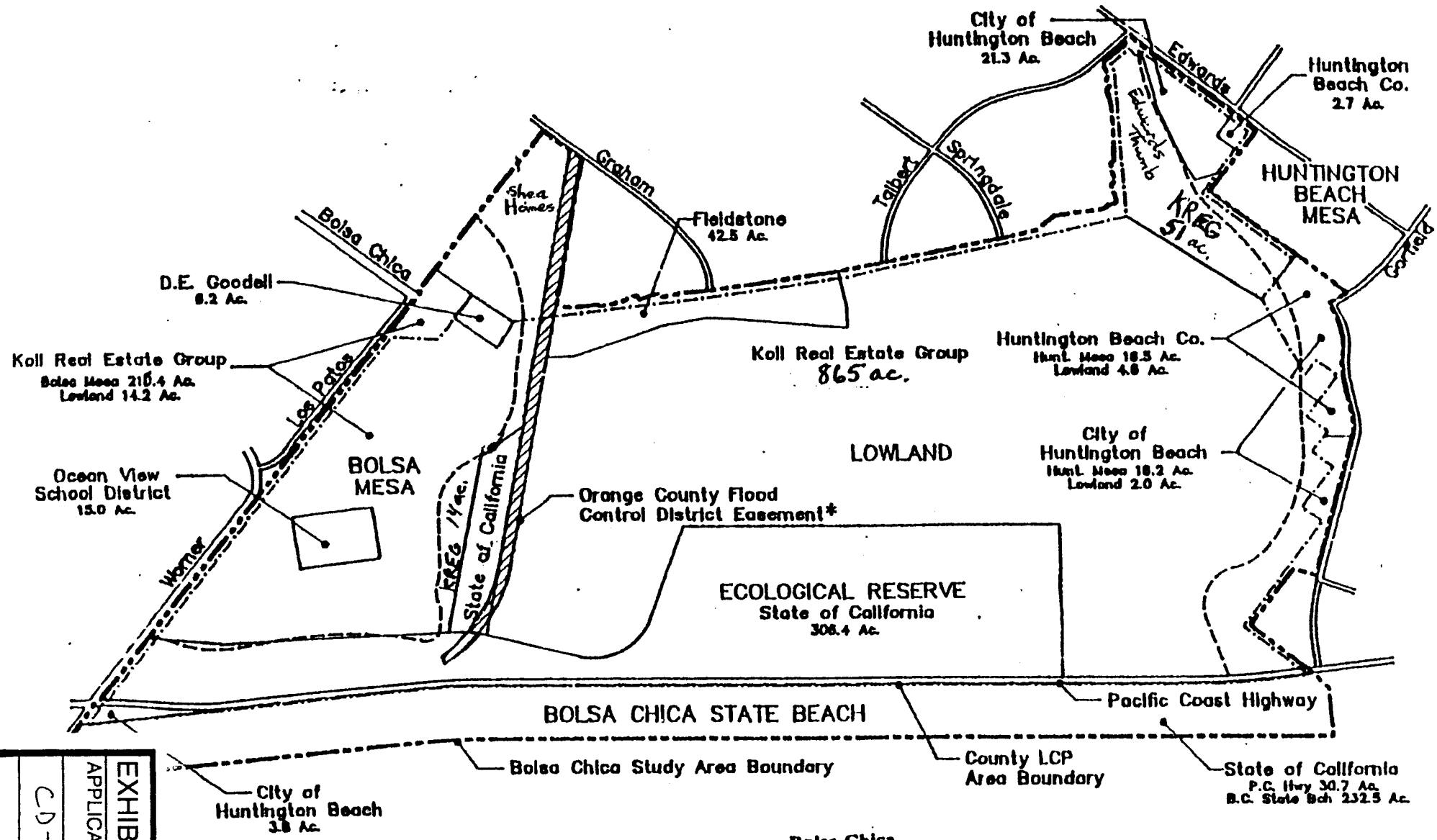

EXHIBIT NO. 2
APPLICATION NO.
CD-115-96
California Coastal Commission






EXISTING HABITAT

EXHIBIT NO. 4
APPLICATION NO.
CD-115-96
California Coastal Commission




Bolsa Chica

Figure 1. ACREAGE BY OWNERSHIP

EXHIBIT NO.
APPLICATION NO.
CD-115-96

California Coastal Commission

RESTORATION CONCEPT PLAN MASTER SCHEDULE

PREPARED APRIL 12, 1995

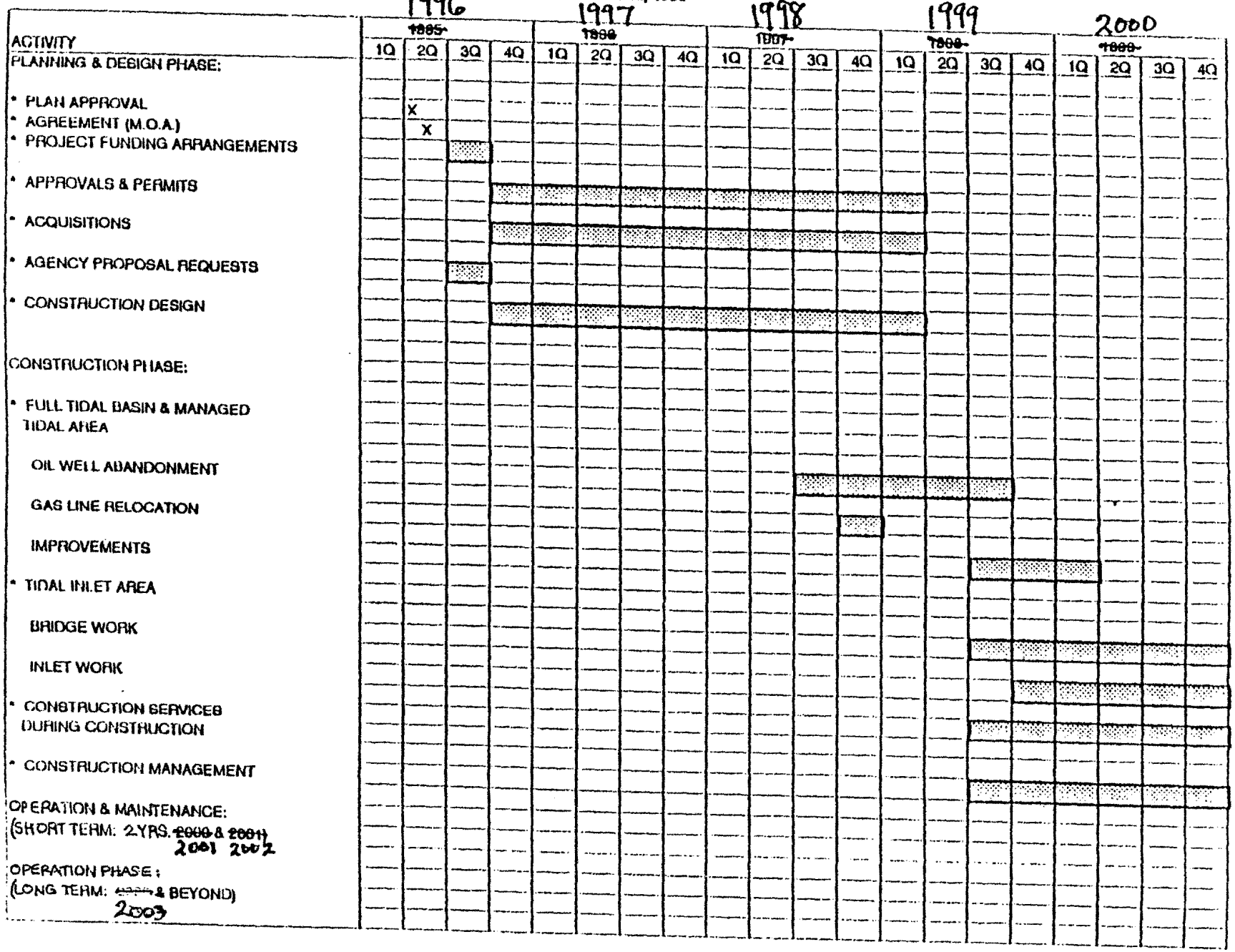



EXHIBIT NO. 6
APPLICATION NO.
CD-115-96

Attachment 2

FINAL ESTIMATE DETAIL



SCLSA CHICA/PORT MITIGATION CONSTRUCTION COST ESTIMATES
BASED UPON COASTAL CONSERVANCY RESTORATION CONCEPT PLAN
AS REVISED APRIL 1995

PREPARED BY: 12-Apr-95
MOFFATT & NICHOL, ENGINEERS
WILLIAMSON & SCHMID HUITT-ZOLLARS
P/T ASSOCIATES

| PHASE | ITEM NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COST | ESTIMATED COST |
|---|---|---|---|---|---|---|
| I. | | CONSTRUCTION PHASE | | | | |
| | A. | FULL TIDAL BASIN & MANAGED TIDAL AREA | | | | |
| | 1. | MOBILIZATION | | | | 922,315 |
| | 2. | CLEAR & GRUBB | 234 | AC | 2000.00 | 468,000 |
| | 3. | DEMO - MISC. STRUCTURES | 1 | LS | 30,000.00 | 30,000 |
| | 4. | OIL WELL ABANDONMENT | 26 | EA | 65,000.00 | 1,690,000 |
| | 5. | GAS LINE RELOCATION - BY UTILITY | | | | - |
| | 6. | OTHER UTILITY RELOCATIONS | | | | - |
| | 7. | EXCAVATION & GRADING | | | | |
| | | EXCAVATION TOTAL 1,660,000 C.Y. | 740,000 | CY | 5.95 | 4,403,000 |
| | | (BY LAND BASED & DREDGE OPERATIONS) | | | | |
| | 8. | MATERIAL DISPOSAL OPTIONS | | | | |
| | | ON-SITE: | | | | |
| | | FILL (DIKES & CORD GRASS AREA) | 140,000 | CY | 4.00 | 560,000 |
| | | TEMP. STORAGE (FUTURE OFF-SITE USE) | 600,000 | CY | 1.00 | 600,000 |
| | | OFF-SITE: | | | | |
| | | NEAR SHORE - VIA DREDGE | 940,000 | CY | 6.00 | 5,640,000 |
| | 9. | REVETMENT & PROTECTION OF IMPROVEMENTS | 60,000 | TN | 25.00 | 1,500,000 |
| | 10 | GROUND WATER INTRUSION BARRIER (HDPE) | 8,000 | LF | 180.00 | 1,440,000 |
| | 11 | PROTECTION OF EXISTING HOMES & PROPERTY (SEE OPTIONS FOR FIELDSTONE PROPERTY) | | | | - |
| | | NOTE: NO ADDITIONAL PROTECTION FOR EXISTING HOMES IS NECESSARY. | | | | |

EXHIBIT NO.
APPLICATION NO.
CD-115-96
California Coastal Commission

FINAL ESTIMATE DETAIL

BCLSA CHICA/PORT MITIGATION CONSTRUCTION COST ESTIMATES
BASED UPON COASTAL CONSERVANCY RESTORATION CONCEPT PLAN
AS REVISED APRIL 1995

PREPARED BY: 12-Apr-95
MOFFATT & NICHOL, ENGINEERS
WILLIAMSON & SCHMID HUITT-ZOLLARS
P/T ASSOCIATES

| PHASE | ITEM NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COST | ESTIMATED COST |
|---|---|---|---|---|---|---|
| | 12. | WATER CONTROL SYSTEM | | | | |
| | | (STRUCTURES & CHANNELS) | | | | |
| | | a. GATES - MANUAL | 3 | EA | 25,000 | 75,000 |
| | | b. ELECTRIC OPTION | 3 | EA | 5,000 | 15,000 |
| | | c. PIPES/CULVERTS | 350 | LF | 125.00 | 43,750 |
| | | d. CHANNELS - W/ EXCAVATION | N/A | | | - |
| | 13. | REVEGETATION | | | | |
| | | a. EMBANKMENTS (LEAVE BARE) | | | | - |
| | | b. CORD GRASS PLANTING | 40 | AC | 8,166.00 | 326,640 |
| | | c. SALVAGING EXIST'G PICKLEWEED | 40 | AC | 3,500.00 | 140,000 |
| SUBTOTAL | | 16,931,390 | | | | |
| MOB. 5.4 % | | 922,815 | | | | |
| TOTAL A | | 17,854,205 | | | | |
| | B. | TIDAL INLET AREA | | | | |
| | 1. | MOBILIZATION | | | | 844,985 |
| | 2. | PCH BRIDGE | | | | |
| | | a. CONSTRUCT DETOUR ROAD | 200,000 | SF | 4.85 | 970,000 |
| | | b. CONSTRUCT NEW BRIDGE & APPROACHES | | | | |
| | | (1) NEW BRIDGE | 34,000 | SF | 80.00 | 2,720,000 |
| | | (2) APPROACHES | 264,000 | SF | 6.10 | 1,610,400 |
| | | c. BEACH ACCESS ROAD (WITH NEW BRIDGE) | | | | - |
| | | d. REPLACE ST. BEACH FACILITIES | 1 | LS | 500,000.00 | 500,000 |
| | 3. | CONSTRUCT OIL SERVICE BRIDGE | 9,300 | SF | 70.00 | 651,000 |

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WILLIAMSON & SCHMID HUITT-ZOLLARS
P/T ASSOCIATES

12-Apr-95

| PHASE | ITEM NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COST | ESTIMATED COST |
|---|---|---|---|---|---|---|
| | 4. | INLET WORK | | | | |
| | | a. JETTIES | | | | |
| | | (1) STONE | 68,350 | TN | 28.60 | 1,954,310 |
| | | (2) CONC. SEAL | 760 | CY | 237.00 | 180,120 |
| | | (3) SCOUR PROTECTION | 1 | LS | 300,000.00 | 300,000 |
| | | b. REVETMENT | 22,500 | TN | 28.80 | 648,000 |
| | | c. SHEET PILE WALL | 700 | LF | 1,921.00 | 1,344,700 |
| | | d. EXCAVATION (50 % 84,500 C.Y.) | 42,250 | CY | 8.30 | 350,675 |
| | | | | | | |
| | | e. SHORE PROTECTION | | | | |
| | | (1) UNDER BRIDGE(S) WITH b. ABOVE | | | | - |
| | | (2) @ BEACH (N. & S. OF INLET) | 55,700 | TN | 28.45 | 1,584,665 |
| | | | | | | |
| | | f. MATERIAL DISPOSAL (50 % 84,500 C.Y.) | 42,250 | CY | 6.00 | 253,500 |
| | | - VIA DREDGE | | | | |
| | | | | | | |
| | | | | | | |
| | | g. OIL BOOM SYSTEM | 750 | LF | 60.00 | 45,000 |
| SUBTOTAL | | 13,112,870 | | | | |
| MOB. 6.4 % | | 844,985 | | | | |
| TOTAL B | | 13,957,355 | | | | |
| | | | | | | |
| | | | | | | |
| | C. | CONST. SERVICES DURING CONSTRUCTION | | | | 1,000,000 |
| | | BY DESIGN TEAMS | | | | |
| | | | | | | |
| | D. | OVERALL CONSTRUCTION MANAGEMENT | | | | 3,500,000 |
| | | | | | | |
| | E. | OIL BUY-OUT (IN 1998) | | | | |
| | | | | | | |
| | 1. | OIL BUY-OUT DIRECT COSTS | | | | 2,060,000 |
| | 2. | OIL CONSULT'G, NEGOTIATION & ENGR'G. | | | | 250,000 |
| | | | | | | |
| | | | | | | |
| | | SUBTOTAL CONSTRUCTION COSTS (ITEM I.) | | | | 38,622,060 |
| | | | | | | |

ECLSA CHICA/PORT MITIGATION CONSTRUCTION COST ESTIMATES
BASED UPON COASTAL CONSERVANCY RESTORATION CONCEPT PLAN
AS REVISED APRIL 1995

PREPARED BY: 12-Apr-95
MOFFATT & NICHOL, ENGINEERS
WILLIAMSON & SCHMID HUITT-ZOLLARS
P/T ASSOCIATES

| PHASE | ITEM NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COST | ESTIMATED COST |
|---|---|---|---|---|---|---|
| | F. | ESCALATION (3YRS @ 3.0 %) | | | | 3,475,385 |
| | | SUBTOTAL | | | | 42,098,045 |
| | G. | CONTINGENCY @ 20 % | | | | 8,419,609 |
| | | TOTAL DIRECT CONSTRUCTION COST ESTIMATE | | | | 50,517,654 |
| | | TOTAL DIRECT CCE (ROUNDED) | | | | 50,500,000 |
| | | OPERATION & MAINTENANCE (O&M): SHORT TERM | | | | |
| | A. | MONITORING PROGRAM | 2 | YR | 50,000.00 | 100,000 |
| | B. | OPERATION PLAN | 2 | YR | 125,000.00 | 250,000 |
| | C. | MAINTENANCE PLAN | 2 | YR | 325,000.00 | 650,000 |
| III. | | CONSTRUCTION DESIGN | | | | 3,500,000 |
| | A. | STUDIES, REPORTS & GEOTECH. WORK | | | | |
| | B. | PREPARE PRELIM. PLANS | | | | |
| | C. | PREPARE FINAL PLANS | | | | |
| | D. | FINAL CONST. DOCUMENTS | | | | |
| | E. | ADVERTISE, BID & AWARD | | | | |
| IV. | | OPERATION PHASE: LONG TERM | | | | EXCLUDED |
| | | (BY OPERATING AGENCY) | | | | |
| | A. | MONITORING PROGRAM | | | | |
| | B. | OPERATION | | | | |
| | C. | FUTURE DEVELOPMENT | | | | |
| | D. | MAINTENANCE PLAN | | | | |
| | | GRAND TOTAL | | | | 55,000,000 |

4/12/95

NOTES PERTAINING TO THE COST ESTIMATE - PORT MITIGATION AT BOLSA CHICA

EXCLUSIONS

The cost estimate does not include engineering analysis of the concept plan.

ASSUMPTIONS

1) Earthwork and dredging values are based on preliminary concept plans by proposed by the State Coastal Conservancy, Port of Los Angeles and Port of Long Beach, and designed by Moffatt & Nichol, Engineers, Williamson & Schmid, Huitt/Zollars and P/T & Associates.

2) Unit costs for excavation and onsite fill include costs for dewatering and mobilization. Mass excavation costs are based on using land-based equipment.

3) Dredged material is suitable for disposal in the nearshore zone (-20 to -30 foot MLLW depth).

4) Unit costs for dredging include use of a medium dredge (16 to 24 inches) mobilized from land, and disposal of all material in the nearshore zone. One 10,000 foot long discharge pipe is to extend from the wetland offshore to a spill barge and downpipe. The dredge capacity is 750 cubic yards of material per hour pumped over a distance of 10,000 feet. No booster pump is necessary.

5) Dredge mobilization costs include purchase and laying of the discharge line, and pipe-jacking the discharge line under Pacific Coast Highway.

6) The HDPE Subsurface Barrier and groundwater monitoring costs are based on information recieved from Woodward-Clyde Consultants and Earth Tech.

7) The subsurface barrier is assumed to extend from the East Garden Grove - Wintersburg Flood Control Channel along the inland property boundary to Huntington Mesa.

8) The unit cost for on-site fill include construction of the berm surrounding the full tidal basin and for filling the new cordgrass area. On-site materials are assumed to be adequate for berm construction. No costs are included for import of earth materials such as clay for an impermeable core.

9) The cordgrass creation area is based on the area graded from -0.3 to +1.2 MSL (-2.5 to +4 MLLW) as will be shown on the conceptual grading plan.

10) Pickleweed salvage is assumed to cover the same area as the cordgrass creation. The unit cost assumes that the salvaged pickleweed will be used for restoration purposes on-site.

11) The managed tidal area is to remain unimproved; no grading or modifications are proposed other than installation of culverts to connect individual cells. An oil spill containment method should be considered.

12) No modifications are proposed to the East Garden Grove - Wintersburg Flood Control Channel, Outer Bolsa Bay and Inner Bolsa Bay.

13) Groundwater monitoring is required prior to, during and after construction.

14) Ultimate improvements to Pacific Coast Highway (PCH), including drainage (curb and gutter) and NPDES requirements (oil/water separators), are not included. One disposal option being considered includes widening and elevating PCH from Warner Avenue to the future tidal inlet bridge.

15) Oil buy-out pertains to the full tidal basin only.

16) Construction of PCH bridge is to be completed prior to construction of the tidal inlet (in the dry).

17) Project construction will start in ~~1998~~ 1999

# APPENDIX C

GENERATION OF ENTEROCOCCI BACTERIA IN A COASTAL SALTWATER MARSH AND ITS IMPACT ON SURF ZONE WATER QUALITY
(S.B. GRANT, et al., 2001)

# Generation of Enterococci Bacteria in a Coastal Saltwater Marsh and Its Impact on Surf Zone Water Quality

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Elevated levels of enterococci bacteria, an indicator of fecal pollution, are routinely detected in the surf zone at Huntington State and City Beaches in southern California. A multidisciplinary study was carried out to identify sources of enterococci bacteria landward of the coastline. We find that enterococci bacteria are present at high concentrations in urban runoff, bird feces, marsh sediments, and on marine vegetation. Surprisingly, urban runoff appears to have relatively little impact on surf zone water quality because of the long time required for this water to travel from its source to the ocean. On the other hand, enterococci bacteria generated in a tidal saltwater marsh located near the beach significantly impact surf zone water quality. This study identifies a potential tradeoff between restoring coastal wetlands and protecting beach water quality and calls into question the use of ocean bathing water standards based on enterococci at locations near coastal wetlands.

## Introduction

Beaches are an important part of the culture and economy in California. An estimated 550 million people visit California's public beaches annually for a total economic benefit to the state of over 27 billion dollars (*1*). To protect beach-goers from exposure to waterborne disease, a new state law mandates the implementation of recreational water quality monitoring programs at public beaches with 50 000 or more annual visitors. Specifically, the law requires monitoring for total coliform (TC), fecal coliform (FC), and the enterococcus (ENT) groups of bacteria, all of which may indicate the presence of fecal contamination. The state also enforces a set of uniform standards for TC, FC, and ENT bacteria including single-sample standards (10 000, 400, and 104 most probable number (MPN) or colony forming units (CFU)/100 mL) and 30 day geometric mean standards (1000, 200, and 35 MPN or CFU/100 mL); a lower single-sample standard for TC of 1000 MPN or CFU/100 mL also applies when the TC/FC ratio falls below 10. The enterococci standard conforms closely to the national guidelines for marine water quality criteria published by the U.S. Environmental Protection Agency (*2*). If indicator bacteria levels in the ocean exceed any of the above standards, the local health officer is required to either post signs that warn against swimming in the water or close the ocean to the public if a sewage spill is suspected. The state standards and U.S. Environmental Protection Agency guidelines are based on a series of epidemiological studies that link gastrointestinal illness and exposure to ocean water containing high levels of indicator bacteria, particularly ENT (*3*−*11*). The origin of ENT in these epidemiological studies was presumed to be anthropogenic sources of fecal pollution, such as sewage, agricultural runoff, and urban runoff.

Huntington State and City Beaches in southern California have been heavily impacted by the passage of the new regulations. According to data provided by the Orange County Health Care Agency, there have been a total of 99 postings at Huntington State and City Beaches between July 26, 1999, when the bill went into effect, and September 5, 2000, approximately 72% and 25% of which were triggered by violations of the ENT single-sample and geometric mean standards, respectively. Persistently high levels of indicator bacteria in the surf zone at Huntington State and City Beaches in the summer of 1999 led to an extensive survey of the local sewage infrastructure (*12*). No significant sewage leaks were discovered, prompting speculation that urban runoff from the nearby Talbert Watershed was a source of fecal pollution (*12*). The present study was designed to test this hypothesis and, more broadly, to characterize the sources and transport of ENT in tidally influenced flood control channels and a saltwater marsh. ENT was the focus of this study because this particular group of indicator bacteria is responsible for the vast majority (97%) of beach advisories issued at Huntington State and City Beaches.

## Field Site

The Talbert Watershed encompasses 3400 hectares in the cities of Huntington Beach and Fountain Valley. The watershed drains an urbanized area consisting of residential developments, commercial districts, plant nurseries, and light industry. This area of southern California has separate stormwater and sanitary sewer systems, so dry and wet weather runoff flows to the ocean without treatment.

Runoff from the Talbert Watershed is conveyed along street gutters to inlets that connect to underground stormwater pipelines. These pipelines connect to a network of three flood control channels (Fountain Valley, Talbert, and Huntington Beach) that converge near the ocean at a constructed wetland known as the Talbert Marsh (Figure 1A). Ocean water floods both the Talbert Marsh and the lower reaches of the open channels during rising tides (flood tides)

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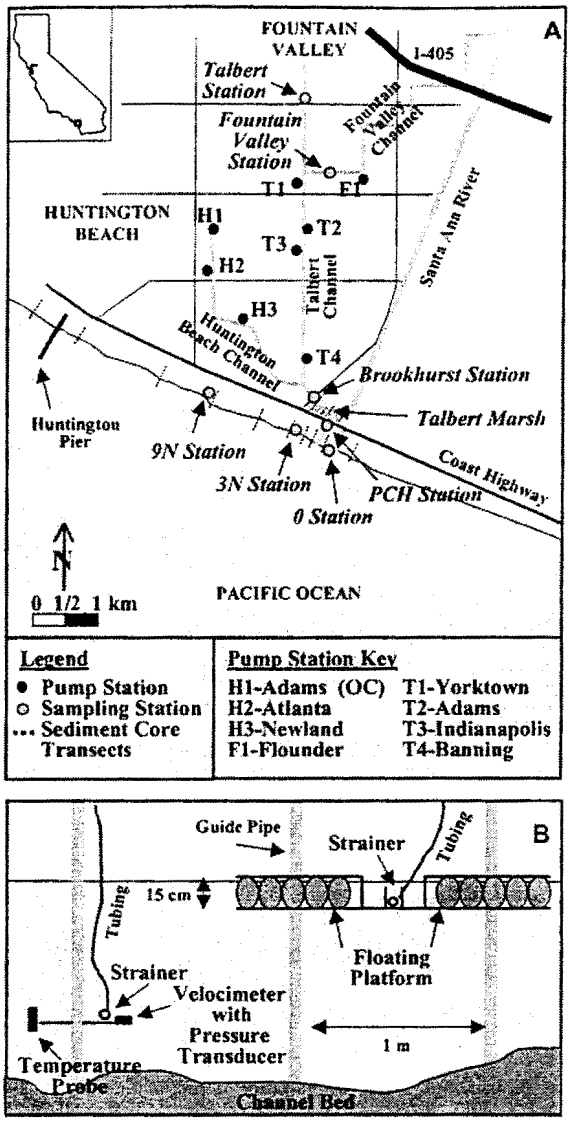


**FIGURE 1. (A) A map of the Talbert Watershed showing the location of drainage channels, pump stations, water sampling stations, and sediment core transects in the marsh and surf zone. (B) A schematic cross section of the two marsh stations, showing the configuration of the surface and bottom sampling system, the velocimeter and pressure transducer, and the temperature sonde.**

and a brackish mixture of ocean water and runoff drains from the system during falling tides (ebb tides).

The Talbert Watershed is nearly flat and only a few feet above sea level. This geographical setting hinders drainage by gravity alone, so a system of transfer stations is used in the lower reaches of the Talbert Watershed to pump runoff into the open channels from stormwater pipelines. Each transfer station, or pump station, consists of a forebay, where runoff can be stored, and several pumps. Pumping of runoff to the channels occurs intermittently during dry weather periods and continuously during storms.

Talbert Marsh is a 10 hectare remnant of what used to be an extensive (1200 hectare) saltwater wetland and dune system in coastal Orange County. The majority of this wetland system was drained and filled over the past century for agricultural reclamation and urban development. Most of what remained of the historical wetland, including Talbert Marsh, was cut off from tidal flushing by the construction of Pacific Coast Highway and channelization of the surrounding area for flood control. As part of a habitat restoration effort, tidal flushing in the Talbert Marsh was restored in 1990 when a new tidal inlet was constructed. Since its restoration, Talbert Marsh has become a typical southern California tidal saltwater marsh with open water, wetland, and upland habitats (*13–15*). Pickle weed (*Salicornia virginica*) is the dominant macrophytic vegetation, and the marsh is utilized by several special-status bird species including the California Least Tern, Brown Pelican, and Beldings Savannah Sparrow.

At the outset of this study it was not clear what effect the Talbert Marsh had on surf zone water quality at Huntington State and City Beaches. On one hand, wetlands, particularly freshwater wetlands, are natural treatment systems that remove chemical and biological pollutants from domestic and agricultural wastewater and urban runoff (*19, 20*). On the other hand, coastal marshes are an important bird habitat, and bird feces are a potential source of ENT (*21, 22*), as is the environmental growth of these organisms in the sediments and on vegetation (*23–26*).

## Methods and Materials

A series of investigations were carried out to (1) quantify the flow of water and ENT into the ocean from the Talbert Marsh and Talbert Watershed, (2) assess the impact of ENT from the marsh and watershed on local surf zone water quality, and (3) identify potential sources of indicator bacteria within these two systems (runoff, birds, vegetation, and sediment). These three different investigations are referred to throughout the paper as the Marsh Study, the Surf Zone Study, and the Source Study, respectively. The methods employed in these investigations are described below.

**Marsh Study.** The goal of the Marsh Study was to measure the flow of water and ENT from the Talbert watershed into the Talbert Marsh and from the Talbert Marsh into the ocean. Measurements were carried out for 15 days starting on May 2, 2000. During the 15 day study, pump stations in the Talbert Watershed were operated in two different modes: during the first 8 days the pump stations were offline, and for the following 7 days the pump stations were online. When the pump stations were offline, runoff that would normally be discharged into the drainage channels was either diverted into the regional sanitary sewer system or stored in the pump station forebays. When the pump stations were online, runoff was intermittently discharged into the drainage channels following normal operating procedures. The impact of these operational changes was monitored at two locations: (i) the junction of the drainage channel network and the marsh at the Brookhurst street bridge (Brookhurst Station) and (ii) the junction of the marsh and the ocean at the Pacific Coast Highway bridge (PCH Station) (see Figure 1A). Two additional sites (Talbert Station and Fountain Valley Station, see Figure 1A) were monitored to characterize the flow of runoff into the drainage channels from the upper reaches of the watershed where there are no pump stations. Methods for monitoring the flow of water and ENT concentrations at these four sites are described below.

*Flow Measurements.* The velocity and level of water at the Brookhurst Station and the PCH Station were measured using acoustic Doppler velocimeters outfitted with pressure transducers (4250 Area Velocity Flow Meter, Isco, Lincoln, NE). The velocimeters were suspended approximately 5 cm above the sediment bed (Figure 1B) and positioned so that the Doppler cone, or area over which the velocity is averaged, was pointing upward and in an inland direction. Data from the velocimeters was electronically logged every five minutes and downloaded onto a laptop computer. The velocity and water level data were used to calibrate a hydrodynamic model for the marsh and channel network (*27*). The calibrated model was then used to compute hourly average values of the volumetric flow rate at both the Brookhurst and PCH Stations over the study period. Water temperature at the two sites was recorded by a sonde (YSI, Yellow Springs, OH) positioned

so that the probe was located approximately 5 cm above the sediment bed (Figure 1B).

The flow of urban runoff into the upstream reaches of the Talbert and Fountain Valley channels was too low to measure using acoustic Doppler technology. Consequently, flow rates at the Talbert and Fountain Valley Stations were estimated by recording the time 10 different pieces of submerged debris took to travel a fixed distance. Volumetric flow rates were then obtained by multiplying this average velocity by the estimated cross sectional area of the flowing water.

No water was discharged from the pump station forebays during the first 8 days of the Marsh and Surf Zone Studies. The volume of water discharged during the last 7 days of the study was estimated from City of Huntington Beach records of water volumes diverted into the sanitary sewer during the first 8 days of the study. The conductivity of forebay water at several pump stations was elevated (30 mS/cm), reflecting the fact that some fraction of the forebay water is ocean water that traveled up the channels during flood tides and spilled into the forebays through leaking flap gates. We computed the fraction of water discharged from the pump stations that was runoff (i.e., not ocean water) as follows

$$F = 1 - (C - C_R)/(C_O - C_R) \quad (1)$$

where $C_O$ and $C_R$ are the conductivity of ocean water and runoff (taken as 53.5 and 3 mS/cm, respectively) and $C$ is the measured conductivity of samples from the pump stations.

The volume of runoff exiting the channel network through the outlet to the ocean was quantified from the magnitude of the conductivity depressions and the volumetric flow rate at the PCH Station by numerically evaluating the following integral

$$\int F(t)\,Q(t)\,dt \quad (2)$$

where $F(t)$ represents the fraction of freshwater computed by applying eq 1 to the conductivity signal measured at the PCH Station and $Q(t)$ is the volumetric flow rate at the PCH Station computed using the calibrated hydrodynamic model (see above). The integral was taken separately over the first 8 days and last 7 days of the study.

*ENT Measurements.* At both the Brookhurst Station and the PCH Station, hourly water samples were collected from the surface and bottom of the water column using programmable sampling units (Isco models 3700 and 6700, Lincoln, Nebraska) (Figure 1B). Surface samples were obtained by drawing water over the lip of an acrylic box that was submerged approximately 1 cm below the water surface and supported by a floating platform (Figure 1B). Bottom samples were drawn through a strainer suspended approximately 5 cm above the sediment bed by a pole attached to the bridge. To obtain an average measure of water quality over each hour-long sampling interval, the automated samplers were programmed to collect 200 mL of water every 15 min for a total sampling volume of 800 mL per bottle per hour. Sample bottles consisted of a disposable plastic liner (Isco ProPak sample bags) supported by a plastic cage (Isco ProPak holder); the liners were used once and then discarded. A purge cycle was executed before and after each sampling event, and the sampling units were filled with ice to reduce bacterial die-off. Samples were retrieved from the Brookhurst and PCH Stations every 6 h and transported to a laboratory at the Orange County Sanitation District (Fountain Valley, CA) where 10 mL was immediately analyzed for ENT using a defined substrate test (IDEXX Enterolert test implemented in a 97 well Quanti-tray format), pH, turbidity, and conductivity (temperature-corrected to 20 °C). A total of 1416 samples were collected using the automated samplers. Automated samplers were employed here because they allowed us to collect hourly water samples in a reproducible manner from precisely the same locations in the water column, 24 h per day, 7 days per week. One potential disadvantage of the automated systems is that the tubing and sampling system (e.g., strainers) are not sterilized between sampling events, so there is a possibility that sample-to-sample cross-contamination might occur. A recent study of sources of *E. coli* in an estuarine system in Florida (*26*) found that automated samplers did not cause significant cross-contamination when a purge step was executed between sampling events, as was done here.

*Solar Radiation.* To assess possible relationships between sunlight and bacterial levels in the marsh, hourly measurements of solar radiation were recorded during the 15 day study period using a thermopile radiometer (Kipp & Zonen, CM3 Thermopile Radiometer, Netherlands) located at the San Joaquin Marsh, which is approximately 6 km west of the Talbert Marsh.

**Surf Zone Study.** Dye experiments and intensive surf zone water quality monitoring were carried out to quantify the impact of ENT from the Talbert marsh and watershed on surf zone water quality at Huntington State Beach. The methods employed for this element of the study are described below.

*Dye Study.* During ebb tides, water from the Talbert Watershed flows into the drainage channels (Huntington Beach, Talbert, and Fountain Valley), through the Talbert Marsh, and into the ocean. To determine how ebb flow from the Talbert marsh and watershed interacts with the surf zone, separate dye experiments were conducted on May 1 and May 10, 2000, as follows. Rhodamine WT dye (Keystone, Santa Fe Springs, California) was added for approximately 30 min to effluent from the Talbert Marsh during an ebb tide. The spatial distribution of the dye was recorded at a series of times post release by a four channel radiometer (DMSV MK-1 SpecTerra Sys., Nedlands, Australia) flown at approximately 1500 m above sea level. The dye field in these images was visualized by forming the ratio of emission and absorption maxima (570 and 550 nm, respectively) of Rhodamine WT.

*Surf Zone Monitoring.* To assess the impact of ENT from the marsh and watershed on surf zone water quality, hourly samples were collected at the PCH Station (to characterize the concentration of ENT entering and leaving the marsh) and at three locations in the surf zone (stations 0, 3N, and 9N, see Figure 1A). The Surf Zone Study was carried out during the same period of time (May 2−16, 2000) as the Marsh Study (see above). However, the methods used to collect and analyze samples in the Surf Zone Study differed from those described above for the Marsh Study. For the Surf Zone Study, hourly grab samples (total volume of approximately 1L) were collected in sterile Nalgene bottles at the PCH and the surf zone stations 24 h per day, 7 days per week, for 2 weeks. Within 6 h of collection, samples were transported to Sierra Laboratories, Inc. (Laguna Hills, California) on ice where 10 mL of each sample was immediately analyzed for ENT using multiple tube fermentation (MTF) (EPA Method 9230B). To characterize cross-shore variability of the ENT signal, separate samples were collected from ankle and waist depths at each surf zone station. A total of 2021 grab samples were collected for this element of the study.

**ENT Source Study.** Additional studies were carried out to identify specific sources of ENT in the marsh and watershed. Specific sources examined included urban runoff, bird feces in the marsh, marine vegetation, and marsh and surf zone sediments, as described below.

*Bird Feces.* To assess the amount of ENT present in bird feces, bird feces were collected, along with any attached sediment from mud flats, in the Talbert Marsh where birds congregate. The nature of the feces (wet or dry) was noted

at the time of collection. Sediment that appeared to contain no bird feces was also collected to determine background levels of ENT. The sediment and feces samples were weighed and placed in acid washed Nalgene bottles with 500 mL of marsh water. The suspensions were shaken vigorously to disperse the feces and sediment and then allowed to settle for 15 min. Depending on the experiment, between 0.1 and 10 mL of supernatant was tested for ENT using the Enterolert protocol described in the Marsh Study. Control experiments were conducted to rule out the possibility that chemicals present in the feces and/or sediment might interfere with the Enterolert system. Specifically, Enterolert analyses were conducted on autoclaved suspensions of sediment and bird feces.

*Bird Census.* To quantify the input of ENT into the marsh from birds, a bird census was carried out as follows. Digital cameras (Kodak Model DC-290, Rochester, New York) were installed at three different locations along the northeastern margin of the marsh. These cameras were positioned so that, together, they provided a complete picture of the upland, wetland, and open water habitat areas. Images were shot hourly at a resolution of 2240 × 1500 pixels in 256 colors, 24 h per day, over the same period of time when samples were being collected in the marsh and in the surf zone (May 2−16, 2000). The images were uploaded to a desktop PC where they were analyzed with Adobe Photoshop (Adobe, San Jose, California). The birds in each image were enumerated manually to obtain an estimate for the total number of birds present in the marsh each hour of the 2-week study.

*Urban Runoff.* To characterize the concentration of ENT in urban runoff, daily grab samples were collected from all 11 pump stations in the Talbert Watershed and from the upstream reaches of the watershed at the Talbert and Fountain Valley Channel Stations (Figure 1A). Runoff sampling occurred over the same period of time that the Marsh and Surf Zone Studies were carried out (May 2−17, 2000). Prior to sampling the pump station forebays, water in the forebay was mixed by cycling the station pumps on and off. Sterile Nalgene bottles were lowered into the underground forebays, and approximately 1 L of water was collected. Five hundred mL samples of runoff at the Talbert and Fountain Valley Channel Stations were collected by manually placing a sterile Nalgene bottle directly in the flowing stream. All samples were stored on ice immediately after collection and transported to the Orange County Sanitation District where they were analyzed for pH, turbidity, conductivity, and ENT using the Enterolert protocol described in the Marsh Study.

*Sediment and Vegetation.* To assess the levels of ENT present in sediments, cores were collected from the marsh and surf zone with a Brandford 5024 Pneumatic Vibrator (Brandford Co., New Britain, CT) outfitted with a 1.52 m barrel (OD 4.4 cm) and Butyrate plastic liners (AMS Inc., American Falls, ID). Each core was cut into three 15 cm segments which were sealed at the ends with Teflon lined caps and transported to Sierra Laboratories, Inc. (Laguna Hills, CA) for bacterial analysis. Upon arrival at the laboratory, 50 g of each core section was suspended in 450 mL of phosphate buffered saline (PBS) (0.3 mM $KH_2PO_4$, 2 mM $MgCl_2$) in accordance with Standard Method 9221 A-3 (*28*). The clarified supernatant was analyzed for ENT using MTF following the protocol outlined in the Surf Zone Study. Seaweed samples were collected from the marsh, stored in disposable plastic bags, and transported on ice to Sierra Laboratories, Inc. Upon arrival at the lab, 50 g of vegetation was placed in a sterile container to which 450 mL of PBS was added. The solution was shaken vigorously and allowed to settle for 15 min and then reshaken. A 100 mL sample of the supernatant was analyzed for ENT using the MTF method described in the Surf Zone Study.

## Results and Discussion

**Marsh Study: Dynamics.** The Talbert Marsh is a highly dynamic system, primarily because the flow of water through the marsh is dominated by the tides (Figure 2). Because Southern California has semidiurnal unequal tides (*29, 30*), there are four different tidal extrema each day including high−high, low−high, high−low, and low−low tide levels. Furthermore, the tide range, which is the difference between the high−high and low−low levels, oscillates over a 14−15 day period. The Marsh and Surf-Zone Studies were carried out over a 15 day period that began shortly before a spring tide when the tide range is maximal, passed through a neap tide when the tide range is minimal, and returned back to a spring tide again. The four daily tide stages and the spring-neap-spring transition are evident in the water levels measured at the Brookhurst and PCH Stations (top panel in Figure 2).

During flood tides (indicated by negative velocities in the second panel of Figure 2), the water levels at the Brookhurst and PCH Stations increase as water flows from the ocean, through the marsh, and inland along the channel network. During ebb tides (indicated by positive velocities) the water levels at the two stations decrease as water flows out of the channel network, through the marsh, and into the ocean. When ebb tides occur during daylight hours, solar heating of water flowing out of the channel network causes a significant increase in the temperature of the marsh water (compare first, third, and fourth panels). The conductivity measured at the Brookhurst and PCH Stations (fifth panel) corresponds to pure ocean water during flood tides (53.5 mS/cm) and a brackish mixture of ocean water and urban runoff at the end of the ebb tides (conductivity depressions).

The next panel in Figure 2 is a plot of the ENT concentrations measured at the Brookhurst and PCH Stations. ENT concentrations in the marsh varied from below the detection limit (10 MPN/100 mL) to a high of 2142 MPN/100 mL. A total of 218 (15%) and 655 (46%) of the marsh samples exceeded the single-sample and geometric mean standards for ENT (104 MPN/100 mL and 35 MPN/100 mL, shown as dark and light blue lines in the plot), respectively. A total of 247 (17%) of the marsh samples fell below the detection limit of 10 MPN/100 mL; all values falling below the detection limit were arbitrarily assigned the detection limit value. The log-transformed ENT concentrations at the top and bottom of the water column in the marsh are correlated ($r = 0.7$and $r = 0.72$ at the Brookhurst and PCH Stations, respectively). Comparing the conductivity and ENT curves in Figure 2, we find that elevated ENT values frequently occur in the marsh during periods of time when runoff from the drainage channels, as indicated by the conductivity depressions, is not present.

The last panel in Figure 2 is a plot of the total number of birds that visited the Talbert Marsh during the course of our study. The birds followed a daily routine in which their numbers started out low in the morning, peaked in the afternoon, and tapered off in the evening. Gulls and Elegant Terns constituted the majority (80%) of birds visible in the images. The largest congregation of birds, 1180 individuals, occurred at 2:00 in the afternoon on May 5.

**Marsh Study: ENT Source or Sink?** A primary objective of this study was to determine if the marsh functions as a net source or sink of ENT as water flows out of the Talbert Watershed drainage channels, through the marsh, and into the ocean during ebb tides. To this end, we segregated all of the marsh ENT data into two groups based on whether the samples were collected during ebb tides (Figure 3A,B) or flood tides (Figure 3C,D). These data were further segregated based on whether the samples were collected during the first 8 days of the study (when the pump stations were offline)

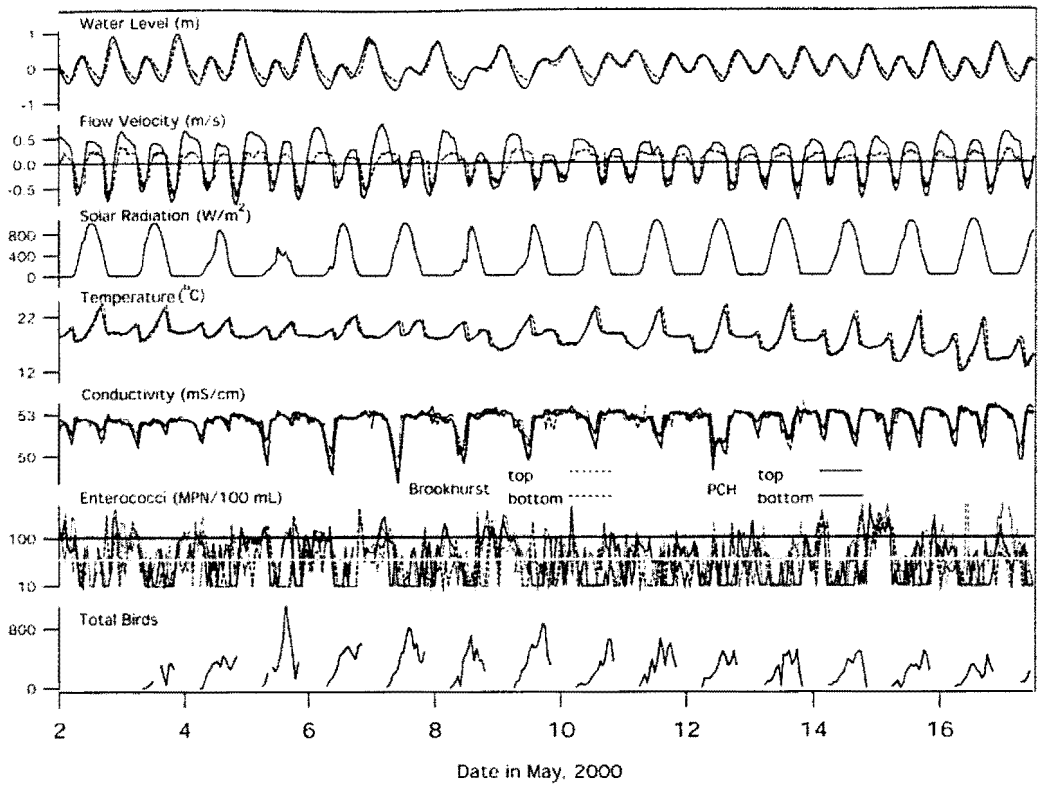


**FIGURE 2. The dynamics of marsh parameters measured during the 15 day study period. The solid and dashed lines (water level, flow velocity, temperature panels) correspond to the PCH and Brookhurst stations, respectively. The key for conductivity and ENT traces is indicated in the figure. The dark and light blue lines denote the single sample and geometric mean standards for ENT. Water level is referenced to mean sea level. Positive and negative velocities correspond to shoreward and landward flow, respectively. The gray vertical stripes represent night-time conditions.**

or the last 7 days of the study (when the pump stations were online) and based on the vertical location of samples in the water column (top or bottom). For each subgroup of data we computed a geometric mean and tabulated the percentage of samples that exceeded the single-sample standard for ENT. The results of this analysis identify the marsh, not urban runoff from the Talbert Watershed, as the primary source of ENT in the water flowing into the ocean. During ebb tides, the geometric mean of ENT (Figure 3A) and the percentage of samples exceeding the single-sample standard (Figure 3B) approximately double as the water flows through the marsh from the Brookhurst to PCH Station. The trend is reversed during flood tides when the geometric mean of ENT (Figure 3C) and percentage of single-sample exceedences (Figure 3D) increase as water flows through the marsh from the PCH to Brookhurst Station. With the exception of two flood-tide cases, water enters the marsh below the geometric mean standard for ENT (35 MPN/100 mL, dashed line in the figure) and exits the marsh in exceedence of the standard. In several cases, the ENT concentrations measured at the top of the water column are higher than the ENT concentrations measured at the bottom of the water column.

The idea that the marsh is a net source of ENT is also supported by Figure 3E, where we plot the hour-by-hour difference between the ENT concentrations measured at the Brookhurst and PCH Stations (ΔENT). On average, the ENT concentration is higher at the PCH Station during ebb tides (mean $\Delta ENT = -29 \pm 7$ MPN/100 mL) and higher at the Brookhurst Station during flood tides (mean $\Delta ENT = 27 \pm 6$ MPN/100 mL). A direct comparison of the ENT concentrations at the Brookhurst and PCH Stations is valid only if the residence time of water in the marsh is less than our sampling interval of 1 h. This condition appears to be satisfied based on a dye study conducted on the morning of May 19, 2000, which found that the residence time of water in the marsh during a weak spring tide is less than 40 min (*27*).

**Surf Zone Study: Dye Experiment.** The above analysis demonstrates that the Talbert Marsh is a net source of ENT, but it is not clear that ENT generated by the marsh negatively impact surf zone water quality. To characterize how ebb flow from the Talbert Marsh interacts with the ocean, a set of experiments were conducted in which dye (Rhodamine WT) was injected into the outlet of the Talbert Marsh during two separate ebb tides, one on May 1 and the other on May 10, 2000. The spatial pattern of dye released from the Talbert Marsh during the May 1 experiment is displayed in Figure 4. The dye pulse split into two plumes as it flowed into the ocean. One plume was entrained in the surf zone where it rapidly advected upcoast at velocities exceeding 0.2 m/s; a portion of this plume was subsequently taken offshore by a rip current. The second plume was carried directly offshore by a momentum jet located at the mouth of the marsh. The portion of the dye entrained in the surf zone on May 1 was advected in an upcoast direction because, on that day, ocean waves with average significant heights of 0.7 m were from the south (*31*). During the second release on May 10, ocean waves with significant heights of 1.4 m were from the west, and the portion of the dye entrained in the surf zone was advected rapidly (0.3 m/s) in a down coast direction (data not shown). Hence, water flowing out of the marsh during ebb tides can impact surf zone water quality at Huntington State and City Beaches directly upcoast of the Talbert Marsh outlet, provided that ocean waves strike the beach in an upcoast direction. Interestingly, wave conditions similar to those observed during the May 1 experiment were also present during the summer of 1999 when large stretches of Huntington State and City Beaches were closed to the public (personal communication City of Huntington Beach lifeguards, 2000).

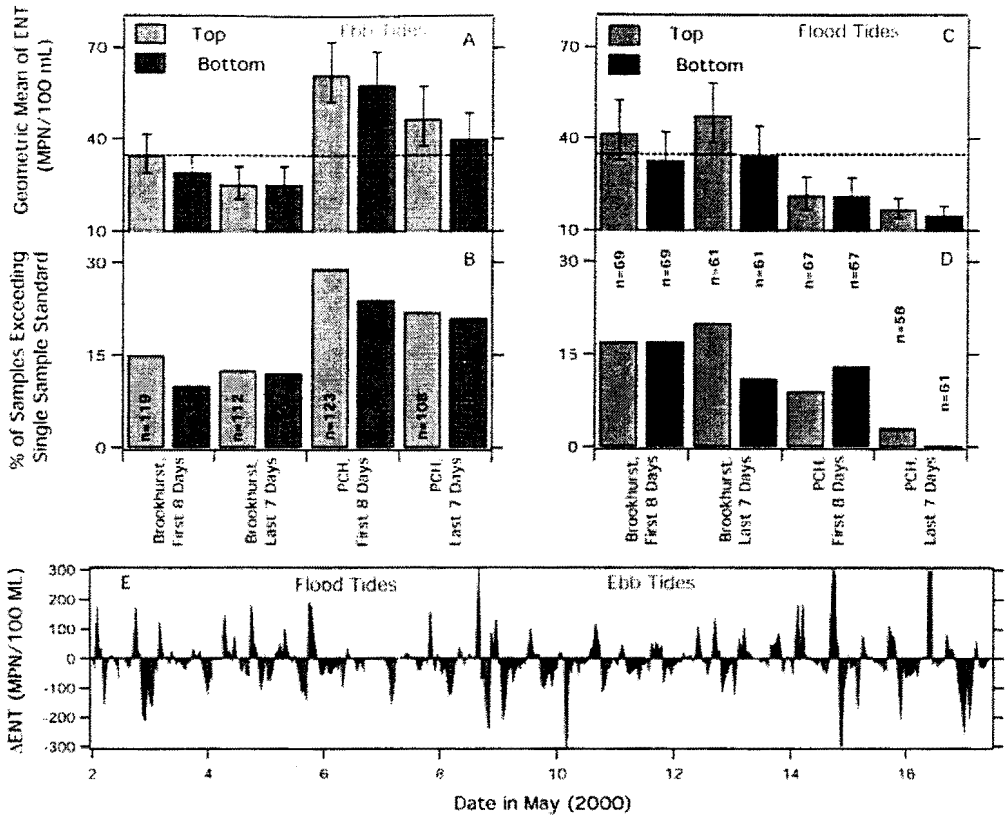


**FIGURE 3. Geometric means of ENT in samples collected during ebb tides (A) or during flood tides (C). The dashed line in these figures represents the geometric mean standard for ENT (35 MPN/100 mL). Also shown are the percentage of samples collected during ebb tides (B) or flood tides (D) that exceeded the single sample standard for ENT (104 MPN/100 mL) and the difference in ENT concentrations at Brookhurst and PCH (E). Error bars represent 95% confidence intervals. The number of samples used to calculate geometric mean values are indicated in the figure.**

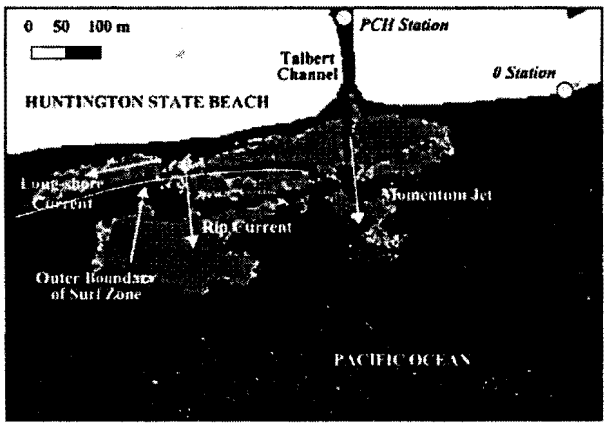


**FIGURE 4. An areal image showing the near shore distribution of Rhodamine WT dye at 11:51 PDT, approximately 25 min into a release from the Talbert outlet during ebb tide on May 1, 2000.**

In addition to providing qualitative information about the fate of marsh effluent as it enters the ocean, the dye experiments can also be used to estimate the dilution that occurs as ebb flow from the marsh becomes entrained in the surf zone. Concentrated dye was released into the Talbert Marsh outlet at a rate of $Q_{dye} = 8 \times 10^{-6}$ m$^3$/s. From the calibrated hydrodynamic model, we estimate that the volumetric flow of water out of the marsh during the dye study on May 1 was relatively steady and equal to $Q_{effluent} = 11.6$ m$^3$/s. Photographs of the dye release indicate that the dye plume mixed over approximately one-half of the channel cross section before reaching the surf zone (*31*). Taking this observation into account, we estimate that the initial dilution of the dye plume into the marsh effluent stream was approximately $7.0 \times 10^5$ $((Q_{effluent}/2)/Q_{dye})$. The volume of the dye field at 11:51 PDT (the time at which the DMSV image in Figure 4 was shot) was approximately $7 \times 10^4$ m$^3$ assuming a 1.5 m mixing depth. Therefore, the dilution of the plume at 11:51 PDT, which includes both the initial and the surf zone dilution, is the volume of the dye field ($7 \times 10^4$ m$^3$) divided by the volume of the dye released ($6.51 \times 10^{-2}$ m$^3$) or $1.1 \times 10^6$. Taking the ratio of this total dilution ($1.1 \times 10^6$) and the initial dilution ($7.0 \times 10^5$) indicates that the marsh effluent stream was diluted by a factor of 1.6 as it became entrained in the surf zone. Hence, effluent leaving the Talbert Marsh during ebb tides suffers approximately a factor two dilution as it is entrained in the surf zone.

**Surf Zone Study: Bacterial Monitoring.** To measure the actual impact of ebb flow from the marsh on surf zone water quality, an intensive surf zone monitoring program was carried out in parallel with the 15 day Marsh Study described above. ENT measurements in the surf zone varied from below detection limit (10 MPN/100 mL) to a high of 5700 MPN/100 mL. A total of 69 (3%) and 298 (15%) surf zone samples exceeded the single-sample and geometric mean standard for ENT, respectively. A total of 1067 (53%) of the surf zone samples fell below the detection limit. As with the data collected in the Marsh Study, samples falling below the detection limit were arbitrarily assigned the detection limit value.

Figure 5 displays the geometric mean and 95% confidence intervals of ENT measured at surf zone stations (9N, 3N, and 0, see Figure 1A) and at the PCH Station during either rising or falling tides. These data are also segregated based on whether samples were collected in the first 8 days of the study or the last 7 days of the study (indicated in the figure as "wk 1" and "wk 2", respectively), whether the samples were collected at ankle or waist depth, and whether the

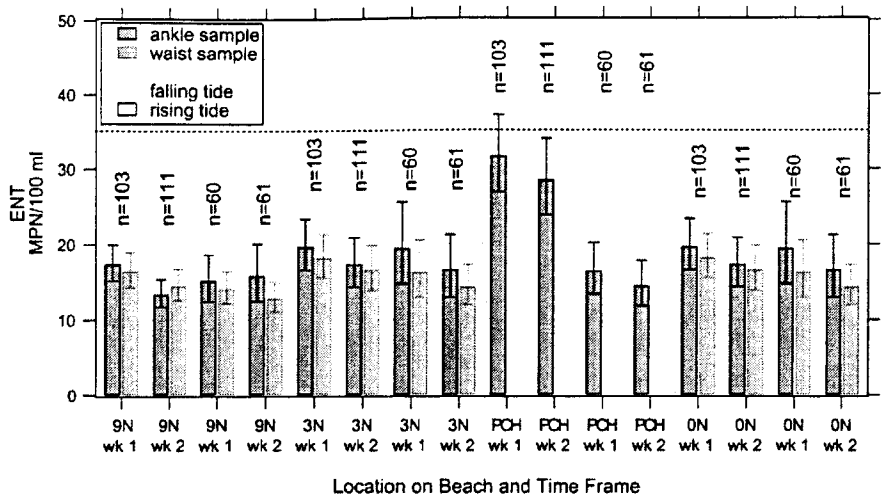


**FIGURE 5. Geometric means and 95% confidence intervals of ENT concentrations (MPN/100 mL) at the PCH and surf zone stations measured during falling (blue background) and rising (white background) tides. The stations are displayed from north (left) to south (right): 9N, 3N, PCH, and 0 (see map in Figure 1). At each station, the geometric means are shown for the first 8 days and last 7 days (denoted wk 1 and wk 2, respectively). For the surf zone stations, geometric means for samples taken at ankle and waist depth are indicated. At the PCH site, only a surface sample was analyzed. The sample sizes are shown above the bars. The dotted line represents the geometric mean standard for ENT (35 MPN/100 mL).**

samples were collected during rising or falling tides. As described in more detail in the Methods and Materials section, all of the ENT data plotted in Figure 5 were obtained by performing MTF analysis on grab samples, while the ENT data collected for the Marsh Study were obtained by performing an Enterolert analysis on samples collected with an automated sampling system. Comparing the PCH Station data in Figure 3A with the PCH Station data in Figure 5, we find that during ebb tides the geometric mean of ENT estimated using the Enterolert/automated sampling system is approximately 60 MPN/100 mL, compared to 30 MPN/100 mL using MTF/grab samples. ENT values estimated by the two approaches are weakly correlated ($r = 0.5$), but the magnitude of the ENT values estimated by the MTF/grab sample method appear to be lower. This difference could arise due to differences in the analytical technique employed (MTF versus Enterolert) and/or the sampling methodology employed (grab versus automated). A strong correlation between Enterolert and MTF measurements of ENT in marine samples ($r = 0.927$) has been previously reported (*32*). Hence, the differences reported here are probably due to the differences in the sample collection protocols employed in the Marsh and the Surf Zone Studies.

Because all of the data presented in Figure 5 were collected and analyzed using the same procedure (MTF on grab samples), we can directly compare the ENT signal leaving the marsh during ebb tides with the ENT signal measured in the surf zone over the same period of time. Figure 5 reveals that during falling tides, when ebb flow from the marsh enters the ocean, the geometric mean of ENT at the PCH Station is approximately two times higher compared to the geometric mean of ENT measured at the surf zone stations. With one exception, the geometric means of surf zone samples collected at waist depth are slightly lower than the geometric mean of samples collected at ankle depth. Based on these data, the ENT signal at stations 0, 3N, and 9N could have been caused by ebb flow from the Talbert Marsh provided that the following conditions were met: (1) near complete surf zone entrainment of the marsh effluent as it flows over the beach and into the ocean during falling tides, (2) no more than a factor of 2 dilution as effluent from the marsh is entrained in the surf zone, and (3) littoral flow in the surf zone directed in an upcoast direction. The first two conditions appear to be met based on the results of the dye study described above. Based on wave azimuth data recorded at Huntington Beach during the 15 day study (*31*), wave-induced flow in the surf zone was directed in an upcoast direction 60% of the time, including long stretches of time between May 4 and 8 and again between May 12 and May 16. Hence, ENT generated in the marsh appear to have at least a localized impact on surf zone water quality at Huntington State Beach.

**ENT Source Study: Urban Runoff.** No more than trace levels of rainfall were measured in Huntington Beach either during, or 14 days prior to, our 15 day study. Therefore, all runoff generated by the Talbert Watershed during this period was from dry weather sources, including landscape irrigation, street cleaning, car washing, and other activities that lead to surface water flow. To determine if the Talbert Watershed might be a significant source of ENT, samples of runoff were collected from pump station forebays and upstream at the Talbert and Fountain Valley Channel Stations (Figure 1A) and then analyzed for ENT using the Enterolert system (Table 1). The largest concentration of ENT (61 310 MPN/100 mL) was detected in a sample collected from the Flounder pump station on 5/8/00 (data not shown). The geometric mean of ENT in the runoff ranged from 23.1 MPN/100 mL at the Indianapolis pump station to 3477 MPN/100 mL in the upstream reaches of the Fountain Valley Channel (Table 1). Despite the high concentration of ENT measured in most urban runoff samples, the activation of pump stations during the last 7 days of our study did not appear to negatively impact downstreamwater quality. Indeed, the geometric means of ENT at the Brookhurst and PCH Stations during ebb tides (Figure 3A) actually *decreased* when pump stations came online. Likewise, the geometric means of ENT at all surf zone stations (Figure 5) were either unchanged when the pump stations went from offline to online or declined slightly.

There are several possible reasons why the discharge of pump station water did not lead to higher ENT concentrations in the marsh and surf zone. Mathematical modeling of tidal flow in the channel network reveals that water discharged from a particular pump station may or may not be flushed to the ocean in a single tide cycle, depending on the tidal range, when in the tide cycle the discharge occurred, and the pump station's inland distance from the shore. Specifically, the model predicts that at least 50% of runoff discharged during the last 7 days of our study was temporarily trapped in the channel network due to the tidally driven oscillation of water flow in the drainage channels.

**TABLE 1. Quality of Water That Enters the Channel Network from Either Uncontrolled Sources of Runoff (Talbert (T.) and Fountain Valley (F.V.) Channels) or from Pump Stations (p.s.)[a]**

| source | conduct. [mS/cm] | pH [−] | turbidity [NTU] | ENT ($\times 10^3$) geometric mean [MPN/100 mL] | ENT ($\times 10^3$) mean [MPN/100 mL] |
|---|---|---|---|---|---|
| Adams p.s. | 4.5 (±1.3) | 7.7 (±0.3) | 10.2 (±5.1) | 1.6 (+1.7/−0.8)) | 3.6 (±6.0) |
| Atlanta p.s. | 32.3 (±6.9) | 7.3 (±0.3) | 22.1 (±4.8) | 1.6 (+0.75/−0.51) | 2.0 (±1.3) |
| Banning p.s. | 36.3 (±3.8) | 7.4 (±0.3) | 9.3 (±2.0) | 0.7 (+0.7/−0.3) | 1.8 (±3.2) |
| OC Adams p.s. | 3.0 (±0.8) | 7.6 (±0.2) | 24.7 (±11) | 2.87 (+2.8/−1.4) | 5.2 (±6.1) |
| Flounder p.s. | 3.5 (±2.4) | 7.4 (±0.4) | 13.8 (±19.8) | 1.9 (+6.1/−1.5) | 12.5 (±17) |
| Indianapolis p.s. | 11.1 (±1.9) | 7.6 (±0.4) | 11.5 (±5.3) | 0.023 (+0.06/−0.02)) | 0.012 (±0.02) |
| Yorktown p.s. | 8.0 (±2.6) | 7.4 (±0.4) | 27.2 (±9.9) | 2.2 (+5.1/−1.6) | 9.7 (±11) |
| Newland p.s. | 19.7 (±4.5) | 7.5 (±0.3) | 10.4 (±4.9) | 1.2 (+1.1/−0.6) | 2.1 (±2.4) |
| F. V. channel | 3.1 (±4.8) | 9.0 (±0.5) | 2.1 (±0.8) | 3.5 (+2.0/−1.3) | 5.2 (±6.3) |
| T. channel | 2.5 (±4.9) | 8.8 (±0.5) | 3.22 (±2.0) | 0.5 (+0.4/−0.2)) | 0.9 (±1.1) |

[a] Standard deviations and 95% confidence intervals are given in parentheses for mean and geometric mean values, respectively.

By integrating the conductivity depressions evident in Figure 2 (see Methods and Materials), we estimate that the volume of runoff flowing into the ocean at the PCH Station during the first 8 days and last 7 days was 5000 $m^3$ and 4000 $m^3$, respectively. Furthermore, we estimate the amount of flow entering the upper reaches of the channels at the Fountain Valley and Talbert Stations to be approximately 8000 $m^3$ (first 8 days) and 7000 $m^3$ (last 7 days), and we estimate the amount of runoff discharged from pump stations the last 7 days of the study to be 16 000 $m^3$. Hence, the net inflow and outflow of runoff roughly balance during the first 8 days (8000 and 5000 $m^3$, respectively), while the net inflow and outflow of runoff do not balance during the last 7 days (22 000 and 4000 $m^3$, respectively). These volume estimates support the conclusion that the majority of the pump station water discharged in the last 7 days of the study was trapped in the channel network. Importantly, the 7000 $m^3$ per week of runoff continuously entering the drainage channels from the upper reaches of the Talbert Watershed had relatively little impact on downstreamwater quality, at least compared to the ENT signal generated by the Talbert Marsh. Die-off of ENT and the relatively long residence time (~1 week) of runoff in the drainage channels may limit the downstream impact of urban runoff (*33*−*35*). The fate and transport of bacterial pollutants in the drainage system at Huntington Beach is a subject of ongoing investigations.

**ENT Source Study: Sediment and Vegetation.** Sediment cores were collected from May 22 to June 6, 2000 along a set of transects (dotted lines in Figure 1A) located both in the marsh and surf zone. ENT levels in the sediment cores are consistent with the marsh being a significant source of these bacteria. Nineteen percent of sediment samples from the marsh ($n = 96$) were positive for ENT, compared to 2% of the sediment samples from the surf zone ($n = 121$). A total of 65% of the surface sediment samples in the marsh were positive for ENT. Vertical profiles of ENT in the marsh sediments indicate that the bacteria are concentrated in the top 1 cm of the cores (Figure 6). The largest concentration of ENT in the sediment cores (50 000 MPN/100 g) was from a surface sample collected from the northeast corner of the marsh. Of the sediment collected from the surf zone, only one sample had significant levels of ENT (800 MPN/100 mL), and this was a surface sample collected directly upcoast of the Talbert Marsh outlet.

High levels of ENT, ranging from 18 to 450 000 MPN/100 g (geometric mean of 2284 MPN/100 g, $n = 9$), were also found on seaweed collected from the marsh. The fact that sediments and vegetation are enriched in ENT suggests that these organisms are surviving, and perhaps even growing, in the marsh environment. Marine vegetation supports the growth of certain strains of ENT in New Zealand, and estuarine sediments can apparently support the growth of

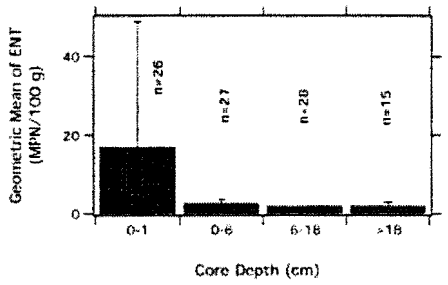


**FIGURE 6. The vertical distribution of ENT in marsh sediments. Error bars represent 95% confidence intervals. The number of cores used to calculate the geometric mean values are indicated.**

ENT in tropical settings such as Hawaii and Guam (*21*, *22*), although there are no published reports of this occurring in Mediterranean climates such as southern California.

**ENT Source Study: Bird Feces.** Bird feces are a significant source of ENT in the marsh environment. This conclusion was arrived at by measuring the ENT levels in the following: (1) marsh water alone, (2) 500 mL of marsh water after addition of approximately 10 g of marsh sediment, and (3) 500 mL of marsh water after addition of approximately 10 g of marsh sediment containing bird feces that were either wet or dry at the time of collection. The concentration of ENT was below the detection limit (100 MPN/100 mL) in samples of pure marsh water and in marsh water containing feces-free sediment. However, when marsh water was exposed to sediment containing feces that were wet at the time of collection, the ENT concentrations ranged from 9090 to 24 192 000 MPN/100 mL ($n = 10$). Likewise, marsh water exposed to sediment containing feces that were dry at the time of collection had ENT concentrations ranging from 100 to 241 920 MPN/100 mL ($n = 10$). The geometric mean and 95% confidence intervals of the ENT measured in marsh water exposed to wet and dry feces were $1.8 \times 10^5 + 6.2 \times 10^5 / -1.4 \times 10^5$ and $6.8 \times 10^2 + 3.3 \times 10^3 / -5.6 \times 10^2$ MPN/100 mL, respectively. Expressing these geometric means and confidence intervals on a per feces basis, we obtain $8.9 \times 10^5 + 3.1 \times 10^6 / -6.9 \times 10^5$ and $3.4 \times 10^4 + 1.6 \times 10^4 / -2.8 \times 10^3$ MPN/feces for wet and dry feces, respectively.

The majority of the bird feces are deposited on low-lying mud flats in the marsh which become submerged to varying degrees during high tides. To determine if bird feces deposited in the marsh can account for the observed increase of ENT in water as it flows through the marsh, we performed a simple mass balance calculation as follows:

$$G = C_{out}Q_{out} - C_{in}Q_{in} \quad (3)$$

Here $G$ is the rate of generation of bacteria in the marsh with units of [MPN/T], $C_{out}$ and $C_{in}$ are the concentrations of ENT

at the outlet and inlet of Talbert Marsh, respectively, with units of [MPN/$L^3$], and $Q_{out}$ and $Q_{in}$ are the volumetric flow rates of water at the outlet and inlet of Talbert Marsh with units [$L^3$/T], where $L$ and $T$ represent length and time scales, respectively.

During ebb tides, in-situ measurements of flow velocity and water elevation at Brookhurst and PCH Stations indicate that the flow in and out of Talbert Marsh roughly balance so that $Q_{out} \approx Q_{in}$ and eq 3 simplifies as follows:

$$G = Q(\Delta C) \quad (4)$$

The parameter $\Delta C$ is the increase in ENT measured in water as it flows through Talbert Marsh.

Using average ebb tide values of $\Delta C = 29$ MPN/100 mL (see Figure 3E) and $Q = 8.37$ $m^3/s$ from the calibrated hydrodynamic model, we estimate a generation rate for ENT in the marsh to be $G \approx 10^{10}$ MPN/h. Assuming each bird dropping has $10^6$ MPN/feces (the geometric mean for wet bird feces), then $10^4$ wet feces/h would be needed to account for the estimated generation rate. Our bird census indicates that, at most, $10^3$ birds are present in the marsh, which corresponds to a deposition rate of more than 1 feces per bird every six minutes. If instead we use the maximum number of ENT liberated from the wet bird feces ($10^8$ MPN/feces) and the average number of birds present in the marsh during the day (228 birds), the deposition rate required decreases to approximately 1 feces per bird every 3 h. This latter deposition rate is comparable to rates observed for the same bird species in captivity, typically one dropping every 3 h (personal communication, J. Pavlat, Wildlife Care Facility, Huntington Beach, CA).

The above analysis does not consider the potential contributions of older, dried, bird feces, which were also found to contain significant levels of ENT. Portions of the mud flats in Talbert Marsh may remain exposed over many tide cycles, allowing the quantity of bird feces deposited there to increase. During a spring tide, when higher than average high tides occur, these older feces may become suspended in the marsh water and thereby increase the concentration of ENT in the water column. This idea is consistent with the fact that the highest level of ENT recorded at the Brookhurst and PCH Stations occurred during spring tides when the mud flats are most likely to be washed by tidal action (see Figure 2). Vegetation in the Talbert Marsh may also contribute to the levels of ENT in the water column, as could the growth of these organisms at the sediment/water interface. Indeed, growth at the sediment/water interface is supported by the distribution of ENT in cores taken from Talbert Marsh (see Figure 6). While bird droppings are clearly a significant source of ENT in the marsh, other sources may also contribute to the generation of ENT in the marsh including urban runoff, sediment, and vegetation.

**Implications.** ENT generated in the Talbert Marsh appear to be at least partially responsible for the frequency with which surf zone samples in Huntington State and City Beaches exceed state bathing water standards. This conclusion is based on two findings from our study: (i) ENT concentrations are increased above ENT standards (both single-sample and geometric mean) as water passes through the marsh and (ii) water flowing out of the marsh can be transported by littoral currents to the region of Huntington State and City Beaches where ENT standards are routinely exceeded. The ENT appear to enter the marsh from birds and runoff, and once there these organisms accumulate, and perhaps even grow, on marsh vegetation and sediments.

While ENT flowing into the surf zone during ebb tides may be responsible for beach postings that occur near the marsh outlet, the marsh is probably not the only source of ENT at Huntington State and City Beaches. During the summers of 1999 and 2000, for example, surf zone station 9N (see Figure 1) was frequently posted or closed (total of 70 days) due to elevated levels of ENT, even during periods of time when the concentration of ENT at stations near the Talbert Marsh outlet were relatively low (*31*). Given this spatial distribution of ENT, it is unlikely that the bacteria at 9N are coming solely from the Talbert Marsh, and their exact source is a matter of ongoing investigation. Indeed, we anticipate that the impact of marsh effluent on surf zone water quality will be relatively localized, given the factor two dilution that occurs as the marsh water mixes into the surf zone, and the fact that ENT die-off in ocean water (*34, 35*).

Based on the results presented in this paper, there may be a tradeoff between the restoration of coastal wetlands and compliance with marine water contact standards. This tradeoff could be ameliorated by specifically designing wetlands to remove bacteria from the water column. For example, freshwater wetlands remove bacterial pollutants most efficiently when the flow velocities are slow (<0.7 m/s) and the residence time of water is long (10 h) (*36, 37*). While the flow velocities in the Talbert Marsh are within the recommended range, the residence time of water (<1 h) is not. On the other hand, if there are no human health risks associated with ENT from wetland effluent, then marine water contact standards may need to be modified to account for the existence of both benign and nonbenign sources of these bacteria. An epidemiological study could help to define the human health risks associated with human exposure to nonanthropogenic sources of ENT such as marsh effluent. These issues are especially timely, as a Federal law has recently been enacted that mandates national monitoring and reporting of coastal water quality (*38*).

## Acknowledgments

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# APPENDIX D

NUMERICAL MODELING OF POTENTIAL WATER QUALITY IMPACTS FROM BIRD USE OF THE BOLSA CHICA WETLAND
(Moffatt & Nichol Engineers, 2001)

MOFFATT & NICHOL
ENGINEERS

July 18, 2001

State of California
Coastal Conservancy
1330 Broadway, Suite 1100
Oakland, CA 94612-2530

Attn: Melanie Denninger, Project Manager

Subj: Final Letter Report, Numerical Modeling of Potential Water Quality Impacts from Bird Use of the Bolsa Chica Wetland
M&N File: 4012-18

Dear Ms. Denninger:

This final report presents findings of the numerical modeling of potential water quality impacts from bird use of Bolsa Chica wetland, and addresses potential impacts at Talbert Marsh from birds as comparison information. The report also includes other revisions from the draft as requested by the Subcommittee and others at the meeting at the State Lands Commission on June 13, 2001. Revisions are presented in the Analysis of Results section of this report and include:

- Analysis of bacteria concentrations at existing Inner Bolsa Bay to place predictions for future Bolsa Chica in context;
- First-order approximation of bacteria generation and concentrations from birds at Talbert Marsh as an initial step at model verification;
- Cursory analysis of the potential for stratification of flows and effects on model results; and
- Revised graphic presentation of results per the direction of the group in the meeting.

This analysis is currently based on the assumption that only the full tidal basin is used by birds and contributes bacteria to the ocean. Supplemental modeling is currently being performed to add effects of bird use and bacteria contributions from the muted tidal areas and future full tide basin to the analysis. The draft findings of the supplemental work will be released as soon as possible. This letter report will eventually be reissued to present those results together with this present work.

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## INTRODUCTION

The recent study done at Talbert Marsh by Dr. Stanley Grant, *Generation of Enterococci Bacteria in a Coastal Salt Marsh and Its Impact on Surf Zone Water Quality,* to be published in the journal of Environmental Science and Technology in June of 2001 (Reference 1), indicates that seagull feces are a contributor of enterococcus bacteria to the marsh and ocean. The State Department of Parks and Recreation has expressed concern that restoration at Bolsa Chica may cause similar conditions, and has requested modeling to predict bacteria levels caused by bird feces relative to state criteria and the potential for beach closures. The objectives of this study are as follows:

- Perform numerical modeling of potential water quality impacts at Bolsa Chica from bird excrement, and
- Quantify the potential number of beach closures that could occur during a representative period of time that could cause a worst-case impact to Bolsa Chica State Beach Park.

## BACKGROUND

This work was performed in two iterations. Both modeling iterations are presented below.

Initially, modeling was done to predict impacts from a reasonable worst case of tides and bird use at the marsh. A typical ocean tide condition of alternating spring and neap tides (ranges of approximately 8.2 feet and 2.8 feet in the ocean, and 7.3 feet and 2.8 feet in the marsh, respectively) as would occur over a 14-day period was assumed. Bird use was assumed to be similar to that recorded at Batiquitos Lagoon in Carlsbad, which is a site comparable in size and configuration to Bolsa Chica. Additionally, a population of 280 seagulls and terns was assumed to excrete on the flood bar just inside the lagoon from the inlet, similar to that observed at Talbert Marsh. Initial results showed very low levels of bacteria at the tidal inlet mouth from bird excretions, suggesting no beach postings would occur. Maximum bacteria concentrations were predicted to be 0.21 Most Probable Number (MPN)/100 milliliters (ml), compared to a state standard of 35 MPN/100 ml for a 30-day geometric mean condition.

These results prompted the Bolsa Chica subcommittee to direct modeling be done for more conservative conditions to predict a worst-case condition. The second iteration of modeling was done for conditions of narrow range neap tides that were recorded in March of 2001. The tide range was between 4.4 and 3.8 feet for seven days. Bird use throughout the entire marsh was assumed to be five times the bird concentration assumed for the initial modeling, with a population of 2,000 seagulls and terns excreting on the flood bar. Modeling results showed an increase in bacteria concentrations by one order of magnitude to 2.19 MPN/100 ml, still less than the state standard of 35 MPN/100 ml for a 30-day geometric mean. Conditions during a neap tide would not likely extend over 30 days, however the instantaneous standard of 104 MPN/100 ml may be more appropriate as a comparison.

Modeling of bacteria concentrations from bird excretions was not modeled at Talbert Marsh due to inherent difficulties in quantifying the bacteria budget of the system. Talbert Marsh differs from proposed Bolsa Chica in that bacteria are supplied from upstream flood control channels, from a higher concentration of seagulls, from the ocean on incoming tides, and with an unknown level of contribution from the marsh soils and/or vegetation. It also possesses a smaller tidal prism and an extensive shallow sand bar system resulting in less dilution of contaminants. Modeling would require quantification of the bacteria budget including inputs, storages and possible generation, and outputs of bacteria to predict concentrations in the marsh. This task is difficult and its accuracy with available data is widely open to question.

Modeling of this process at Bolsa Chica is based primarily on the parameters of tidal prism, bird concentrations, bird types and distribution. Bacteria generation by the marsh itself was not included due to its unknown magnitude and the possible ramifications on results. The lack of available data for this parameter precludes its effective use as a modeling assumption.

## SCENARIO 1 – REASONABLE WORST-CASE

### Modeling Assumptions

### A. Marsh Area Enterococci Concentration Calculation

Bird use was assumed to be the same as that measured at Batiquitos Lagoon (similar in size and habitat distribution to future Bolsa Chica) in mid-Spring of 1999, with gull use of the flood bar assumed to be similar to Talbert Marsh measured in May of 2000. Figure 1 shows assumed bird distributions and consequent areas of excretions, and Tables 1 through 4 shows their bacteria generation levels.

The modeling area was divided into two subareas: the ocean (nearshore ocean, tidal inlet and easternmost portion of the full tidal basin) and the marsh defined as the remaining full tidal basin marsh area. The enterococci bacteria dropped by all birds were distributed in the marsh. It is assumed that the bacteria become evenly distributed over time in the marsh.

The average enterococci concentration in the marsh was calculated assuming that the total number of enterococci dropped by all birds in the marsh in one tidal cycle would be diluted by the tidal prism of that area. Therefore, the marsh enterococci concentration can be calculated by following formula:

$$C_{ENT} = \frac{\sum_{1}^{n} (B_i \times D_i \times ENT_i)}{TP}$$

Where

$C_{ENT}$ = Enterococci concentration (MPN/ml),

MPN = Most Probable Number
$B_i$ = total number of type i bird in the marsh,
$D_i$ = total number of drops for a type i bird per tidal cycle,
$ENT_i$ = total number of enterococci per drop for a type i bird,
n = number of bird types, and
TP = average tidal prism, TP equals to the water surface area at mean sea level (MSL) multiplied by the average tide range (296 acres or 12,893,760 square feet times 3.82 feet = 49,254,000 cubic feet).

**B. Input Value of Enterococci Concentration at the Marsh Boundary to the Ocean**

The input value of average enterococci concentration (calculated using the method shown above) to the downstream portion of the marsh to be contributed to the nearshore for water quality modeling was specified as shown in Tables 1 through 4. The enterococci bacteria were then modeled as moving with ebbing tides to the nearshore and offshore area.

**Numerical Modeling Methods for Scenario 1**

Two numerical models were used to perform the work. A one-dimensional model was used to calculate ebbing tidal discharge to transport contaminants seaward from the marsh and a two-dimensional model was used to disperse the contaminants in the nearshore ocean. The modeling sequence is described below.

**A. Marsh Area Enterococci Concentration**

Enterococci concentrations were calculated based on two conditions:

- Condition 1: Worst Case – Early spring with gulls and terns on the flood bar, and
- Condition 2: Early spring with no birds using the flood bar.

Several types of birds (brown pelicans, Caspian and black skimmers) only excrete in the daytime. Therefore, the daytime and nighttime enterococci concentrations for the two conditions were calculated separately. The maximum enterococci concentrations predicted for Condition 1 (worst case of birds) in the ocean end of the tidal inlet are 0.21 and 0.20 MPN/100 ml for day and night conditions, respectively. Maximum enterococci concentrations predicted for Condition 2 (typical bird numbers) in the ocean end of the tidal inlet are 0.20 and 0.18 MPN/100 ml for day and night conditions, respectively. The AB411 Single-Sample Standard is 104 MPN/100 ml and the 30-Day Geometric Mean Standard is 35 MPN/100 ml. Tables 1 through 4 show the detailed calculations, such as tidal prism, type of birds, number of each type of bird, number of drops per bird per tidal cycle and number of enterococci per bird drop.

For modeling bacteria levels from bird excretions under a typical scenario of bird use of the marsh, the maximum enterococci concentration of 0.21 MNP/100 ml was used as the input boundary enterococci concentration at the marsh for the worst case relative to the volume of bird excretion and bacteria contributions (Condition 1, daytime).

**B. Calculation of Tidal Discharge From the Marsh to the Ocean**

The calibrated one-dimensional Hydrodynamic Circulation Model (HCM) for the Bolsa Chica Wetland system study (see Reference 2) was used to calculate the discharge from the marsh to the ocean system. The model domain is shown in Figure 2. Tides were based on developing a representative 14-day tidal cycle called a Tidal Epoch Analysis (TEA) tide from the 19-year tidal epoch. This TEA tide is simply a statistical tide developed to represent the variations that occur over the two-week spring and neap tide cycles and longer-term tidal variations over 19 years. It provides the benefit of analyzing the full range of tide conditions over a shorter time period with less computation time than modeling of the full 19-year tidal record. It is fully described in Reference 2. This statistical tide is run to represent a period of 45 calendar days of hydraulic exchange between the marsh and ocean. The tidal discharge at the marsh/ocean boundary line predicted by the calibrated HCM over this period is shown in Figure 3 and the TEA tide at the boundary used in this computation is shown in Figure 4.

**C. Calculation of Enterococci Concentration in the Nearshore and Offshore Area**

The calibrated two-dimensional RMA2 hydrodynamic model for the Bolsa Chica wetland restoration project (Reference 2) was used to compute the flow in the nearshore and offshore area with the TEA tide at the offshore boundary and discharge obtained from the HCM model at the marsh/ocean boundary. The model domain is shown in Figure 5. The calibrated RMA4 water quality model for the Bolsa Chica project (Reference 2) was then used to calculate the enterococci concentration in the nearshore and offshore area for a 45-day period with input of hydrodynamics predicted by the RMA2 model. To be extremely conservative, no decay of the enterococci bacteria was assumed in the RMA4 enterococci transport modeling. This assumption is not realistic, but was employed to generate the absolute worst-case predicted bacteria levels along the beach as an envelope to work within for analysis. It was also assumed that wind and wave-driven currents were negligible so that maximum concentrations remain at the inlet mouth, rather than dispersing along the coast.

It was also assumed that stratification of flows in the inlet and ocean is negligible due to turbulence. The shallow depth of flow and high flow rate in the inlet will clearly lead to mixing through the water column. In the ocean, waves mix nearshore waters, and wave- and wind-driven currents generate further turbulence that creates a generally well-mixed environment. An unstratified condition leads to greater dilution of bacteria and lower concentrations. A stratified flow condition in the inlet or ocean would lead to a lower dilution of bacteria and higher concentrations.

## Modeling Results for Scenario 1

Figure 6 shows the highest enterococci concentration that the model predicted through the 45-day modeling period. Values at the beach and ocean varied, with the highest value occurring at ebbing tides for the worst case during Scenario 1 in the daytime with a zero value for the decay rate. As shown in Figure 6, the peak enterococci concentrations are 0.20 MPN/100 ml in the marsh area, 0.18 MPN/100 ml in the inlet area and 0.06 MPN/100 ml at a radius of 1000 feet from the tidal inlet. These values are compared to the state criteria of 104 MPN/100 ml for an instantaneous maximum value and 35 MPN/100 ml for a 30-day geometric mean. Either criterion could be applied in the exercise, but the prediction falls well below either value. Because the predicted values with no decay rate were so low relative to state criteria, no additional modeling was performed using a realistic decay rate. Any modeling results with a decay rate would yield bacteria values below those predicted with a rate of zero.

## Conclusions for Scenario 1

The highest predicted enterococci bacteria concentration levels for the worst case condition in the marsh and nearshore area over the entire 45-day modeling period are two orders of magnitude lower than the applicable state criteria (AB411 30-Day Geometric Mean Standard of 35 MPN/100 ml). Therefore, no beach closures would occur from bird use of the marsh under the assumptions used for this analysis. In order to reach an exceedance of the criteria, the concentration of bacteria would have to be increased 170 fold in the marsh. No physical (decreased tidal prism) or biological conditions (increased bird use) are anticipated for this to occur with the proposed project.

## MODELING SCENARIO 2 – WORST-CASE

## Modeling Assumptions

### A. Marsh Area Enterococci Concentration Calculation

Bird use throughout the marsh was assumed to be five times that assumed for the reasonable worst case (modeling scenario 1), with gull use of the flood bar assumed to be increased from 280 gulls and terns to 2,000. Assumed bird distributions and consequent areas of excretions were the same as those shown in Figure 1, and Tables 5 through 8 show bird bacteria generation levels.

The method used to calculate the bacteria concentration at the marsh was slightly modified from the first iteration, in that bacteria on the flood bar were assumed to be diluted to a lesser extent than those in the main marsh before they are carried to the ocean. The modeling area was divided into two subareas: the ocean (nearshore ocean, tidal inlet and easternmost portion of the full tidal basin) and the marsh defined as the remaining full tidal basin marsh area. The enterococci bacteria dropped by all birds were distributed in the marsh as shown in the Figure 1 and Tables 5 through 8.

The enterococci concentration in the marsh was calculated assuming that the total number of enterococci dropped by the bird types of A, B and C (see Table 5 and Figure 1) in one tidal cycle would be diluted by the tidal prism of marsh area. Also, all enterococci dropped by the bird types of A, B and C in one tidal cycle would be assumed to move to the ocean with ebbing flow in one tidal cycle period. The bird type D (gulls/terns) drops enterococci on the flood bar which is located close to the inlet (see Figure 1). Therefore, only a fraction of the tidal prism would dilute all the enterococci dropped by bird type D. Based on the estimated size of the flood bar (Reference 2) and to be conservative, it was assumed that one sixth of the tidal prism was sufficient to dilute all enterococci dropped by bird type D. Also, all enterococci dropped by bird type D in one tidal cycle were assumed to move to the ocean in the first hour of the ebbing flow.

### B. Input Value of Enterococci Concentration at the Marsh Boundary to the Ocean

The input value of enterococci concentration at the downstream portion of the marsh to be contributed to the nearshore for water quality modeling was specified using the assumptions described above. The enterococci bacteria were then modeled as moving with ebbing tides to the nearshore and offshore area.

## Numerical Modeling Methods for Scenario 2

The same two numerical models were used to perform the work as were used for Scenario 1. The one-dimensional model was used to calculate ebbing tidal discharge to transport contaminants seaward from the marsh and the two-dimensional model was used to disperse the contaminants in the nearshore ocean. The modeling sequence is described below.

### A. Marsh Area Enterococci Concentration

Enterococci concentrations were calculated based on two bird use conditions:

- Condition 1: Most Birds – Early spring with gulls and terns on the flood bar, and
- Condition 2: Typical Number of Birds – Early spring with no birds using the flood bar.

The same types of birds (brown pelicans, Caspian terns and black skimmers) and timing of excretions assumed for Scenario 1 were assumed for Scenario 2. However, the numbers of birds were increased. The maximum enterococci concentrations predicted for the Condition 1 (worst case of birds) in the ocean near the inlet are 1.8 and 1.7 MPN/100 ml for day and night conditions, respectively. Maximum enterococci concentrations predicted for Condition 2 (typical bird numbers) in the marsh are 1.41 and 1.32 MPN/100 ml for day and night conditions, respectively and are even lower in the ocean. The AB411 Single-Sample Standard is 104 MPN/100 ml and the 30-Day Geometric Mean Standard is 35 MPN/100 ml. Tables 5 through 8 show the detailed calculations, such as

the type of birds, number of each type of bird, number of drops per bird per tidal cycle and number of enterococci per bird drop.

For modeling of bacteria concentrations from bird excretions, the enterococci concentration for the worst case relative to the volume of bird excretion and bacteria contributions (Condition 1, daytime) was used as the input boundary enterococci concentration at the marsh. This enterococci concentration versus time is shown in Figure 7.

**B. Calculation of Tidal Discharge From the Marsh to the Ocean**

The calibrated one-dimensional Hydrodynamic Circulation Model (HCM, see Reference 2) was used to calculate the discharge from the marsh to the ocean system. The model domain is shown in Figure 2. To be conservative, a neap tide was selected in the modeling in order to create a smaller dilution of enterococci bacteria compared to other tides. Neap tide elevation data of March 13, 2001 to March 19, 2001 at the tidal gage in the Outer Harbor, Los Angeles, California were used in the modeling. These neap tide elevation data were downloaded from the National Oceanic and Atmospheric Administration (NOAA) web page. This is the closest tidal gage to the Bolsa Chica. The difference of tidal elevation and phase lag between this tidal gage and Bolsa Chica are negligible. The tidal discharge at the marsh/ocean boundary line predicted by the calibrated HCM over this period is shown in Figure 8 and the neap tide at the offshore boundary used in this computation is shown in Figure 9.

**C. Calculation of Enterococci Concentration in the Nearshore and Offshore Area**

The calibrated two-dimensional RMA2 hydrodynamic model for the Bolsa Chica wetland restoration project (Reference 2) was used to compute the flow in the nearshore and offshore area with the neap tide at the offshore boundary and discharge obtained from the HCM model at the marsh/ocean boundary. The model domain is shown in Figure 5. The calibrated RMA4 water quality model for the Bolsa Chica project (Reference 2) was then used to calculate the enterococci concentration in the nearshore and offshore area for the neap tide period with input of hydrodynamics predicted by the RMA2 model. To be extremely conservative, no decay of the enterococci bacteria was assumed in the RMA4 enterococci transport modeling. This assumption is not realistic, but was employed to generate the absolute worst-case predicted bacteria levels along the beach as an envelope to work within for analysis.

As with Scenario 1, it was assumed that stratification of flows in the inlet and ocean is negligible due to turbulence. The shallow depth of flow in the inlet and high flow rate will clearly lead to mixing through the water column. In the ocean, waves mix nearshore waters, and wave- and wind-driven currents generate further turbulence that creates a generally well-mixed environment. An unstratified condition leads to greater dilution of

bacteria and lower concentrations. A stratified flow condition in the inlet or ocean would lead to a lower dilution of bacteria and higher concentrations.

**Modeling Results for Scenario 2**

Figure 10 shows the highest enterococci concentration that the model predicted through the neap tide modeling period for the worst case (condition 1, daytime). Figure 11 shows the enterococci concentration versus time at model input boundary, inlet and ocean for the worst case (condition 1, daytime). Locations of the model input boundary, inlet and ocean are shown in Figure 12. Values at the beach and ocean varied, with the highest value occurring at ebbing tides for the worst case during Condition 1 in the daytime with a zero value for the decay rate. As shown in Figures 10 and 11, in this instance, the peak enterococci concentrations are 2.2 MPN/100 ml in the marsh area, 1.8 MPN/100 ml in the inlet area and 0.2 MPN/100 ml at a radius of 1000 feet from the tidal inlet. These values are compared to the state criteria of 104 MPN/100 ml for an instantaneous maximum value and 35 MPN/100 ml for a 30-day geometric mean. Either criterion could be applied in the exercise, but again, the prediction falls well below either value. Because the predicted values with no decay rate were so low relative to state criteria, no additional modeling was performed using a realistic decay rate. Any modeling results with a decay rate would yield bacteria values below those predicted with a rate of zero.

**Conclusions for Scenario 2**

The highest predicted enterococci bacteria concentration levels for the worst case condition in the marsh and nearshore area over the neap tide modeling period are one order of magnitude lower than the applicable state criteria (either the AB411 30-Day Geometric Mean Standard of 35 MPN/100 ml or the instantaneous standard of 104 MPN/100 ml). Therefore, no beach closures would occur from bird use of the marsh under the assumptions used for this analysis. In order to reach an exceedance of the criteria, the concentration of bacteria would have to be increased 16 fold in the marsh. No physical (decreased tidal prism) or biological conditions (increased bird use) are anticipated for this to occur with the proposed project.

## ANALYSIS OF RESULTS

Results are analyzed in context with available water quality and bird data for existing Inner Bolsa Bay and Talbert Marsh. Inner Bolsa Bay is relevant to the study in that it is immediately adjacent to proposed Bolsa Chica and it is assumed that bird use and consequent water quality in both sites should be similar. Talbert Marsh is particularly significant in that the large-scale water quality problem along Huntington State Beach in 1999 occurred in the vicinity of the Talbert Marsh inlet and researchers hypothesized that it conveyed bacteria to the sea contributing to the problem. Several studies were conducted and therefore detailed data of bird use, soil quality, water quality and tidal flows are available for analysis and comparison to predictions for Bolsa Chica as validation of the method.

**Water Quality at Inner Bolsa Bay**

Inner Bolsa Bay (IBB) is located immediately south and west of the proposed Bolsa Chica wetland restoration project. It was restored to a 159-acre wetland in 1979 by the State of California. Birds use the site and bird counts occur regularly. Water samples are also regularly retrieved and tested for bacteria by the Orange County Health Care Agency (OCHCA). Attached as Table 9 is a matrix of instantaneous water sample test results for IBB and from other nearby water bodies. It shows that water quality exceeded state standards twice since August 1997. Exceedances were for fecal coliform on February 20, 1998 after a storm and on May 22, 1998 when levels were also high upstream on a connecting flood control channel. Standards for instantaneous readings of enterococcus have never been exceeded. The maximum concentration recorded for enterococcus was 40 MPN/100 ml on both June 16, 1999 and April 9, 2001.

It should be noted that the tidal prism for IBB is relatively small at 6.2 million cubic feet (compared to approximately 50 million cubic feet for future Bolsa Chica), so dilution of bacteria is not causing concentrations to be unusually low. Bacteria concentrations at IBB appear to be more a function of anomalous events rather than from excessive bacteria loading from birds.

These data suggest that if bird use concentrations at future Bolsa Chica are similar to that at IBB as expected, then bacteria concentrations may also be relatively low. Additionally, IBB is presently connected to the East Garden Grove Flood Control Channel with culverts and is subject to contamination during storms or sewage spills. Future Bolsa Chica is not proposed to be connected to a flood control channel so this water quality influence should not be present.

**Water Quality at Talbert Marsh**

A first-order approximation of bacteria generation and concentrations from birds at Talbert Marsh is presented as an initial step at verification of the method used in the analysis for future Bolsa Chica. Data provided by UCI and analyzed in the recent journal article cited in Reference 1 were used to calculate the bacteria concentration in the marsh from bird use.

The bird population in the marsh during the two-week study in May of 2000 was recorded by UCI. The maximum number of birds were present on May 9 and the population was 1,180. Assuming all of these birds were the western gull, the bacteria loading to the marsh would have been 4.7 billion per day during daylight hours. The tidal prism of the marsh dilutes the bacteria concentration. It was estimated at 1.9 million cubic feet as determined from the engineering design drawings from 1987 prior to its construction in 1991 as provided by the County of Orange, Public Facilities and Resources Division. Since its construction, significant shoaling has occurred and the tidal prism is undoubtedly lower than this initial estimate. The effect of a smaller tidal prism on the bacteria concentration calculation is that the concentration would be higher than calculated here.

The calculated bacteria concentration for Talbert Marsh under the above conditions is 8.7 MPN/100 ml as shown in Table 10. No decay rate is assumed. If the birds are assumed to be 50 percent western gulls and 50 percent elegant terns, the calculated bacteria concentration is 5.5 MPN/100 ml as shown in Table 11. These concentrations compare with the estimate at Bolsa Chica of 0.21 MPN/100 ml under typical bird use conditions and a maximum concentration of 2.2 MPN/100 ml assuming a bird population of five times that predicted. If modeled, the concentrations at Talbert would gradually disperse once released to the ocean and would trail off in the direction of wave-induced currents. Ocean and beach bacteria concentrations would decrease from levels in the marsh.

The UCI study indicated that birds were a contributor to water quality conditions at Talbert Marsh, and that other factors such as marsh soils may also contribute to bacteria loading there. In the article (Reference 1), the geometric means of enterococcus concentrations on ebbing tides during the May 2000 study period are shown to vary from 40 to 60 MPN/100 ml. Therefore, other unknown sources would have to contribute from approximately 5- to 9-fold the quantity of bacteria assumed to be contributed by birds. These sources are obviously significant and should be determined if that system is to be understood. Similar studies may not be necessary for Bolsa Chica due to its more typical water quality and bird use characteristics.

## RECOMMENDATIONS

If additional investigation of bacteria contributions from marshes is warranted, several tasks can be performed to further verify predictions at Bolsa Chica compared to other wetlands. Additional soil bacteria data could be collected at Talbert Marsh over a specified time period for the express purpose of investigating the possibility that the marsh possesses anomalous sediment quality compared to Bolsa Chica or another representative site such as Batiquitos Lagoon. Similar data could be collected concurrently at other sites including Bolsa Chica and Batiquitos Lagoon for comparison. These data would be analyzed to quantify existing bacteria levels in soils, and patterns in the marshes over space at the first order. The study purpose would be to quantify the bacteria concentration in soils at Talbert Marsh, Inner Bolsa Bay and Batiquitos Lagoon and assess anomalies. It is not recommended that modeling occur until field data are collected and analyzed to determine if it is useful or necessary.

## CLOSING

We trust this information fully responds to your request, and thank you for the opportunity to be of continued service to the Conservancy and the subcommittee on this project. Please call Chris Webb or me with any questions or comments you may have.

Sincerely,

MOFFATT & NICHOL ENGINEERS

Michael J. McCarthy

Michael J. McCarthy, P.E.

Vice President

MJM/CKW:pjs

*P:MGMT/4012-18/4012LTRMM2*

Enclosure

## REFERENCES


1. Grant, S.G., *Generation of Enterococci Bacteria in a Coastal Salt Marsh and Its Impact on Surf Zone Water Quality*, to be published in the journal of Environmental Science and Technology, June 2001.

2. Moffatt & Nichol Engineers, Preliminary Engineering Studies for Bolsa Chica Wetlands Restoration, Final Report, 2000.

**Scenario 1**

**Table 1** **Calculation of ENT Concentration in the Marsh for Condition 1 (Daytime)**

(Most Birds - Early Spring with Gulls and Terns on Flood Shoal)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/day time | Bird Weight (g) | No. of ENT/drop [1] | Total No. of ENT/Day Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 1,600 | 4 | 26 | 26,000 | 166,400,000 |
| A | Black Bellied plover | 325 | 4 | 240 | 240,000 | 312,000,000 |
| A | Wading birds (Great egret) | 20 | 4 | 870 | 870,000 | 69,600,000 |
| | | | | | Total ------>> | 548,000,000 |
| B | Coot | 200 | 4 | 650 | 650,000 | 520,000,000 |
| B | Northern shoveler | 200 | 4 | 610 | 610,000 | 488,000,000 |
| B | Northern pintail | 200 | 4 | 800 | 800,000 | 640,000,000 |
| B | Brown pelican[2] | 7 | 4 | 3,740 | 3,740,000 | 104,720,000 |
| B | Western grebe | 40 | 4 | 1,500 | 1,500,000 | 240,000,000 |
| | | | | | Total ------>> | 1,992,720,000 |
| C | Caspian tern[2] | 20 | 4 | 660 | 660,000 | 52,800,000 |
| C | Black skimmer[2] | 20 | 4 | 300 | 300,000 | 24,000,000 |
| C | Ring-billed gull | 60 | 4 | 520 | 520,000 | 124,800,000 |
| | | | | | Total ------>> | 201,600,000 |
| D | Western gull | 140 | 1 | 1,000 | 1,000,000 | 140,000,000 |
| D | Elegant tern | 140 | 1 | 260 | 260,000 | 36,400,000 |
| | | | | | Total ------>> | 176,400,000 |
| | Total | 2,972 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>> 2,918,720,000**

(2) birds excrete over 12-hour period at daylight

| | | |
|---|---|---|
| **Total Marsh Area ($ft^2$)** | **12,893,760** | **$ft^2$** |
| **Total Marsh Area (acre)** | **296** | **acre** |
| **Average Tide Range (ft)** | **3.8** | **ft** |
| **Tidal Prism (acre-ft)** | **1131** | **acre-ft** |
| **ENT Concentration =Total No. of ENT/ Tidal Prism** | **0.21** | **MPN/100ml** |

**Scenario 1**

**Table 2** **Calculation of ENT Concentration in the Marsh for Condition 1 (Nighttime)**

(Most Birds - Early Spring with Gulls and Terns on Flood Shoal)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/Night time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Night Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 1,600 | 4 | 26 | 26,000 | 166,400,000 |
| A | Black Bellied plover | 325 | 4 | 240 | 240,000 | 312,000,000 |
| A | Wading birds (Great egret) | 20 | 4 | 870 | 870,000 | 69,600,000 |
| | | | | | Total ------>> | 548,000,000 |
| B | Coot | 200 | 4 | 650 | 650,000 | 520,000,000 |
| B | Northern shoveler | 200 | 4 | 610 | 610,000 | 488,000,000 |
| B | Northern pintail | 200 | 4 | 800 | 800,000 | 640,000,000 |
| B | Western grebe | 40 | 4 | | 1,500,000 | 240,000,000 |
| | | | | | Total ------>> | 1,888,000,000 |
| C | Ring-billed gull | 60 | 4 | 520 | 520,000 | 124,800,000 |
| | | | | | Total ------>> | 124,800,000 |
| D | Western gull | 140 | 1 | 1,000 | 1,000,000 | 140,000,000 |
| D | Elegant tern | 140 | 1 | 260 | 260,000 | 36,400,000 |
| | | | | | Total ------>> | 176,400,000 |
| | Total | 2,925 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>>** **2,737,200,000**

| | | |
|---|---|---|
| **Total Marsh Area ($ft^2$)** | **12,893,760** | **$ft^2$** |
| **Total Marsh Area (acre)** | **296** | **acre** |
| **Average Tide Range (ft)** | **3.8** | **ft** |
| **Tidal Prism (acre-ft)** | **1131** | **acre-ft** |
| **ENT Concentration=Total No. of ENT/ Tidal Prism** | **0.20** | **MPN/100ml** |

**Scenario 1**

**Table 3** **Calculation of ENT Concentration in the Marsh for Condition 2 (Daytime)**

(Typical Number of Birds)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/day time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Day Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 1,600 | 4 | 26 | 26,000 | 166,400,000 |
| A | Black Bellied plover | 325 | 4 | 240 | 240,000 | 312,000,000 |
| A | Wading birds (Great egret) | 20 | 4 | 870 | 870,000 | 69,600,000 |
| | | | | | Total ------>> | 548,000,000 |
| B | Coot | 200 | 4 | 650 | 650,000 | 520,000,000 |
| B | Northern shoveler | 200 | 4 | 610 | 610,000 | 488,000,000 |
| B | Northern pintail | 200 | 4 | 800 | 800,000 | 640,000,000 |
| B | Brown pelican[2] | 7 | 4 | 3,740 | 3,740,000 | 104,720,000 |
| B | Western grebe | 40 | 4 | 1,500 | 1,500,000 | 240,000,000 |
| | | | | | Total ------>> | 1,992,720,000 |
| C | Caspian tern[2]) | 20 | 4 | 660 | 660,000 | 52,800,000 |
| C | Black skimmer[2] | 20 | 4 | 300 | 300,000 | 24,000,000 |
| C | Ring-billed gull | 60 | 4 | 520 | 520,000 | 124,800,000 |
| | | | | | Total ------>> | 201,600,000 |
| | Total | 2,692 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight.

(2) birds excrete over 12-hour period at daylight

**Total No. of ENT ——>>** **2,742,320,000**

| | | |
|---|---|---|
| **Total Marsh Area ($ft^2$)** | **12,893,760** | **$ft^2$** |
| **Total Marsh Area (acre)** | **296** | **acre** |
| **Average Tide Range (ft)** | **3.8** | **ft** |
| **Tidal Prism (acre-ft)** | **1125** | **acre-ft** |
| **ENT Concentration=Total No. of ENT/ Tidal Prism** | **0.20** | **MPN/100ml** |

**Scenario 1**

**Table 4** **Calculation of ENT Concentration in the Marsh for Condition 2 (Nighttime)**

(Typical Number of Birds)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/Night time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Night Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 1,600 | 4 | 26 | 26,000 | 166,400,000 |
| A | Black Bellied plover | 325 | 4 | 240 | 240,000 | 312,000,000 |
| A | Wading birds (Great egret) | 20 | 4 | 870 | 870,000 | 69,600,000 |
| | | | | | Total ------>> | 548,000,000 |
| B | Coot | 200 | 4 | 650 | 650,000 | 520,000,000 |
| B | Northern shoveler | 200 | 4 | 610 | 610,000 | 488,000,000 |
| B | Northern pintail | 200 | 4 | 800 | 800,000 | 640,000,000 |
| B | Western grebe | 40 | 4 | 1,500 | 1,500,000 | 240,000,000 |
| | | | | | Total ------>> | 1,888,000,000 |
| C | Ring-billed gull | 60 | 4 | 520 | 520,000 | 124,800,000 |
| | | | | | Total ------>> | 124,800,000 |
| | Total | 2,645 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>>** **2,560,800,000**

| | | |
|---|---|---|
| **Total Marsh Area ($ft^2$)** | **12,893,760** | **$ft^2$** |
| **Total Marsh Area (acre)** | **296** | **acre** |
| **Average Tide Range (ft)** | **3.8** | **ft** |
| **Tidal Prism (acre-ft)** | **1131** | **acre-ft** |
| **ENT Concentration=Total No. of ENT/ Tidal Prism** | **0.18** | **MPN/100ml** |

**Scenario 2**

**Table 5** **Calculation of Total Number of ENT in the Marsh for Condition 1 (Daytime)**

(Most Birds - Early Spring Times Five with Gulls and Terns on Flood Shoal)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/day time | Bird Weight (g) | No. of ENT/drop [1] | Total No. of ENT/Day Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 8,000 | 4 | 26 | 26,000 | 832,000,000 |
| A | Black Bellied plover | 1,625 | 4 | 240 | 240,000 | 1,560,000,000 |
| A | Wading birds (Great egret) | 100 | 4 | 870 | 870,000 | 348,000,000 |
| | | | | | Total ------>> | 2,740,000,000 |
| B | Coot | 1,000 | 4 | 650 | 650,000 | 2,600,000,000 |
| B | Northern shoveler | 1,000 | 4 | 610 | 610,000 | 2,440,000,000 |
| B | Northern pintail | 1,000 | 4 | 800 | 800,000 | 3,200,000,000 |
| B | Brown pelican[2] | 35 | 4 | 3,740 | 3,740,000 | 523,600,000 |
| B | Western grebe | 200 | 4 | 1,500 | 1,500,000 | 1,200,000,000 |
| | | | | | Total ------>> | 9,963,600,000 |
| C | Caspian tern[2] | 100 | 4 | 660 | 660,000 | 264,000,000 |
| C | Black skimmer[2] | 100 | 4 | 300 | 300,000 | 120,000,000 |
| C | Ring-billed gull | 300 | 4 | 520 | 520,000 | 624,000,000 |
| | | | | | Total ------>> | 1,008,000,000 |
| D | Western gull | 1,000 | 1 | 1,000 | 1,000,000 | 1,000,000,000 |
| D | Elegant tern | 1,000 | 1 | 260 | 260,000 | 260,000,000 |
| | | | | | Total ------>> | 1,260,000,000 |
| | **Total** | 15,460 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>> 14,971,600,000**

(2) birds excrete over 12-hour period at daylight

**Scenario 2**

**Table 6** **Calculation of Total Number of ENT in the Marsh for Condition 1 (Nighttime)**

(Most Birds - Early Spring Times Five with Gulls and Terns on Flood Shoal)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/Night time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Night Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 8,000 | 4 | 26 | 26,000 | 832,000,000 |
| A | Black Bellied plover | 1,625 | 4 | 240 | 240,000 | 1,560,000,000 |
| A | Wading birds (Great egret) | 100 | 4 | 870 | 870,000 | 348,000,000 |
| | | | | | Total ------>> | 2,740,000,000 |
| B | Coot | 1,000 | 4 | 650 | 650,000 | 2,600,000,000 |
| B | Northern shoveler | 1,000 | 4 | 610 | 610,000 | 2,440,000,000 |
| B | Northern pintail | 1,000 | 4 | 800 | 800,000 | 3,200,000,000 |
| B | Western grebe | 200 | 4 | | 1,500,000 | 1,200,000,000 |
| | | | | | Total ------>> | 9,440,000,000 |
| C | Ring-billed gull | 300 | 4 | 520 | 520,000 | 624,000,000 |
| | | | | | Total ------>> | 624,000,000 |
| D | Western gull | 1,000 | 1 | 1,000 | 1,000,000 | 1,000,000,000 |
| D | Elegant tern | 1,000 | 1 | 260 | 260,000 | 260,000,000 |
| | | | | | Total ------>> | 1,260,000,000 |
| | Total | 15,225 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>>** **14,064,000,000**

**Scenario 2**

**Table 7** **Calculation of Total Number of ENT in the Marsh for Condition 2 (Daytime)**

(Typical Number of Birds Times Five)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/day time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Day Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 8,000 | 4 | 26 | 26,000 | 832,000,000 |
| A | Black Bellied plover | 1,625 | 4 | 240 | 240,000 | 1,560,000,000 |
| A | Wading birds (Great egret) | 100 | 4 | 870 | 870,000 | 348,000,000 |
| | | | | | Total ------>> | 2,740,000,000 |
| B | Coot | 1,000 | 4 | 650 | 650,000 | 2,600,000,000 |
| B | Northern shoveler | 1,000 | 4 | 610 | 610,000 | 2,440,000,000 |
| B | Northern pintail | 1,000 | 4 | 800 | 800,000 | 3,200,000,000 |
| B | Brown pelican[2] | 35 | 4 | 3,740 | 3,740,000 | 523,600,000 |
| B | Western grebe | 200 | 4 | 1,500 | 1,500,000 | 1,200,000,000 |
| | | | | | Total ------>> | 9,963,600,000 |
| C | Caspian tern[2] | 100 | 4 | 660 | 660,000 | 264,000,000 |
| C | Black skimmer[2] | 100 | 4 | 300 | 300,000 | 120,000,000 |
| C | Ring-billed gull | 300 | 4 | 520 | 520,000 | 624,000,000 |
| | | | | | Total ------>> | 1,008,000,000 |
| | Total | 13,460 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>>** **13,711,600,000**

(2) birds excrete over 12-hour period at daylight

**Scenario 2**

**Table 8** **Calculation of Total Number of ENT in the Marsh for Condition 2 (Nighttime)**

(Typical Numer of Birds Times Five)

| Location | Name of Bird | No. of Birds | No. of Drops per bird/Night time | Bird Weight (g) | No. of ENT/drop[1] | Total No. of ENT/Night Time |
|---|---|---|---|---|---|---|
| A | Western sandpiper | 8,000 | 4 | 26 | 26,000 | 832,000,000 |
| A | Black Bellied plover | 1,625 | 4 | 240 | 240,000 | 1,560,000,000 |
| A | Wading birds (Great egret) | 100 | 4 | 870 | 870,000 | 348,000,000 |
| | | | | | Total ------>> | 2,740,000,000 |
| B | Coot | 1,000 | 4 | 650 | 650,000 | 2,600,000,000 |
| B | Northern shoveler | 1,000 | 4 | 610 | 610,000 | 2,440,000,000 |
| B | Northern pintail | 1,000 | 4 | 800 | 800,000 | 3,200,000,000 |
| B | Western grebe | 200 | 4 | 1,500 | 1,500,000 | 1,200,000,000 |
| | | | | | Total ------>> | 9,440,000,000 |
| C | Ring-billed gull | 300 | 4 | 520 | 520,000 | 624,000,000 |
| | | | | | Total ------>> | 624,000,000 |
| | Total | 13,225 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weight. **Total No. of ENT ——>> 12,804,000,000**

Table 9

COUNTY OF ORANGE
HCA/ENVIRONMENTAL HEALTH DIVISION
Bolsa Chica/East Garden Grove Wintersburg Channel
Bacteriological Monitoring
Total Coliform (TC), Fecal Coliform (FC) or * = E.Coli, Enterococcus (ENT) Most Probable Number per 100 ml Sample

| LOCATION DESCRIPTION | | 8/28/97 | 9/15/97 | 9/25/97 | 1/8&12/98 | 2/20/98 | 3/23/98 | 4/30/98 | 5/22/98 | 6/30/98 | 7/28/98 | 8/19/98 | 9/24/98 | 10/22/98 | 11/19/98 | 12/16/98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Rain | | Rain 2/19 | | | | | | | | | | |
| BOLSA CHICA RESERVE AT PED BRIDGE | TC | <20 | NS | 80 | 230 | 9000 | 20 | <20 | 1300 | 20 | 170 | 230 | <20 | <20 | 20 | 40 |
| | FC | <20 | NS | 80 | <20 | 9000 | 20 | <20 | 1300 | NS | NS | NS | <20 | <20 | 20 | 40 |
| | ENT | | | | | | | | | | | | | | | |
| EGGWC ABOVE TIDE GATE | TC | 40 | 20 | 20 | 1400 | >16000 | 500 | 130 | 230 | 230 | 500 | <20 | 40 | 80 | 800 | 130 |
| | FC | 20 | <20 | 20 | 140 | 16000 | 500 | <20 | NS | 20 | 300 | <20 | 40 | <20 | 40 | <20 |
| | ENT | | | | | | | | | | | | | | | |
| OUTER BOLSA CHICA BELOW TIDE GATE | TC | <20 | 500 | <20 | 800 | >16000 | 500 | 80 | 20 | <20 | <20 | <20 | 20 | 20 | 500 | 20 |
| | FC | <20 | 230 | <20 | 20 | 16000 | 500 | 80 | NS | <20 | <20 | <20 | <20 | 20 | 520 | 20 |
| | ENT | | | | | | | | | | | | | | | |
| HUNTINGTON HARBOUR AT WARNER AVENUE | TC | <20 | 40 | 500 | 300 | >16000 | 40 | <20 | 170 | 20 | 20 | <20 | 40 | 40 | 70 | 40 |
| | FC | <20 | 40 | 70 | 20 | >16000 | 40 | <20 | NS | <20 | <20 | <20 | 40 | 40 | 20 | <20 |
| | ENT | | | | | | | | | | | | | | | |
| EGGWC AT SLATER CHANNEL | TC | 110 | 500 | 2400 | 80000 | 160000 | 2400 | 1400 | 2800 | 1300 | 700 | 900 | 300 | 130 | 800 | 230 |
| | FC | 70 | 40 | 2400 | 8000 | 90000 | 2400 | 170 | NS | 800 | 300 | 40 | 230 | 80 | 170 | <20 |
| | ENT | | | | | | | | | | | | | | | |
| SLATER CHANNEL BY PUMP STATION | TC | 500 | 3000 | 1600000 | 50000 | 50000 | 1700 | 2400 | >16000 | 9000 | 16000 | 9000 | 1100 | 3000 | 9000 | 300 |
| | FC | 40 | 500 | 900000 | 2800 | 50000 | 1700 | 300 | NS | 110 | 500 | 5000 | 700 | 800 | 5000 | 80 |
| | ENT | | | | | | | | | | | | | | | |
| SPRINGDALE PUMP STATION WET WELL | TC | 240000 | NS | 300000 | NS | 160000 | NS | >16000 | NS | NS | NS | NS | NS | NS | NS | NS |
| | FC | 14000 | NS | 80000 | NS | 30000 | NS | 3000 | NS | NS | NS | NS | NS | NS | NS | NS |
| | ENT | | | | | | | | | | | | | | | |
| SPRINGDALE PUMP STATION DISCHARGE GATE | TC | NS | NS | NS | 3000 | >16000 | 3000 | <20 | 3000 | 1700 | >16000 | 16000 | 5000 | 1700 | 1700 | >16000 |
| | FC | NS | NS | NS | 1300 | >16000 | 3000 | <20 | NS | 70 | >16000 | 16000 | 5000 | 500 | 230 | 500 |
| | ENT | | | | | | | | | | | | | | | |
| EGGWC AT GOLDENWEST STREET | TC | NS | 3000 | >1600000 | 8000 | 30000 | NS | 3000 | 16000 | >16000 | NS | NS | NS | 16000 | 9000 | 16000 |
| | FC | NS | 700 | 900000 | 130 | 24000 | NS | 220 | NS | >16000 | NS | NS | NS | 70 | 1300 | 2800 |
| | ENT | | | | | | | | | | | | | | | |

Tabl

COUNT ORANGE
HCA/ENVIRONMENTAL HEALTH DIVISION
Bolsa Chica/East Garden Grove Wintersburg Channel
Bacteriological Monitoring
Total Coliform (TC), Fecal Coliform (FC) or * = E.Coli, Enterococcus (ENT) Most Probable Number per 100 ml Sample

| LOCATION DESCRIPTION | | 2/11/99 | 3/18/99 | 4/28/99 | 5/19/99 | 6/16/99 | 7/15/99 | 8/18/99 | 10/20/99 | 11/17/99 | 12/8/99 | 1/12/00 | 3/7/00 | 4/26/00 | 5/24/00 | 8/23/00 | 9/27/00 | 10/1/00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rain 2/9/99 | | | | | | | | | | | Rain 3/5/00 | | | | | |
| BOLSA CHICA RESERVE AT PED BRIDGE | TC | 170 | 110 | 20 | 80 | 20 | 500 | 20 | 20 | 20 | <20 | 110 | 40 | 40 | <20 | 130 | 20 | |
| | FC | NS | 110 | *52 | *<10 | *20 | *399 | *52 | *<10 | *10 | *<10 | *52 | *<10 | *20 | 31 | 72 | 61 | |
| | ENT | | | <10 | 20 | 40 | 10 | <10 | <10 | <10 | 10 | 10 | <10 | 10 | 20 | <10 | <10 | |
| EGGWC ABOVE TIDE GATE | TC | >16000 | 1300 | 20 | 130 | 80 | <20 | <20 | 170 | 80 | 40 | 40 | >16000 | 16000 | 170 | <20 | >16000 | |
| | FC | >16000 | 80 | *<10 | *<10 | *173 | *20 | *<10 | *120 | *10 | *20 | *31 | *563 | *6131 | 63 | 41 | 5475 | |
| | ENT | | | 31 | <10 | 20 | <10 | <10 | 10 | <10 | <10 | 10 | 933 | 1334 | 20 | <10 | >24192 | |
| OUTER BOLSA CHICA BELOW TIDE GATE | TC | >16000 | 300 | 20 | 40 | 40 | 20 | <20 | <20 | 80 | <20 | 40 | 800 | 260 | 220 | <20 | 5000 | |
| | FC | >16000 | 80 | *<10 | *<10 | *20 | *<10 | *10 | *41 | *31 | *52 | *<10 | *74 | *4106 | 41 | 10 | 209 | |
| | ENT | | | 20 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 20 | 10 | 10 | <10 | 10 | |
| HUNTINGTON HARBOUR AT WARNER AVENUE | TC | 300 | 1300 | <20 | <20 | 20 | 20 | <20 | 20 | 20 | <20 | 20 | 700 | 70 | 20 | 40 | 3000 | |
| | FC | 20 | 230 | *<10 | *10 | *20 | *20 | *<10 | *<10 | *<10 | *<10 | *<10 | *63 | *1669 | 41 | <10 | 161 | |
| | ENT | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 31 | <10 | <10 | <10 | 20 | |
| EGGWC AT SLATER CHANNEL | TC | >16000 | 16000 | 230 | 1300 | 300 | 300 | 80 | 800 | <20 | 2400 | 3000 | >16000 | 5000 | 700 | 500 | 230 | |
| | FC | 2400 | 800 | *20 | *98 | *359 | *240 | *98 | *3123 | *<10 | *336 | *98 | *794 | *19863 | 158 | 173 | 24192 | |
| | ENT | | | 41 | 20 | 74 | 30 | <10 | <10 | <10 | 31 | 20 | 85 | 10 | 63 | 1354 | 1597 | |
| SLATER CHANNEL BY PUMP STATION | TC | 16000 | >16000 | 2400 | 130 | 130 | >16000 | 800 | 500 | 3000 | 270 | 5000 | >16000 | 3000 | >16000 | >16000 | >1600 | |
| | FC | 3000 | 3000 | *488 | *121 | *<10 | *24192 | *213 | *10 | *689 | *84 | *1607 | *1989 | *275 | 4884 | 10462 | 3873 | |
| | ENT | | | 573 | 52 | <10 | >24192 | 20 | <10 | 2187 | 30 | 115 | 1313 | 4106 | 1674 | 20 | 1086 | |
| SPRINGDALE PUMP STATION WET WELL | TC | NS | NS | NS | NS | NS | NS | NS | NS | 16000 | >16000 | 5000 | >16000 | >16000 | >16000 | >16000 | 16000 | |
| | FC | NS | NS | NS | NS | NS | NS | NS | NS | *1616 | *24192 | *12997 | *1793 | *5794 | 1789 | >24192 | 3076 | |
| | ENT | | | NS | NS | NS | NS | NS | NS | 19863 | 4884 | 1017 | 9208 | 9208 | 19863 | >24192 | 6131 | |
| SPRINGDALE PUMP STATION DISCHARGE GATE | TC | NS | >16000 | NS | NS | 1100 | >16000 | 230 | NS | NS | NS | NS | NS | NS | NS | NS | NS | |
| | FC | NS | 5000 | NS | NS | *10 | *>24192 | *5794 | NS | NS | NS | NS | NS | NS | NS | NS | NS | |
| | ENT | | | NS | NS | 504 | 3255 | 708 | NS | NS | NS | NS | NS | NS | NS | NS | NS | |
| EGGWC AT GOLDENWEST STREET | TC | 16000 | 3000 | 1700 | 9000 | 500 | 1700 | 1700 | 2400 | >16000 | >16000 | >1600 | 16000 | 3000 | 9000 | 700 | >16000 | |
| | FC | 800 | 800 | *794 | *663 | *86 | *98 | *86 | *226 | *>24192 | *1918 | *2755 | *748 | 272 | 109 | 52 | 1211 | |
| | ENT | | | 122 | 63 | 31 | 10 | 20 | 20 | 404 | 422 | 269 | 160 | <10 | 413 | 20 | 857 | |

Table 9

COUNTY OF ORANGE
HCA/ENVIRONMENTAL HEALTH DIVISION
Bolsa Chica/East Garden Grove Wintersburg Channel
Bacteriological Monitoring
Total Coliform (TC), Fecal Coliform (FC) or * = E.Coli, Enterococcus (ENT) Most Probable Number per 100 ml Sample

| LOCATION DESCRIPTION | | 11/1/00 | 12/1/00 | 1/1/01 | 2/22/01 | 3/12/01 | 4/9/01 | 5/10/01 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Minmum | Maximum |
| BOLSA CHICA RESERVE AT PED BRIDGE | TC | | | | 170 | 30 | 80 | 120 | 20 | 9000 |
| | FC | | | | 51 | <10 | 20 | <10 | 20 | 9000 |
| | ENT | | | | <10 | <10 | 40 | 10 | 10 | 40 |
| EGGWC ABOVE TIDE GATE | TC | | | | 1300 | 130 | >15200 | 40 | | |
| | FC | | | | 31 | <10 | 100 | <10 | | |
| | ENT | | | | 52 | 20 | 30 | 20 | | |
| OUTER BOLSA CHICA BELOW TIDE GATE | TC | | | | 230 | 70 | 4400 | <10 | | |
| | FC | | | | 10 | <10 | 70 | <10 | | |
| | ENT | | | | 20 | <10 | <10 | <10 | | |
| HUNTINGTON HARBOUR AT WARNER AVENUE | TC | | | | 130 | 40 | 8000 | 10 | | |
| | FC | | | | 10 | 10 | 90 | 10 | | |
| | ENT | | | | 41 | 20 | <10 | <10 | | |
| EGGWC AT SLATER CHANNEL | TC | | | | 5000 | 800 | TNTC | 600 | | |
| | FC | | | | 578 | 10 | 350 | 260 | | |
| | ENT | | | | 313 | 10 | <10 | 130 | | |
| SLATER CHANNEL BY PUMP STATION | TC | | | | 16000 | >16000 | 6200 | >16000 | | |
| | FC | | | | 213 | 4352 | 10 | 12200 | | |
| | ENT | | | | 10 | 30 | 220 | 4800 | | |
| SPRINGDALE PUMP STATION WET WELL | TC | | | | 9000 | 9000 | TNTC | >16000 | | |
| | FC | | | | 1860 | 3873 | TNTC | 6600 | | |
| | ENT | | | | 145 | 1624 | 14800 | 16800 | | |
| SPRINGDALE PUMP STATION DISCHARGE GATE | TC | | | | NS | NS | NS | NS | | |
| | FC | | | | NS | NS | NS | NS | | |
| | ENT | | | | NS | NS | NS | NS | | |
| EGGWC AT GOLDENWEST STREET | TC | | | | 3500 | 3000 | >20000 | >600 | | |
| | FC | | | | 408 | 259 | 3200 | 240 | | |
| | ENT | | | | 379 | 156 | 150 | 30 | | |

**Table 10** **Calculation of ENT Concentration in the Talbert Marsh (Daytime)**

| Name of Bird | No. of Birds | No. of Drops per bird/day time | Bird Weight (g) | No. of ENT/drop [1] | Total No. of ENT/Day Time |
|---|---|---|---|---|---|
| Western gull | 1,180 | 4 | 1,000 | 1,000,000 | 4,720,000,000 |
| | | | | Total ------>> | 4,720,000,000 |
| Total | 1,180 | | | | |

(1) No. of ENT/drop calculated based on 1,000 ENT/dropping for each gram of bird weigh **Total No. of ENT ——>>** **4,720,000,000**

| | | | |
|---|---|---|---|
| | **Tidal Prism** | **1912214** | **ft^3** |
| **ENT Concentration =** | **Total No. of ENT/ Tidal Prism** | **8.7** | **MPN/100ml** |