FINAL ENVIRONMENTAL IMPACT STATEMENT/REPORT FOR THE UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT

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ABSTRACT

Upper Newport Bay, one of the largest coastal wetlands remaining in southern California, is an ecological resource of national significance. The 1000-acre Upper Bay is characterized by development in its lower reach and a 752-acre undeveloped ecological reserve in its upper reach. Natural habitats within upper Newport Bay include marine open water, intertidal mudflats, cordgrass dominated low saltmarsh, pickleweed dominated mid saltmarsh, high saltmartsh, salt panne, riparian, freshwater marsh and upland. Because of its diversity of habitats and its location on the Pacific Flyway, Upper Newport Bay supports an impressive number and diversity of birds particularly during fall and winter when shorebirds and waterfowl arrive from their northern breeding grounds. Upper Newport Bay also supports several endangered bird species and an endangered plant. The subtidal and intertidal waters of the Upper Bay provide important habitat for marine and estuarine fishes.

The ecological diversity and functionality of upper Newport Bay has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport Bay is San Diego Creek which drains approximately 85 percent of the 98,500-acre watershed. Sediment from the San Diego Creek watershed has filled open water areas within the Bay. This sedimentation has decreased the extent of tidal inundation, diminished water quality, degraded habitat for endangered species as well as migratory water birds and marine and estuarine fishes, and resulted in navigation problems in the Upper Bay marinas and navigation channels. If sediment deposition within Upper Newport Bay is allowed to continue, open water areas will evolve into mudflats and eventually marsh or upland habitat resulting in a loss of ecological diversity.

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Sediment will continue to deposit in the Bay no matter what control measures are implemented in the watershed. Therefore, one of the most important components of this project is to develop a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediment will settle.

A full array of preliminary alternatives to control sediment and restore habitat values in Upper Newport Bay was developed. Through the screening process, four viable basin configurations to trap sediment were identified. Alternative 1 would restore previously dredged basin configurations. Alternative 4 features the largest deepest basins. Under this alternative most of the uppermost basin (Unit III basin) would be dredged to -20 feet (ft.) (-6 meters [m]) Mean Sea Level (MSL), one tern island would be relocated to the lower basin (Unit II basin), and the Unit II basin would be widened and deepened. Alternative 5 would expand the Unit III basin and maintain it at -14 ft. (-4.2 m) MSL and relocate one of the tern islands to the Unit II basin. However, Alternative 5 would not maintain the Unit II basin. Alternative 6 would expand the Unit III basin and deepen it to -20 ft. (-6 m) MSL but would retain mudflats in the northeast corner. Alternative 6 would relocate one tern island to the Unit II basin and would expand and deepen the Unit II basin but with a smaller footprint than under Alternative 4. These four alternatives, along with the No Project alternative, were analyzed in equal detail. In addition, this document analyzed two dredging alternatives, a clamshell dredge and a small hydraulic dredge. Finally, six additional habitat restoration measures were carried forward and analyzed in detail.

Based on the analysis Alternative 6 was selected as the recommended plan. Alternatives 4 and 6, with the largest basin footprints, would provide the greatest benefits. However, Alternative 4 also had the most adverse impacts. Alternative 6 had the fewest number of unavoidable significant adverse impacts. Alternative 6 was determined to be the Environmentally Preferred Plan. Alternative 6, thus, was selected because it provides high benefits with comparatively low impacts.

Unavoidable significant adverse impacts of Alternative 6 include interference with recreational uses of Newport Bay during dredging and exceedance of NO_x emissions during dredging. Other significant adverse impacts of Alternative 6 that could be mitigated to insignificant include disturbance to listed bird species from the dredge and associated equipment, exceedance of noise standards during dredging, and risk to boater safety from the dredge and disposal scows.

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EXECUTIVE SUMMARY

S.1 INTRODUCTION

This joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses the potential environmental impacts and benefits of a habitat restoration plan for Upper Newport Bay. Newport Bay is located along the coast of Orange County, California approximately 40 miles (mi) (64 kilometers [km]) south of Los Angeles and 75 mi (120 km) north of San Diego. The Bay is divided into the Lower and Upper Bay at the Pacific Coast Highway (PCH) Bridge. The 750-acre Lower Bay is a small boat harbor surrounded by residential development. The 1,000-acre Upper Bay is characterized by a diverse mix of development in its lower reach and an undeveloped ecological reserve in its upper reach. The 752-acre Upper Newport Bay Ecological Reserve, managed by the California Department of Fish and Game (CDFG), is one of the last remaining southern California coastal wetlands that continues to play a significant role in providing critical habitat for a variety of migratory water fowl and shorebirds, as well as several endangered species of animals and plants. For this reason, Upper Newport Bay is an ecological resource of national significance

The ecological diversity and functionality of Upper Newport Bay has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport bay is San Diego Creek, which drains approximately 85 percent of the 98,500 acre watershed. Of the 178,000 cubic yards (cy) (135,280 cubic meters [cu m]) of sediment that flows into the Upper Bay, approximately 129,000 cy (98,040 cu m) remains within the Upper Bay. The rest is deposited in the Lower Bay or discharged to the ocean.

Sedimentation has been identified as the biggest problem in Newport Bay. Sedimentation has filled open water areas, decreased the extent of tidal inundation, diminished water quality, degraded habitat for biological resources, including threatened and endangered species, and resulted in navigation problems in the Upper Bay marinas and navigation channels. Sediment not trapped in the Upper Bay passes under PCH Bridge, where it causes similar problems in the Lower Bay. If sediment deposition within Upper Newport Bay were allowed to continue, open water areas would evolve into mudflats and eventually marsh or upland habitat, resulting in a loss of ecological diversity. Additionally, the Unit II Basin is not in compliance with the Regional Water Quality Control Board's (RWQCB) sediment Total Maximum Daily Load (TMDL) objective.

S.2 PURPOSE OF AND NEED FOR ACTION

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. One of the most important components is to implement a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediments will settle.

A sediment management plan is needed to meet the primary ecosystem restoration study objectives:

- Restore, enhance, optimize, and maintain the ecological values for fish and wildlife, including sensitive communities in and around the Upper Newport Bay Ecological Reserve, to provide a diversity of use for resident and migratory species, and
- Restore, maintain, and manage a healthy and productive mix of habitat types including subtidal marine, intertidal mudflat, cordgrass dominated low salt marsh, and pickleweed dominated mid-salt marsh.

In addition to a sediment management plan, the restoration project includes other habitat measures to restore the Upper Newport Bay ecosystem.

The U.S. Army Corps of Engineers, Los Angeles District (Corps) is the federal Lead Agency for this project and has prepared this EIS in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321, as amended). The County of Orange is the state lead agency and has prepared this EIR in accordance with the California Environmental Quality Act (CEQA) of 1970 (Public Resources Code, Sections 21000-21177).

This EIS/EIR is an informational document to advise decisionmakers and the general public of the benefits and potential adverse impact of the project as well as feasible alternatives. This document assesses the short-term, long-term, and cumulative impacts and benefits of the project. This EIS/EIR is also intended to provide information to all agencies whose discretionary approvals must be obtained for project actions.

S.3 PROPOSED ACTION ALTERNATIVES

A total of 6 alternatives were evaluated against screening criteria, which included goals and objectives developed for the Restoration Project by the Upper Newport Bay Environmental Restoration Technical Advisory Group (TAG). Four sediment control alternatives were selected for detailed analysis. Table S-1 summarizes the key differences among the four sediment control alternatives.

Table S-1
Key Differences Among Sediment Control Alternatives

Alternative	Uppermost Basin	Unit II Basin	Least Tern Islands
1	Unit III basin footprint and depth (-14 ft. MSL), creates channel between tern islands.	Original Unit II footprint (-14 ft. MSL), restores side channel around New Island.	unchanged
4	Expands basin footprint to include all but an approximately 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -20 ft. MSL, creates channel between hot dog island and shore.	Expands Unit II basin to south and west, deepens basin to -20 ft. MSL, restores side channel around New Island.	Relocates northern least tern island to main dike.
5	Expands basin footprint to include all but approximately a 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -14 ft. MSL, creates channel between hot dog island and shore.	No restoration or expansion of Unit II basin, only dredging in Unit II basin is -14 ft. MSL barge access channel through the basin and maintenance access channel to tern island.	Relocates northern least tern island to main dike.
6	Deepens basin to -20 ft. MSL, expands Unit III basin footprint but retains mudflats in northeast corner, creates channel between hot dog island and shore.	Expands Unit II basin to the west, deepens basin to -20 ft. MSL and restores side channel around New Island.	Relocates northern least tern island to main dike.

Each of the sediment control alternatives is analyzed with two alternative dredging methodologies: a large conventional clamshell dredge and a small hydraulic dredge. Only one disposal method, ocean disposal at the LA-3 dredged material disposal site, is considered because other disposal methods were eliminated based on one or more screening criteria. Finally, a variety of habitat restoration measures are addressed that could be implemented with any of the sediment control alternatives. The No Project Alternative was also evaluated and compared to each alternative.

No Project Alternative

With the No Project Alternative, no dredging would occur within the Upper Bay ecological reserve. The mudflats surrounding the two least tern islands in the Unit III basin would remain as mudflats and would not be restored to open water.

Sediment Control Alternatives

Alternative 1 would restore previously-dredged basin configurations. With this alternative, the Unit III basin would be maintained at its current depth and configuration but channels would be added between the tern islands, and the Unit II basin and side channel east of New Island would be restored.

Alternative 4 features the largest and deepest basins. This alternative involves deepening the Unit III basin to -20 feet (6 m) below MSL and expanding its footprint, removing one least tern island from the uppermost basin, expanding the Unit II basin to the south and west, and constructing a new tern island along the western portion of the dike.

Alternative 5 would involve the removal of the northern "kidney shaped" tern island in the upper basin, expanding the footprint of the Unit III basin, and creating a new least tern island along the main dike in the middle segment of the Upper Bay. The Unit II basin would not be expanded.

Alternative 6 would expand and deepen the Unit III basin, remove the northern "kidney shaped" tern island and create a new least tern island at the main dike. The Unit II basin would be widened and deepened, but with a smaller footprint than Alternative 4.

Dredging Alternatives

Tables S-2 and S-3 summarize the equipment and personnel requirements for the large clamshell dredge and the small hydraulic dredge alternatives, respectively. Tables S-4 and S-5, respectively show the initial and maintenance dredging requirements for each sediment control alternative.

Table S-2
Equipment and Personnel for Large Clamshell Dredge Alternative

Equipment Type	Number	Dimensions	Specifications	Personnel
Clamshell Dredge on Deck Barge	1	60 ft x 210 ft. x 6 ft.	5 cy bucket 1,000 hp diesel engine	5 day 4 night
Disposal Scow	3	50 ft. x 150 ft. by 5 ft.	1,500 cy capacity	1 each
Tugboat	2	30 ft. x 60 ft. x 7 ft.	1,600 hp diesel engine	2 each
Work/Guide Boats	2	12 ft. x 25 ft. x 3 ft.	50 hp diesel engine	2 each
Fuel Barge	1	12 ft. x 25 ft. x 6 ft.		2
Survey Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
QC Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
Office/Storage Yard	1	9,000 sq. ft.	Shellmaker Island	7

Table S-3
Equipment and Personnel for Small, Hydraulic Dredge Alternative

Equipment Type	Number	Dimensions	Specifications	Personnel
Floating Hydraulic dredge	1	63 ft. x 21.5 ft. x 5 ft.	440 hp diesel engine, cutterhead	2 day 2 night
Disposal Scow	3	50 ft. x 150 ft. x 5 ft.	1,500 cy capacity	1 each
Tugboat	3	30 ft. by 60 ft. x 7 ft.	1,600 hp diesel engine	2
Work Boat	1	12 ft. x 25 ft. x 3 ft.	50 hp diesel engine	2
Survey Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
QC Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
Office/Storage Yard	1	9,000 sq. ft.	Shellmaker Island	3

Large Clamshell Dredge. With this alternative, dredging would be conducted from a floating barge by a crane equipped with a 5 cy (3.8 cu m) grab bucket or by a CAT 245 backhoe with a 5 cy (3.8 cu m) bucket. The sediment in the grab bucket would be deposited into a disposal scow with a 1,500 cy (1,147.5 cu m) capacity. The filled scow would be pushed by a tug to a barge marshalling area adjacent to the south end of Shellmaker Island and exchanged for an empty scow. The filled scow would then be pushed to the ocean disposal site at LA-3. Approximately three, 4-hour round trips would be made to the disposal site per day. Dredge operations would be conducted 24 hours per day, 6 days per week. A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every 2 days. A quality control survey boat would be onsite during all dredging operations. Equipment would be refueled every 2 to 3 days from a fuel barged maintained at Shellmaker Island or a site near the PCH Bridge. The dredging contractor would maintain an office and equipment storage on Shellmaker Island or a site near the PCH Bridge. To provide access for the dredge and barge, the channel between the Unit II basin and PCH Bridge would be maintained at -14 ft. (-4.2 m) MSL.

Small Hydraulic Dredge. With this alternative, the dredging operations would be conducted using a small, lightweight, self-propelled dredge that could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which is then pumped through a 12-inch pipeline to a disposal scow at Shellmaker Island or a site near the PCH Bridge. Three, 400-horsepower booster pumps would be located along Back Bay Drive. The dredge would operate 24 hours per day, 6 days per week. Dredged material with this alternative would contain approximately 80 percent water so that it will flow through the pipeline. Prior to leaving the dock, water would be removed from the disposal scow to reduce the number of trips to the disposal sites. Approximately three, 4-hour round trips would be made per day. The hydraulic dredge would be fueled by truck at Jamboree Road.

Tern Island Relocation

Sediment control Alternatives 4, 5, and 6 include relocation of the more northerly, "kidney-shaped" tern island from the Unit III basin to the main dike near the Unit II basin. Removal of the old island foundation would be accomplished during the upper basin dredging. Tern island relocation would occur during the non-breeding season. The new tern island would be constructed from material taken from the top of the "kidney shaped" island and material obtained elsewhere in the Bay.

Ocean Disposal

Ocean disposal at the LA-3 ocean dredged material disposal site, located on the slope of Newport Canyon, is the only feasible alternative for disposal of the dredged material. This site is one of five sites that have been used for disposal of dredged material within coastal southern California. Some of the dredged material may be designated for onsite beneficial uses such as the construction of least tern islands.

Table S-4
Upper Newport Bay
Initial Dredging Requirements
(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge										
	Dredge Area							Time Required		Start
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Other Channels*	Total	Work Days	Months**	Relative to 1999
No Project	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	100,000	100,000	**828,000**	276	11.8	Year 4
4	1,118,000	1,297,000	20,000	8,000	75,000	100,000	**2,618,000**	873	37.3	Year 4
5	616,000	77,000	20,000	8,000	75,000	100,000	**896,000**	299	12.8	Year 4
6	958,000	866,000	20,000	8,000	75,000	100,000	**2,027,000**	507	21.7	Year 4
Dredge Method: Small, Land-based Hydraulic Dredge										
	Dredge Area							Time Required		Start
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Other Channels*	Total	Work Days	Months**	Relative to 1999
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	-	100,000	**728,000**	243	10.4	Year 4
4	1,118,000	1,297,000	20,000	8,000	-	100,000	**2,543,000**	848	36.2	Year 4
5	616,000	77,000	20,000	8,000	-	100,000	**821,000**	274	11.7	Year 4
6	958,000	866,000	20,000	8,000	-	100,000	**1,952,000**	651	27.8	Year 4

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.
* Other Channels include: East Side, New Island (42,000 cy), West Side, Middle Island (24,000 cy), East Side, Shellmaker Island (34,000 cy).
** Work Days are converted to Months by assuming 6 work days per week with 90% efficiency.

Table S-5
Upper Newport Bay
Maintenance Dredging Requirements
(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge									
	Dredge Area						Time Required		
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Total	Work Days	Months**	Maintenance Frequency Years
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	200,000	**861,000**	287	12.3	7
4	1,118,000	814,000	52,000	28,000	300,000	**2,312,000**	771	32.9	24
5	616,000	131,000	27,000	14,000	200,000	**988,000**	329	14.1	10
6	958,000	554,000	53,000	37,000	300,000	**1,902,000**	476	20.3	21
Dredge Method: Small, Land-based Hydraulic Dredge									
	Dredge Area						Time Required		
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Total	Work Days	Months**	Maintenance Frequency Years
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	-	**661,000**	220	9.4	7
4	1,118,000	814,000	52,000	28,000	-	**2,012,000**	671	28.7	24
5	616,000	131,000	27,000	14,000	-	**788,000**	263	11.2	10
6	958,000	554,000	53,000	37,000	-	**1,602,000**	534	22.8	21

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.
** Work Days are converted to Months by assuming 6 work days per week with 90% efficiency.

Habitat Restoration Alternatives

Six habitat restoration measures were analyzed as a potential part of the Upper Newport Bay Restoration Project (see Figure 2.3-8 on page 2-27). These habitat restoration measures would be implemented with any of the sediment control alternatives.

Addition of Sand to the Least Tern Islands. The existing least tern islands in the uppermost basin have become degraded by the erosion of sand and invasion of vegetation. With this alternative, sand would be obtained from within the bay and added to the nesting islands.

Construction of Small Dendritic Channels through the Marsh. A pilot program of one dendritic channel would be dredged through Shellmaker Island. The purpose of this restoration measure would be to increase foraging habitat for aquatic-feeding birds, improve circulation, and restrict access for humans and terrestrial predators.

Restoration of Wetlands in Filled Areas. Three areas of fill within the Upper Bay have been identified where the potential exists to restore the filled areas to wetlands. These areas include Northstar Beach, the bull-nose section of land at the lower end of the northern side of the Unit I/II basin, and dredge spoil on Shellmaker Island. For any of these wetlands creation alternatives, the material would be excavated as described for the dredging alternatives.

Restoration of Side Channels. This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Restoration of the side channels would increase habitat for aquatic species, improve circulation, and isolate the islands from terrestrial predators.

Restore Eelgrass Beds in Lower Portions of Upper Bay. The lower portions of the Upper Bay formerly supported eelgrass, but beds disappeared following wet years in the 1980s and 1990s. With this alternative, an area near Shellmaker Island in the lower portion of the Upper Bay would be revegetated using eelgrass from around Harbor Island and Balboa Island in the Lower Bay.

Removal of Segments of the Main Dike. With this alternative, a backhoe would remove approximately 500 cy (382.5 cu m) from the dike in segments. This would remove an access route for terrestrial predators and humans into the marsh (see Figure 1.2-2 on page 1-3).

S.4 SUMMARY OF ANTICIPATED ENVIRONMENTAL IMPACTS

Table S-6 identifies the impacts and benefits of each sediment control and dredging alternative.

No Project Alternative

Earth Resources. Increased sedimentation would have significant adverse impacts on Upper Newport Bay through the loss of open water areas.

Water Quality. Increased sedimentation in the Upper bay would result in a significant adverse impact to water quality because of decreased circulation and greater influence of San Diego Creek. RWQCB TMDL objectives would continue not to be met.

Biological Resources. Sedimentation would result in a loss of over 80 percent of the marine open water habitat in Newport Bay within 50 years, resulting in a significant adverse impact. Other significant adverse impacts include the loss of foraging habitat for the endangered California least tern and a overall net loss in habitat value of an area of special biological significance, the Upper Newport Bay Ecological Reserve.

Table S-6
Summary of Impacts of Sediment Control Alternatives

Impact	No Project	Alternative 1		Alternative 4		Alternative 5		Alternative 6	
		C	H	C	H	C	H	C	H
Earth Resources									
negative changes in topography	x	+	+	+	+	+	+	+	+
excavation of beach for tern island sand	-	-	-	o	o	o	o	o	o
Water Quality									
degradation from increased sedimentation	x	+	+	+	+	+	+	+	+
conflict with RWQCB TMDL objectives	x	x	x	+	+	x	x	+	+
turbidity during dredging	-	o	o	o	o	o	o	o	o
water column and sediment impacts at LA-3	-	o	o	o	o	o	o	o	0
fuel spill	-	o	o	o	o	o	o	o	o
turbidity from creation of new tern island	-	-	-	o	o	o	o	o	o
Biological Resources									
loss of open water habitat	x	+	+	+	+	+	+	+	+
loss of foraging habitat for least tern	x	+	+	+	+	+	+	+	+
net loss of habitat units	x	+	+	+	+	+	+	+	+
loss of intertidal mudflat	+	o	o	x	x	o	o	o	o
protection by restoration of side channels	-	+	+	+	+	+	+	+	+
loss of invertebrates from dredging	-	x	x	o	o	o	o	o	o
turbidity during dredging	-	o	o	o	o	o	o	o	o
loss of beach invertebrates for tern island	-	-	-	o	o	o	o	o	o
disturbance to least terns from dredging	-	*	*	*	*	*	*	*	*
disturbance to clapper rails from dredging	-	*	*	*	*	*	*	*	*
disturbance to Beldings savannah sparrow	-	*	*	*	*	*	*	*	*
damage to clapper rail nests from wake	-	*	-	*	-	*	-	*	-
fuel spill impacts to listed species or marsh	-	o	o	o	o	o	o	o	o

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Impact	No Project	Alternative 1		Alternative 4		Alternative 5		Alternative 6	
		C	H	C	H	C	H	C	H
Air Quality									
exceedance of total NO_X emission standards during dredging	-	x	x	x	x	x	x	x	x
dust emissions during dredging	-	-	-	-	-	-	-	-	-
odor emissions during dredging	-	o	o	o	o	o	o	o	o
Noise									
exceed noise standards during dredging	-	*	*	*	*	*	*	*	*
Hazards									
decreased navigation	x	*	*	*	*	*	*	*	*
risk to boater safety during dredging	-	*	*	*	*	*	*	*	*
Land and Water Uses									
loss of recreation/land/water uses from	x	+	+	+	+	+	+	+	+
increased sedimentation									
interference with recreation/land/water uses	-	x	x	x	x	x	x	x	x
during dredging									
excavation of beach for tern island sand	-	-	-	o	o	o	o	o	o
visual impacts during dredging	-	o	o	o	o	o	o	o	o
Nighttime glare during dredging		*	*	*	*	*	*	*	*
Energy									
annual diesel consumption	-	o	o	o	o	o	o	o	o

C = clamshell dredge
H = hydraulic dredge
X = significant adverse impact that cannot be mitigated to insignificant
*** = significant adverse impact that can be mitigated to insignificant**
o = adverse but insignificant impact
+ = beneficial effect

Air Quality. No project activities would occur. Therefore, no impacts to air quality would result.

Noise. No noise would be produced and no impacts would occur.

Hazards. Increased sedimentation would cause significant adverse impacts. Navigation channels and marinas would shoal, creating an increased risk that vessels could either run aground or collide.

Cultural Resources. No project activities would occur and no impacts to cultural resources would result.

Socioeconomics. As the Bay silts in, recreation uses would change and shoals would develop rapidly in the navigation channels and slips in the Upper Bay, resulting in an indirect adverse impact to the recreation economy.

Land and Water Uses. Recreational uses will change and boating in the Upper Bay will diminish or be eliminated. By 2049, marinas would silt in and affect recreational uses. This would permanently change water use and result in a significant impact.

Circulation. No increase in traffic would result from the No Project Alternative.

Energy. No fuel or energy source would be affected with the No Project Alternative.

Alternative 1

Earth Resources. Control of sedimentation would have a beneficial effect on earth resources.

Water Quality. Alternative 1 would improve water quality. This alternative would result in the third best water quality, after Alternatives 4 and 6, because the basin footprints would be smaller and shallower. Alternative 1 would not comply with the RWQCB TMDL for sediment, resulting in a significant adverse impact.

Biological Resources. This alternative would result in the third largest increase in Habitat Units (HUs). A 4 percent loss in mudflat habitat would result in an insignificant adverse impact. Restoration of the side channel around New Island would result in beneficial impacts by decreasing intrusion of predators. Dredging would destroy most of the benthic invertebrates within the dredge area. Because the frequent maintenance dredging required under Alternative 1, a mature benthic invertebrate community would be prevented from establishing, diversity would be lost, and a significant unmitigable adverse impact would result. Turbidity would disturb biological resources during dredging, resulting in an insignificant adverse impact. Noise impacts to birds, particularly the least tern, during dredging would result in a significant impact that could be mitigated. The wake of the disposal scows would affect clapper rail nests. This significant, adverse impact could be mitigated to insignificant.

Air Quality. The oxides of nitrogen (NO_x) emissions will exceed South Coast Air Quality Management District (SCAQMD) emissions criteria. This impact cannot feasibly be reduced to insignificant.

Noise. Noise standards would be exceeded during dredging. This impact can be mitigated to insignificant.

Hazards. Disposal scows travelling in navigation channels have the potential to interfere with an emergency craft or collide with a recreational boater. This impact can be mitigated to insignificant.

Socioeconomics. The sediment control alternatives are considered temporary actions and would not affect socioeconomics.

Land and Water Uses. Access for canoeing and kayaking in the upper portion of Upper Newport Bay would be constrained during dredging, resulting in a significant, unmitigable impact.

Circulation. Minimal increases in traffic would result in an insignificant impact to local roadways.

Energy. Alternative 1 would require the most fuel consumption. This impact would not be significant.

Alternative 4

Earth Resources. Control of sediment would have a beneficial impact on earth resources.

Excavation of beach sand near the Entrance Channel to supply sand for a new least tern island would be an adverse but insignificant impact to earth resources.

Water Quality. This alternative would result in the best water quality of all alternatives. The RWQCB TMDL for sediment would be met.

Biological Resources. This alternative would result in the largest increase in Habitat Units (HUs). A 26 percent loss in mudflat habitat would result in an unmitigable significant adverse impact. Restoration of the side channels would result in beneficial impacts by decreasing intrusion of predators. Dredging would destroy most of the benthic invertebrates within the dredge area. However, because of the length of time between dredging activities, benthic invertebrate diversity could be re-established. Turbidity would disturb biological resources during dredging, resulting in an insignificant adverse impact. Noise impacts to birds, particularly the least tern, during dredging would result in a significant impact that could be mitigated. The wake of the disposal scows would affect clapper rail nests. This significant, adverse impact could be mitigated to insignificant.

Air Quality. The oxides of nitrogen (NO_x) emissions will exceed South Coast Air Quality Management District (SCAQMD) emissions criteria. This impact cannot feasibly be reduced to insignificant.

Noise. Noise standards would be exceeded during dredging. This impact can be mitigated to insignificant.

Hazards. Disposal scows travelling in navigation channels have the potential to interfere with an emergency craft or collide with a recreational boater. This impact can be mitigated to insignificant.

Socioeconomics. The sediment control alternatives are considered temporary actions and would not affect socioeconomics.

Land and Water Uses. Access for canoeing and kayaking in the upper portion of Upper Newport Bay would be constrained during dredging, resulting in a significant, unmitigable impact. Excavation of beach sand to construct a new tern island would result in insignificant, adverse impacts.

Circulation. Minimal increases in traffic would result in an insignificant impact to local roadways.

Energy. Alternative 4 would require fuel consumption. This impact would not be significant.

Alternative 5

Earth Resources. Control of sediment would have a beneficial impact on earth resources.

Excavation of beach sand near the Entrance Channel to supply sand for a new least tern island would be an adverse but insignificant impact to earth resources.

Water Quality. This alternative would result in the worst water quality of all alternatives because the Unit II Basin would not be restored. The RWQCB TMDL for sediment would not be met, resulting in a significant, unmitigable impact.

Biological Resources. This alternative would result in the third lowest increase in Habitat Units (HUs). An 8 percent loss in mudflat habitat would result in an insignificant adverse impact. Restoration of the side channels would result in beneficial impacts by decreasing intrusion of predators. Dredging would destroy most of the benthic invertebrates within the dredge area. However, because little dredging would occur in the Unit II Basin, only the Unit I Basin would have a reduction in the diversity of the benthic invertebrate community, and the impact would be adverse but insignificant. Turbidity would disturb biological resources during dredging, resulting in an insignificant adverse impact. Noise impacts to birds, particularly the least tern, during dredging would result in a significant impact that could be mitigated. The wake of the disposal scows would affect clapper rail nests. This significant, adverse impact could be mitigated to insignificant.

Air Quality. The oxides of nitrogen (NO_x) emissions will exceed South Coast Air Quality Management District (SCAQMD) emissions criteria. This impact cannot feasibly be reduced to insignificant.

Noise. Noise standards would be exceeded during dredging. This impact can be mitigated to insignificant.

Hazards. Disposal scows travelling in navigation channels have the potential to interfere with an emergency craft or collide with a recreational boater. This impact can be mitigated to insignificant.

Socioeconomics. The sediment control alternatives are considered temporary actions and would not affect socioeconomics.

Land and Water Uses. Access for canoeing and kayaking in the upper portion of Upper Newport Bay would be constrained during dredging, resulting in a significant, unmitigable impact. Excavation of beach sand to construct a new tern island would result in insignificant, adverse impacts.

Circulation. Minimal increases in traffic would result in an insignificant impact to local roadways.

Energy. Alternative 5 would require fuel consumption. This impact would not be significant.

Alternative 6

Earth Resources. Control of sediment would have a beneficial impact on earth resources.

Excavation of beach sand near the Entrance Channel to supply sand for a new least tern island would be an adverse but insignificant impact to earth resources.

Water Quality. This alternative would result in improvements to water quality. The RWQCB TMDL for sediment would be met.

Biological Resources. This alternative would result in the second largest increase in Habitat Units (HUs). A 17 percent loss in mudflat habitat would result in an insignificant adverse impact. Restoration of the side channels would result in beneficial impacts by decreasing intrusion of predators. Dredging would destroy most of the benthic invertebrates within the dredge area. However, because of the length of time between dredging activities, benthic invertebrate diversity could be re-established. Turbidity would disturb biological resources during dredging, resulting in an insignificant adverse impact. Noise impacts to birds, particularly the least tern, during dredging would result in a significant impact that could be mitigated. The wake of the disposal scows would affect clapper rail nests. This significant, adverse impact could be mitigated to insignificant.

Air Quality. The oxides of nitrogen (NO_x) emissions will exceed South Coast Air Quality Management District (SCAQMD) emissions criteria. This impact cannot feasibly be reduced to insignificant.

Noise. Noise standards would be exceeded during dredging. This impact can be mitigated to insignificant.

Hazards. Disposal scows travelling in navigation channels have the potential to interfere with an emergency craft or collide with a recreational boater. This impact can be mitigated to insignificant.

Socioeconomics. The sediment control alternatives are considered temporary actions and would not affect socioeconomics.

Land and Water Uses. Access for canoeing and kayaking in the upper portion of Upper Newport Bay would be constrained during dredging, resulting in a significant, unmitigable impact. Excavation of beach sand to construct a new tern island would result in insignificant, adverse impacts.

Circulation. Minimal increases in traffic would result in an insignificant impact to local roadways.

Energy. Alternative 6 would require fuel consumption. This impact would not be significant.

S.5 ENVIRONMENTALLY PREFERRED PLAN AND RECOMMENDED PLAN

Because it provides the greatest benefits relative to impacts and because it has the fewest number of unavoidable significant adverse impacts, Alternative 6 is the environmentally-preferred plan. Because the hydraulic dredge is generally less impacting than the clamshell dredge, the environmentally-preferred plan would be to implement Alternative 6 using the hydraulic dredging method.

The alternative that best addresses the problems and opportunities and objectives and constraints for this study is Alternative 6. Alternative 6 provides a balance between sediment control and environmental restoration, and has the fewest number of significant unavoidable adverse environmental impacts. National Ecosystem Restoration benefits are equal to the highest, maintenance intervals easily comply with the sediment TMDL objective, and the storage capacity of both basins ensure less deposition in habitat areas below the Unit II basin.

In addition to the Alternative 6 basin configuration, the recommended plan includes the following habitat restoration measures:

- Addition of sand to the least tern island.
- Construction of a small dendritic channel through the marsh on Shellmaker Island.
- Restoration of wetlands in filled areas at Northstar Beach, the bull-nose section of land at the lower end of the northern side of the Unit I/III basin, and in a dredge spoil area on Shellmaker Island.
- Restoration of side channels on the west side of Middle Island and the east side of Shellmaker Island.
- Restoration of eelgrass adjacent to Shellmaker Island.
- Removal of segments of the Main Salt Dike.

To reduce the net loss of intertidal mudflat, additional opportunities to restore intertidal mudflat habitat are being investigated. Furthermore, during final design of the Unit II basin, measures to reduce the loss of intertidal mudflat to the basin footprint will be implemented.

S.6 ENVIRONMENTAL COMMITMENTS

Table S-7 summarizes the significant environmental impacts of the recommended plan and describes the mitigation program that will be implemented to reduce those impacts. The County of Orange will establish a monitoring and reporting program to insure compliance with these mitigation measures.

Table S-7
Significant Impacts and Environmental Commitments for the Recommended Plan

Impact	Mitigation	Approvals Required	Timing	Standards for Compliance
Disturbance to least terns from dredging.	Avoid dredging activities within 200 ft. of the least tern nesting island between April 15 and September 15.	None	Include stipulations in project contracts before project activities begin. Avoid dredging activities within 200 ft. of the least tern island between April 15 and September 15.	Compliance with this measure will occur if the above time restrictions for activities near the tern islands are enforced. In addition, the absence of least terns on the tern islands at the end of the season should be confirmed by a qualified biologist before dredging activities near the tern islands resume.
Disturbance to light-footed clapper rail and Belding's savannah sparrow from dredging.	Avoid high density nesting areas of the federal- and state- endangered light-footed clapper rail and state-endangered Belding's savannah sparrow during the nesting season, and monitor nests of listed bird species near dredging activities. If disturbance is observed cease dredging near the nests until after the breeding season.	The qualifications of the biological monitor(s) shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.	Include stipulations in project contracts before project activities begin. Avoid high density nesting areas between March and September for the light-footed clapper and between March and August for Belding's savannah sparrow. The biological monitor shall monitor light-footed clapper rail nests near dredging activities between March and September and Belding's savannah sparrow nests between March and August.	This measure will be complied with if disturbance to listed marsh bird species is avoided during the nesting season.
Damage to light-footed clapper rail nests from the wakes of scows and tugboats.	Place floats along the channel perimeter of saltmarsh habitat during the March to September breeding season of the light-footed clapper rail. Monitor clapper rail nests to insure damage from the wakes of scows and tugs is not occurring.	The qualifications of the biological monitor(s) shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.	Include stipulations in project contracts before project activities begin. Floats should be placed prior to the start of the March light-footed clapper rail breeding season. The biological monitor shall monitor light-footed clapper rail nests near the channel between March and September.	This measure would be complied with if floats are placed along the channel perimeter near saltmarsh habitat, if the nests are monitored by a qualified biologist, and if the dredging contractor follows any instructions from the biological monitor to avoid damage to clapper rail nests.

Impact	Mitigation	Approvals Required	Timing	Standards for Compliance
Disturbance to light-footed clapper rails and Belding's savannah sparrow from the noise of pumps associated with hydraulic dredging.	If an hydraulic dredge is selected place booster pumps at least 150 ft. (45 m) away from saltmarsh habitat.	None	The location for the booster pumps should be established prior to the beginning of dredging.	Compliance with this measure will occur if booster pumps are placed over 150 ft. (45 m) from saltmarsh habitat.
Disturbance to sensitive plant species from restoration of degraded upland habitat.	For the habitat restoration measure that would convert uplands to wetlands, conduct a sensitive plant survey to insure no sensitive plant species would be destroyed by the excavation of uplands habitat. If sensitive plants are observed, avoid disturbing areas where they occur.	The qualifications of the botanist who performs the sensitive plant survey shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.	The sensitive plant survey shall be conducted prior to any excavation in uplands habitat and at the proper time of year to identify sensitive plant species that have the potential to occur.	Compliance with this measure will occur if the sensitive plant survey is conducted and any observed sensitive plant populations avoided.
Exceedance of air quality standards for NO_X emissions.	The dredging contractor shall use Best Available Control Technology and/or an electric dredge to reduce emissions to the maximum extent feasible. In addition, the dredging contractor may be required to purchase emissions credits to achieve conformity with the state implementation plan.	The Corps of Engineers or its designated environmental monitor shall approve the contractor's plan to use Best Available Control Technology to reduce emissions. The Southern California Air Quality Management District (SCAQMD) also shall review and approve the air quality plan and will approve the purchase of emissions credits, if necessary. The contractor shall demonstrate that any equipment subject to an air quality permit has been permitted by the SCAQMD.	Air quality stipulations shall be included in project contracts. The Corps of Engineers or its designated environmental monitor shall approve the equipment and applicable Best Available Control Technology proposed by the contractor prior to the beginning of dredging.	Compliance with this measure will occur if Best Available Control Technologies as approved by the Corps of Engineers and SCAQMD are implemented throughout project construction.

Table 3-7, page 3 of 4

Impact	Mitigation	Approvals Required	Timing	Standards for Compliance
Noise levels in excess of standards.	All dredging equipment and tug boats shall be operated only with their engine hatches (if so equipped) in a closed position. If such equipment uses a free-standing or exposed engine, an acoustic shroud, lead curtain, or other such devise shall be employed to reduce mechanical noise. All internal combustion engines (including dredge, tugs, and pumps) shall be fitted with properly operating mufflers or exhaust gasses shall be routed below the water line. All exposed mechanical apparatus which employs metal-on-metal wear points, (e.g., gears, pulleys etc.) shall be well lubricated and maintained as per manufacturer's specifications. A qualified noise expert shall monitor noise levels at a representative number of proximate receptor locations during the night to ensure that operations do not exceed the local noise standards.	The Corps of Engineers or its designated environmental monitor shall approve measures proposed by the dredging contractor to reduce noise levels.	Noise stipulations shall be included in project contracts. Equipment shall be approved prior to the beginning of dredging. Noise monitoring shall be conducted during dredging.	Compliance with this measure will occur if noise standards are not exceeded at proximate receptor locations.
Hazards to recreational boaters from collision with a disposal scow or obstruction of emergency rescue equipment.	The dredging contractor shall develop a plan to reduce hazards to boaters from dredging and disposal operations. The following measures or approved alternatives shall be incorporated into the plan: Scow trips through the main navigation channels shall be scheduled to avoid peak use hours on summer weekends. Peak use summer hours are defined as 9 am to 7 pm on summer weekends and holidays and during any scheduled boating events in the main channel of the Lower Bay. Scow routes and schedules shall be coordinated with the U.S. Coast Guard and the Orange County Sheriff-Coroner/Harbor Patrol. Lookout personnel with communications equipment shall be placed on the scows, tugs, or an auxiliary boat to warn boaters to avoid the scow.	The contractor's plan to avoid risks to boaters in Newport Bay shall be approved by the Corps of Engineers or its designated environmental monitor and by the U.S. Coast Guard and the Orange County Sheriff-Coroner/ Harbor Patrol.	Boating safety stipulations shall be included in project contracts. The boating safety plan shall be approved prior to the commencement of dredging.	Compliance with this measure will occur if the dredging contractor adheres to the measures specified in the approved boating safety plan.

Table 3-7, page 4 of 4

Impact	Mitigation	Approvals Required	Timing	Standards for Compliance
Disturbance to archaeological sites ORA-164, ORA-193 and ORA-347 from wetlands restoration north of the Unit I/III basin.	If during the final design phase it is determined that wetlands restoration may affect an archaeological site, a qualified archaeologist shall conduct a field reconnaissance to determine whether archaeological sites ORA-164, ORA-193 and ORA-347 will be affected by work associated with wetlands restoration. If the survey determines that one or more of these sites may be affected, a test program shall be performed by a qualified archaeologist to provide information with which to evaluate the NRHP eligibility of the site(s) and define the subsurface boundaries of the site(s). If the site(s) are determined eligible by SHPO, the restoration plan shall either be revised to avoid disturbance to the site(s) or a data recovery plan shall be prepared and implemented.	The Corps of Engineers or its designated environmental monitor shall approve the qualifications of the archaeologists who performs the field survey. If the reconnaissance survey determines that a cultural resource site is located within the project boundaries the Corps SHPO and ACHP shall approve the proposed test program to determine the site's eligibility.	The archaeological field reconnaissance survey shall be performed following the project final design phase, before project construction. If the reconnaissance survey determines that a site or sites is within the project footprint and the site cannot be avoided, a test program shall be conducted prior to disturbance of the site(s).	Compliance with this measure will occur if no disturbance occurs to cultural resource sites or if an approved data recovery program is conducted at any eligible sites disturbed by the wetlands restoration.
Interference with recreational users from the presence of the dredge.	Provide access for recreational users around the dredge.	The boating access plan shall be approved by the Corps of Engineers, the Newport Bay Harbormaster, and the U.S. Coast Guard.	Recreational access stipulations shall be included in project contracts. The access plan shall be approved prior to the commencement of dredging.	Compliance with this measure will occur if access around the dredge is provided for recreational users.
Conflicts with recreational boaters from scow trips through Lower Newport Harbor.	Schedule scow trips through the lower portion of the bay to avoid peak use times during summer weekends. Peak use summer hours are defined as 9 am to 7 pm on summer weekends and holidays and during any scheduled boating events in the main channel of the Lower Bay.	The scheduling of scow trips through the lower bay shall be approved by the Corps of Engineers, the Orange County Sheriff-Coroner/ Harbor Patrol, and the U.S. Coast Guard.	Scheduling stipulations shall be included in project contracts. The scow trip schedule shall be approved prior to the commencement of dredging.	Compliance with this mitigation measure will occur if scow trips through the lower bay avoid times of peak recreational boater use.
Glare from night lighting during construction.	Lights shall be focused downward and shielded from the surrounding environment.	None	Lighting stipulations shall be included in project contracts.	Compliance with this measure shall occur if nightlighting is shielded and directed to avoid disturbing the surrounding area.

SECTION 1.0 - INTRODUCTION

1.1 PROPOSED ACTION

This joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses the benefits and potential environmental impacts of a habitat restoration plan for Upper Newport Bay. Because sedimentation is the biggest existing and future problem responsible for habitat degradation within Newport Bay, the habitat restoration plan focuses on sediment management through the design of sedimentation basins within Upper Newport Bay. Other restoration measures that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

The U.S. Army Corps of Engineers, Los Angeles District (Corps) is the federal Lead Agency for this project and has prepared this EIS in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] 4321, as amended). The County of Orange is the state lead agency and has prepared this EIR in accordance with the California Environmental Quality Act (CEQA) of 1970 (Public Resources Code, Sections 21000-21177).

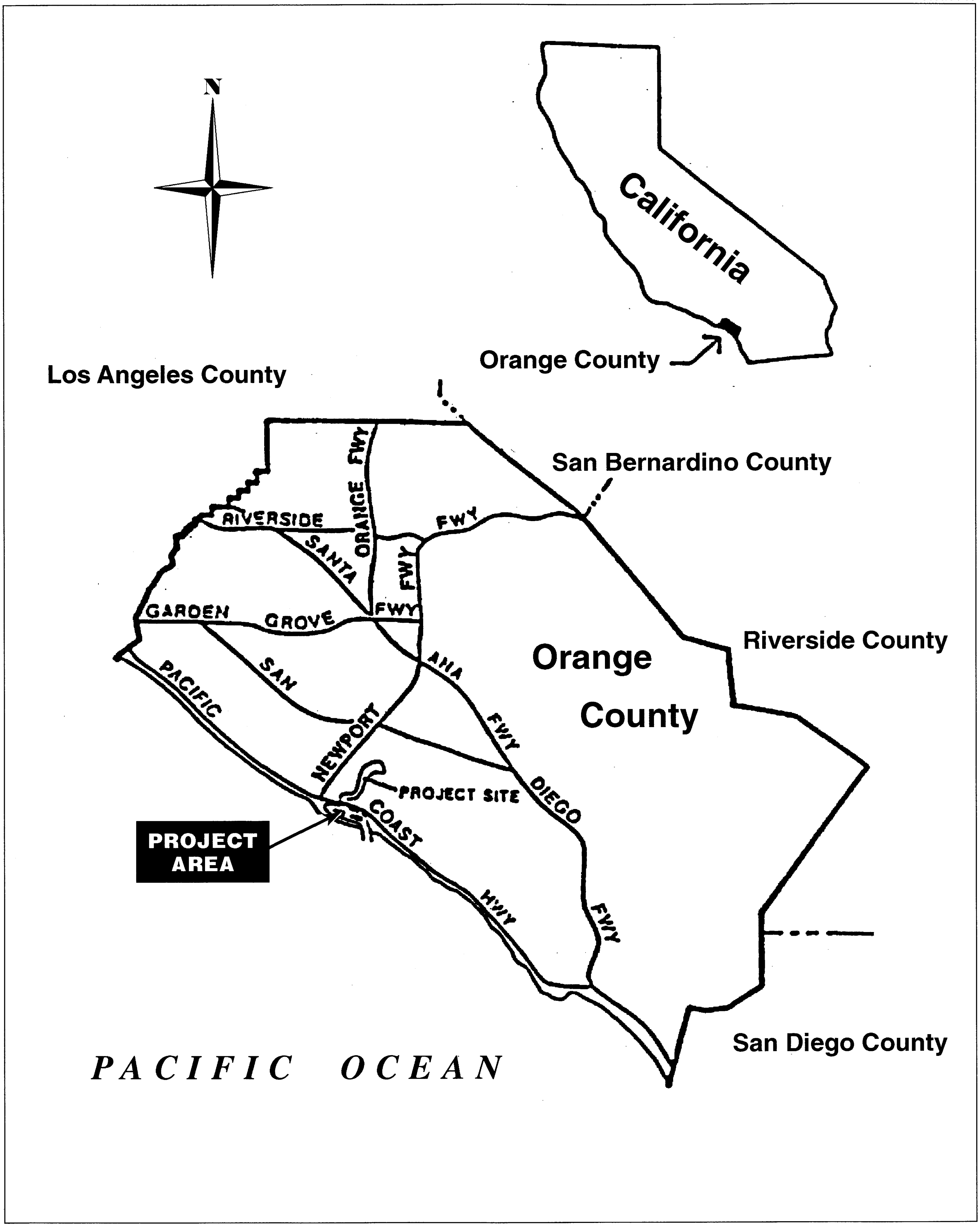
This EIR/EIS is an informational document to advise decisionmakers and the general public of the benefits and potential adverse impacts of the project as well as feasible alternatives. This document assesses short-term, long-term and cumulative impacts and benefits of the project. This EIR/EIS is also intended to provide information to all agencies whose discretionary approvals must be obtained for project actions.

1.2 LOCATION

Newport Bay is located along the coast of Orange County, California approximately 40 miles (64 kilometers [km]) south of Los Angeles and 75 miles (120 km) north of San Diego (Figure 1.2-1). The Bay is divided into the Lower and Upper Bay at the Pacific Coast Highway (PCH) Bridge (Figure 1.2-2). The 750-acre Lower Bay is a small boat harbor surrounded by residential development. The 1,000-acre Upper Bay is characterized by a diverse mix of development in its lower reach and an undeveloped ecological reserve in its upper reach. The 752-acre Upper Newport Bay Ecological Reserve, managed by the California Department of Fish and Game (CDFG), is one of the last remaining southern California coastal wetlands that continues to play a significant role in providing critical habitat for a variety of migratory waterfowl and shorebirds as well as several endangered species of animals and plants. For this reason, Upper Newport Bay is an ecological resource of national significance.

1.3 BACKGROUND

Natural habitats within Upper Newport Bay include marine open water, intertidal mudflats, cordgrass dominated low saltmarsh, pickleweed dominated mid saltmarsh, high saltmarsh, salt panne, riparian, freshwater marsh, and upland. Because of its diversity of habitats and its location on the Pacific flyway, Upper Newport Bay supports an impressive number and diversity of birds particularly during fall and winter when shorebirds and waterfowl arrive from their northern breeding grounds. Upper Newport Bay also supports several endangered bird species and an endangered plant. The subtidal and intertidal waters of Upper Newport Bay also provide important habitat for marine and estuarine fishes. Horn and Allen (1976) reported that Newport Bay fish diversity was the highest of the seven major southern California coastal embayments. In addition, Upper Newport Bay provides critical nursery habitat for commercially and recreationally important fish species such as California halibut.

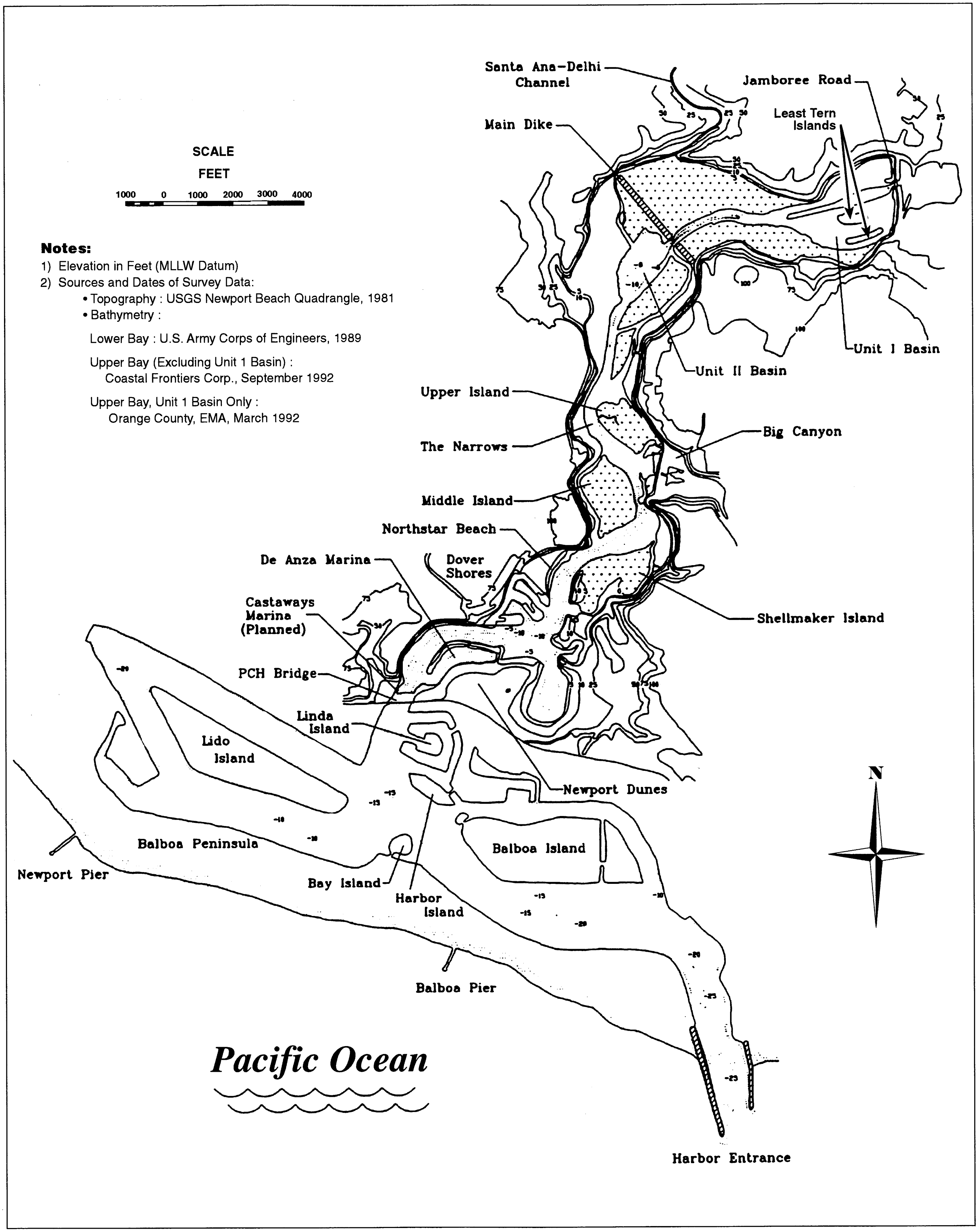


Chambers Group

SOURCE: CORPS 1998

NOT TO SCALE

PROJECT LOCATION
Figure 1.2-1



Source: Corps 1993

LOCATION OF PLACES IN NEWPORT BAY
Figure 1.2-2

The ecological diversity and functionality of Upper Newport Bay has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport Bay is San Diego Creek which drains approximately 85 percent of the 98,5000-acre watershed. Secondary sources include urban and industrial runoff from the Santa Ana – Delhi Channel, urban and residential runoff from Big Canyon Creek, and discharges from various storm drains. Based on the last 25 years of stream gauge records, the average annual sediment inflow from San Diego Creek to Newport Bay was estimated to be 178,000 cubic yards (cy) (135,280 cubic meters [cu m]). Of the sediment that flows into the Upper Bay, approximately 129,000 cy (98,040 cu m) remains within the Upper Bay. The rest is deposited in the Lower Bay or discharged to the ocean.

Sedimentation has been identified as the biggest problem within Newport Bay. Sediment from the San Diego Creek watershed has filled open water areas within Newport Bay. This sedimentation has decreased the extent of tidal inundation, diminished water quality, degraded habitat for threatened and endangered species as well as migratory water birds and estuarine and marine fishes, and resulted in navigation problems in the Upper Bay marinas and navigation channels. Sediment not trapped in the Upper Bay passes under the PCH bridge where it causes problems in the Lower Bay. If sediment deposition within Upper Newport Bay were allowed to continue, open water areas would evolve into mudflats and eventually marsh or upland habitat resulting in a loss of ecological diversity.

In response to the ongoing threat to Newport Bay from sediment deposition, a comprehensive study, "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan" (Boyle Engineering Corporation 1982) was sponsored by the cities of Irvine and Newport Beach, and the Southern California Association of Governments. This plan, known as the 208 Plan, called for a long-term sediment management strategy that would eventually shift sediment management from in-bay measures to upstream controls. In 1982, in response to the recommendations of the study, two sedimentation basins were constructed within the San Diego Creek channel upstream of its discharge into the Upper Bay and a 50-acre basin was constructed within the uppermost portion of the Bay. In the next six years, to further implement the recommendations of the "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan," two additional dredging projects were completed in Upper Newport Bay. In 1985, the Unit I sedimentation basin was constructed by enlarging the previously constructed in-bay sedimentation basin from 50 to 85 acres. A total of 890,000 cy (680,850 cu m) was dredged from the uppermost portion of the Bay to enlarge the basin by 35 acres and deepen it to -7 feet (ft.) (-2.1 meters [m]) Mean Sea Level (MSL). From 1987 to 1988, a second basin, the Unit II basin, was constructed within the Bay. The 14-ft. (4.2 m) deep Unit II basin is located just below the Main Dike at the southern end of the Unit I outlet channel. Side channels to the basin were created to support environmental enhancement. In addition, a 100-ft.-wide dredge access channel was constructed from the Lower Bay to the Unit II Basin. The dredged quantity for the project was 1,200,000 cy (918,000 cu m) of sediment. The location of the Unit I and Unit II basins are shown on Figure 1-2-2.

In 1995 and 1996, the County of Orange determined that the Unit I and Unit II basins were essentially full and that a severe storm event could jeopardize the safety and personal property of the residents living along the Lower Bay. As predicted, the winter storms of 1997 and 1998 deposited large volumes of sediment throughout the entire Bay, expanding mudflat areas and reducing open water areas in the ecological reserve. Shoaling occurred in navigation channels in the marinas in the lower portion of the Upper Bay. Vessels were running aground in this area, and in the federal channels below PCH Bridge. In response to the need to restore the capacity of the basins to trap sediment, in 1998 and 1999 the Orange County Public Facilities and Resources Department (OCPFRD) completed the Unit III dredging project. The Unit III project deepened a portion of the Unit I basin to -14 ft. (-4.2 m) MSL by removing 860,000 cy (657,900 cu m) of sediment. This dredging project also restored a channel for access to boat slips in the lower portion of the Upper Bay and a main channel for passage of the dredge and barge equipment from the PCH bridge to the Unit III basin.

1.4 PURPOSE AND NEED

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Sediments will continue to deposit in the Bay no matter what control measures are implemented in the watershed. Therefore, one of the most important components of this project is to implement a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediment will settle.

The 1997/98 Unit III dredging project was an interim measure to curb the loss of valuable open water habitat supporting a variety of sensitive species. Local funding for the project was very difficult to obtain. At present no funding or plan exists to maintain the Unit III basin in the future. Furthermore, the Unit II basin was not dredged as part of the Unit III dredging project, and is now in non-compliance with the Total Maximum Daily Load (TMDL) objectives of the Regional Water Quality Control Board (RWQCB). Pursuant to Section 303(d) of the Clean Water Act, the RWQCB has identified Upper Newport Bay and San Diego Creek as water quality limited because beneficial uses and water quality objectives are not being maintained. For the sediment TMDL (RWQCB 1998a), both the Unit III and Unit II basins are to be maintained to a minimum depth of -7 ft. (-2.1 m) MSL. Because existing depths in the Unit II basin are shallower than the required -7 ft. (-2.1 m) MSL depth, as specified in the sediment TMDL, this objective is not being met.

The Corps also dredged federal navigation channels in the Lower Bay below PCH Bridge for the first time in 1999. About 277,000 cy (211,905 cu m) of material were dredged and disposed of at the LA-3 offshore disposal site. The need for this dredging project clearly shows that more storm in-flows will deposit sediment further down the Bay if the trapping efficiency of the existing in-bay basins declines significantly.

A sediment management plan is needed to meet the primary ecosystem restoration study objectives:

- Restore, enhance, optimize, and maintain the ecological values for fish and wildlife, including sensitive communities in and around the Upper Newport Bay Ecological Reserve, to provide a diversity of use for resident and migratory species, and
- Restore, maintain, and manage a healthy and productive mix of habitat types including subtidal marine, intertidal mudflat, cordgrass dominated low salt marsh and pickleweed dominated mid-salt marsh.

Although the emphasis of the Upper Newport Bay Restoration Project is on developing a dredging program to remove sediment from Upper Bay waters, other restoration opportunities that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

1.5 STUDY AUTHORITY

Authorization of the Upper Newport Bay Restoration Project is based on Section 841 of the Water Resources Development Act of 1986 (WRDA 86), Public Law 99-662, which states:

> "Subject to Section 903(b) of this Act, the project for navigation for Newport Bay Harbor, Orange County, California, authorized by the River and Harbor Act approved August 26, 1937 (50 Stat. 849), and Section 2 of the River and Harbor Act approved March 2, 1945 (59 Stat.21), is modified to authorize the Secretary to dredge and maintain a 250-ft wide channel in the Upper Newport Bay to the boundary of the Upper Newport Bay Ecological Reserve to a depth of -15 ft Mean Lower Low Water (MLLW), and to deepen the channel in the existing project below the Pacific Coast Highway Bridge to a depth of -15 ft (MLLW), at a total cost of $3,500,000, with an estimated first Federal cost of $3,150,000 and an estimated first non-Federal cost of $350,000."

Section 903(b) of WRDA 86 states that a favorable report must be recommended by the Chief of Engineers and approved by the Secretary of the Army. To date, this has not been accomplished.

The Corps initiated a reconnaissance study in the early 1990's based on this authority. During this study it became clear that there were significant sedimentation problems in the ecological reserve, located north of the proposed channel extension. For this reason, the reconnaissance study alternatives focused on addressing problems and needs in the ecological reserve.

Corps policies for restoration of fish and wildlife habitat during the time of the reconnaissance study required a direct link between a Federal project and the degraded habitat that was identified for restoration. Since development within the San Diego Creek watershed resulted in the most evident changes in the UNB ecosystem, the Corps concluded that there was no substantial link between the Federal project in LNB and habitat degradation in UNB. Therefore, it was determined that there was no Federal interest at that time in pursuing a feasibility study for ecosystem restoration. Political lobbying and expanded ecosystem restoration authorities, allowing for restoration studies and projects without a direct link to an existing Federal project, permitted the Corps to initiate the feasibility study in 1997.

More recent Corps policy has also allowed for consideration of Corps participation in restoration projects that are not directly linked to existing Federal projects. The policy for Corps involvement in ecosystem restoration and protection through Civil Works programs and activities is provided in Engineering Regulation 1165-2-501, "Ecosystem Restoration in the Civil Works Program", dated 30 September 1999. Corps guidance is available on the Internet at the Corps website at the Policy and Planning tabs located at http://www.usace.army.mil/inet/functions/cw/.

Federal Government involvement in environmental quality, which includes ecosystem restoration, is supported in law, Executive Order, and treaty. General statements regarding ecosystem restoration and protection can be found in the following documents, and are used as authorization for the Corps to participate in this study:

- Fish and Wildlife Coordination Act of 1958, as amended
- Federal Water Project Recreation Act of 1965, as amended
- National Environmental Policy Act of 1969, as amended
- Coastal Zone Management Act of 1972, as amended
- Water Pollution Control Act of 1972, as amended
- Marine, Protection, Research and Sanctuaries Act of 1972, as amended
- Endangered Species Act of 1973, as amended
- Coastal Wetlands Planning, Protection and Restoration Act of 1990 (Title III of Public Law 101-646)
- Executive Order 11990, the Protection of Wetlands
- Executive Order 11991, the Protection and Enhancement of Environmental Quality
- Water Resource Development Acts of 1986, 1988, 1990, 1992, 1996 and 1999

The Federal objective of project planning is defined in the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies"(P&G), approved in March 1983. Guidance for conducting U.S. Army Corps of Engineers' (Corps) civil works planning studies is presented in revised Engineering Regulation 1105-2-100, "Planning Guidance Notebook", dated April 22, 2000.

1.6 STUDY PARTICIPANTS AND COORDINATION

The Corps and the OCPFRD are responsible for conducting and coordinating this restoration project. OCPFRD is the local sponsor of the study, but shares fiscal contributions to the project with the City of Newport Beach. Both OCPFRD and the City of Newport Beach have provided in-kind services including baseline surveys, bioassay testing, meeting coordination, and dissemination of information to interested parties. The RWQCB has also participated in the numerical modeling efforts, funding water quality aspects of the modeling.

To facilitate coordination among the resource agencies and special interest groups concerned about the Bay, the Upper Newport Bay Environmental Restoration Technical Advisory Group (TAG) was formed.

Several Meetings of this group have been held to provide a forum for the various agencies and groups with an interest in Upper Newport Bay to identify their concerns, goals, objectives, and potential restoration efforts for Upper Newport Bay. The resource agencies and special interest groups who participated in these meetings included the following:

Federal Agencies

U.S. Department of Interior, U.S. Fish and Wildlife Service
Environmental Protection Agency
U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service
U.S. Department of Commerce, NOAA, National Ocean Service
U.S. Department of Transportation, Coast Guard

State Agencies

California Coastal Commission (CCC)
CDFG
RWQCB

County of Orange Agencies

Public Facilities and Resources Department
Survey Division/Mapping Services and Applications
Parks and Recreation
Coastal Facilities
Flood Control
Sanitation District
Environmental Health

City of Newport Beach

Public Works
Utilities Department
Harbor Patrol
City Council
Attorney's Office
Executive Office

Local Committees/Groups

Newport Bay Water Quality Committee
Newport Bay Coordinating Council
Newport Bay/San Diego Creek Technical Advisory Committee
Dover Shores Homeowners
De Anza Bayside Marina
Newport Dunes Marina
Friends of Newport Bay
The Irvine Company
Newport Chapter of Surfriders
Defend the Bay
UNB Naturalists
Irvine Ranch Water District
Coastal Conservancy
Newport Harbor Boy Scout Sea Base
Stop Polluting Our Newport
Harbor Quality Committee
San Joaquin Freshwater Marsh Reserve

Universities

University of California, Irvine
Orange Coast College

To evaluate the benefits and constraints of habitat restoration a Habitat Evaluation Group (HEG) subcommittee of the TAG was formed. The HEG consists of members of CDFG, the Corps, OCPFRD, the City of Newport Beach, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the RWQCB.

1.7 SCOPING PROCESS, AND PUBLIC INVOLVEMENT

The Corps has participated in many of the monthly Upper Newport Bay Coordinating Council Meetings and has coordinated closely with resource agency representatives through the Habitat Evaluation Procedures process, as described above.

A co-chaired public workshop was held in October 1998 to review the progress of the restoration plan, receive public input, identify concerns related to the Upper Newport Bay restoration project and discuss the CDFG's update of their management plan for the ecological reserve. Input obtained during the scoping process was incorporated into the preparation of the Draft EIS/EIR.

The Draft EIS/EIR is sent out for a 45-day public review period, during which time both written and verbal comments are solicited on the adequacy of the document. Comments received on the Draft EIS/EIR are addressed during the preparation of the Final EIS/EIR. The Final EIS/EIR is furnished to all who commented on the Draft EIS/EIR, and is made available to anyone who requests a copy during the public comment period. The final step for the federal EIS process is the preparation of a Record of Decision (ROD) and for the state EIR process certification of the EIR and adoption of a Mitigation Monitoring and Reporting Plan. The ROD is a concise summary of the decisions made by the lead agencies from among the alternatives analyzed in the EIS/EIR. A certification of the EIR indicates that the environmental document adequately assesses the environmental impacts of the proposed project according to CEQA.

1.8 COMPLIANCE APPLICABLE REGULATORY STATUTES AND PERMIT REQUIREMENTS

This EIS/EIR is a joint document designed to satisfy both federal and state environmental requirements. The Corps is the federal lead agency under NEPA and the County of Orange is the state lead agency under CEQA. The relationship of the project to environmental requirements (federal, state, and local) applicable to the study area is presented below. Additional regulations specific to each resource category are presented in Section 3.0.

1.8.1 National Environmental Policy Act of 1969

This act requires that environmental consequences and project alternatives be considered before a decision is made to implement a federal project. NEPA established requirements for preparation of an EIS for projects potentially having significant environmental impacts. This EIS/EIR has been prepared according to the Council on Environmental Quality regulations on implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508). All project alternatives presented in this EIS/EIR were developed in accordance with the goals specified in Section 101 of NEPA.

1.8.2 California Environmental Quality Act and Implementing Guidelines

This act requires that environmental consequences and project alternatives be considered before a decision is made to implement a project requiring state or local governmental approval, financing, or participation in the State of California. An EIR is prepared if a Lead Agency determines that the project may have a significant impact on the environment. The substantive provisions of this act requires agencies to avoid or mitigate adverse impacts that the proposed project would have on the environment unless there are overriding considerations. Clear authority is given under both NEPA and CEQA for preparation of joint documents when both federal and state jurisdictions are involved. This EIS/EIR has been prepared to meet these requirements.

1.8.3 California Coastal Act of 1976

This act established the state's goals for planning and managing its coastal resources, and created and empowered the CCC to be responsible for decisions affecting the coastal zone. The CCC is responsible for the review and approval of any proposed land use plans, implementing ordinances such as zoning and other implementing actions, and review of any licenses or permits issued by a federal agency in connection with a project to determine consistency with the California Coastal Management Program pursuant to the federal Coastal Zone Management Act (16 USC 1456).

Sections 30230 and 30231 of the California Coastal Act provides for the protection, maintenance, and enhancement of marine resources and coastal waters. This project provides for such enhancement. In addition, the California Coastal Act recognizes navigational channels in harbors and ports as essential elements of coastal resources and related economic development. Under Section 30233 of the act, water areas may be dredged for the safety and accommodation of commerce and vessels to be served by port and harbor facilities. Allowed construction activities include deepening, widening, lengthening, and maintenance of channel approaches and entrances. The project complies with these requirements.

The Corps is also required to conduct and prepare a Coastal Consistency Determination (CCD) to determine the consistency of the proposed dredge and disposal activities with the California Coastal Act of 1976. This CCD is included as Appendix F of this EIS/EIR.

1.8.4 Coastal Zone Management Act of 1972

The Coastal Zone Management Act (CZMA) requires that federal agencies taking actions that could affect coastal resources show how their activities will be consistent, to the maximum extent practicable, with the provisions of the CZMA. In California, the California Coastal Act authorizes the California Coastal Commission to implement the CZMA.

The implementing regulations for the CZMA are described in the Code of Federal Regulations (15 CFR 930). The policies pertinent to coastal consistency determinations in California are included in the California Public Resources Code (Cal. Pub. Res. Code Sections 30200 - 30265.5).

These regulations require that consistency determinations be prepared for all federal projects that could affect the coastal zone. Because the permit application area is within the coastal zone, the Corps' issuance of a Section 404 permit would allow activities that would affect the coastal zone.

1.8.5 Clean Water Act of 1972

The Clean Water Act (CWA) was established to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environment. Section 401 of the CWA addresses dredging activities, and requires that state water quality standards must be met, and that dredging and disposal activities must not cause concentrations of chemicals in the water column to exceed state standards.

Section 404(b)(1) guidelines require that dredging and disposal activities should have no unacceptable adverse impacts on the ecosystem of concern. The Corps requires a permit for the disposal of dredge and fill material into the waters of the United States as per the Section 404(b)(1) guidelines (40 CFR Part 230). An application has been prepared including an evaluation of the affected resources and is included as Appendix G.

1.8.6 Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable waters of the United States. Navigable waters are defined in 33 CFR Part 329 as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A Section 10 permit would be required for the proposed action because navigable waters are present in the Bay. The Corps processes Section 10 permits simultaneously with Section 404 permits because they have similar requirements.

1.8.7 Clean Air Act of 1969

The Clean Air Act (CAA) is intended to protect the nation's air quality by regulating emissions of air pollutants. The CAA is applicable to permits and planning procedures related to dredged material disposal onshore and nearshore and in open waters 3 miles seaward of the nearest shoreline. Section 118 of the CAA (42 U.S.C. 7418) requires that all federal agencies engaged in activities that may result in the discharge of air pollutants comply with state and local air pollution control requirements. In addition, Section 176 of the CAA (42 U.S.C. 7506) prohibits federal agencies from engaging in any activity that does not conform to an approved State Implementation Plan. A Clean Air Act Conformity analysis will be prepared for this project.

1.9 MODELS USED IN EIS/EIR ANALYSIS

Several models were used to provide predictions of future conditions under alternatives analyzed in this EIS/EIR. Resource Management Associates, Inc. (RMA) prepared a suite of numerical models to evaluate conditions in the Bay under future without project conditions and for project alternatives. The RMA study included bay hydrodynamic, sediment transport, and water quality models. To evaluate changes in habitat function under future conditions, habitat quality models were developed for indicator species using a modified Habitat Evaluation Procedure (HEP).

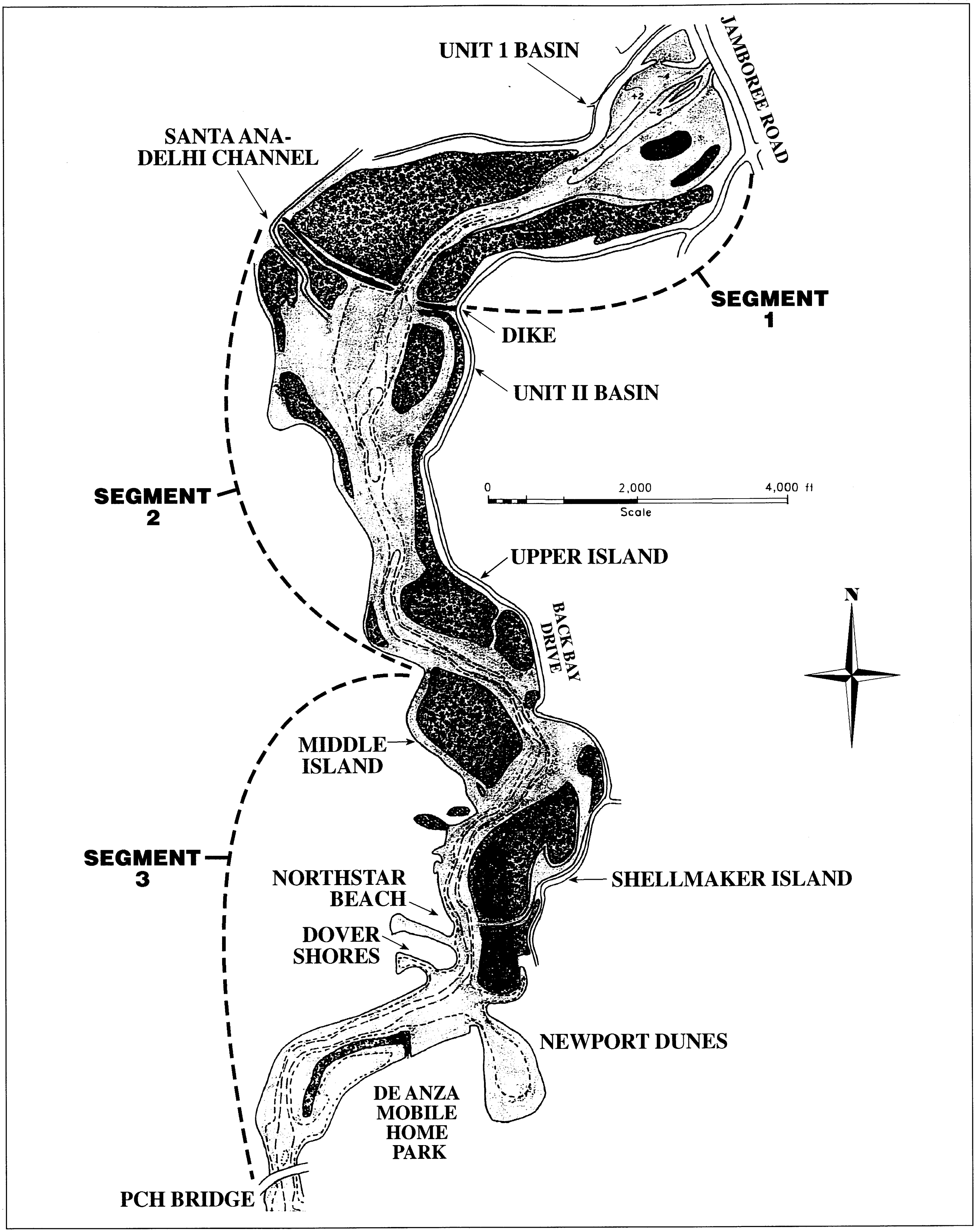
To predict changes in the distribution and area of the various types of habitat in Upper Newport Bay, the OCPFRD Geographic Information System (GIS) was used. Using the GIS, recent habitat mapping, based on both 1997 infrared aerial photographs and 1997 field surveys, was correlated with recent topographic and bathymetric contours to define the relationship between elevation and habitat type in the Bay.

The projected bathymetry for the 50-year future condition of Upper Newport Bay was based on numerical modeling of hydrological and sedimentation processes. The models used 25 years of historic stream gage records for San Diego Creek to simulate future sediment yields. The 25-year record was repeated to form 50 years of records of sediment loading to the Bay. The flow record was used to create representative storm flow hydrographs for the wet weather analyses. For each year, a representative peak storm event was simulated to introduce sediment into the system. The net deposition from that simulation was scaled to represent the total sediment load for the year. A two-month dry weather simulation was performed to allow resuspension and redistribution of sediments. The net deposition from this period then was scaled to represent nine months of dry weather.

The models predicted the distribution of sediment in areas where sedimentation would have the greatest impact, the main channels and basins and adjacent mudflat and low-marsh intertidal elevations, up to approximately +2 ft. (+0.6 m) MSL. The sediment transport model redistributes sediments added to the Upper Bay based on flow and shear conditions simulated by the hydrodynamic model. Initial sedimentation, redistribution, and deposition of newly added and resuspended sediment results in altered elevations from sediments accumulated over the 50-year period. Based on the correlation between elevation and habitat type, the GIS was used to calculate the changes in acreage of habitats in the Upper Bay due to sediment input during the next 50 years. The model of sedimentation was also used for the project alternatives to predict when maintenance dredging would be needed.

Sedimentation can affect both the quality and quantity of habitats for aquatic and wetlands species. To predict future changes in habitat values a modified HEP was used. Details of the HEP are presented in Appendix A of this EIS/EIR. A suite of indicator species was selected for each of the major water-dependent habitat types: marine open water, intertidal mudflat, low saltmarsh, mid saltmarsh, and high saltmarsh. For each of the indicator species, the variables considered most important in defining habitat quality within Upper Newport Bay were defined. These variables were then combined in simple models to produce a Habitat Quality Index (HQI) between 0 and 1 for the species for each habitat. For some habitats for some species, HQI was defined simply as the importance of that habitat to the species. Using the numerical models, the value of the model variables was predicted under existing, future without project and project alternative conditions. HQI was then calculated for each indicator species for each habitat and multiplied by the number of acres of each habitat predicted by the model to derive total Habitat Units (HU). The loss in HU under the 50 year No Project Alternative was calculated to determine the loss of habitat function if sediment were allowed to continue depositing within the Upper Bay. The total HU for each project alternative then was compared to the HU for the 50 year No Project conditions to compare the benefits of each project alternative. Because conditions vary within the Upper Bay, for the HEP analysis the Upper Bay was divided into three segments. Segment 1 extends from Jamboree Road Bridge to the main salt dike, Segment 2 extends from the dike to the upper end of Middle Island, and Segment 3 stretches from Middle Island to PCH Bridge (Figure 1.9-1).

The more northerly of the two islands labeled "Tern Islands" is used for nesting by black skimmers not least terns and is referred to by CDFG as "Skimmer Island." The "main dike" is also sometimes called the salt dike.



Chambers Group

SEGMENTS OF UPPER NEWPORT BAY USED FOR ANALYSIS
Figure 1.9-1

SECTION 2.0 - PROPOSED ACTION ALTERNATIVES

2.1 INTRODUCTION

This section discusses the development of alternatives for the Upper Newport Bay Restoration Project. The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. The sediment control measures are designed to increase the habitat value of the project future condition by increasing the efficiency with which sedimentation is managed, thereby decreasing the negative environmental effects of sedimentation. Although the emphasis of the Restoration Project is on developing a dredging program to remove sediment from Upper Bay waters, other restoration opportunities that will improve the quality of habitats in the Upper Bay are also addressed in this study. These biological restoration measures could be implemented with any of the sediment control alternatives.

2.2 PLAN FORMULATION AND EVALUATION PROCESS

2.2.1 Project Objectives and Constraints

During several meetings, the Upper Newport Bay Environmental Restoration Technical Advisory Group (TAG) developed goals and objectives for the Restoration Project. The goal is:

> "To restore, enhance, maximize and maintain the overall intrinsic ecological values provided in the Upper Newport Bay coastal estuarine system for fish and wildlife including sensitive communities, to provide a diversity of use (i.e., fisheries, waterfowl, shorebirds, fish-eating birds, mammals, recreation, education, research etc.) and to promote a public awareness and appreciation of the unique habitat offered in this system now and in the future."

As a collaborative effort by the TAG participants, the following restoration objectives were developed:

"Primary

- Restore, enhance, maintain and manage a mix of native habitat types, which shall include pickleweed dominated flats, cordgrass dominated intertidal zone, unvegetated intertidal mudflat, and subtidal seawater volume with low residence times.
- Provide nesting habitat for migratory shorebirds and seabirds.
- Provide overwintering habitat for migratory shorebirds, seabirds, waterfowl and raptors.
- Improve the fisheries resource by increasing nurseries, forage, and spawning grounds.
- Protect and enhance habitat for a variety of water associated wildlife, including endangered, threatened and rare species.
- Control, reduce and manage sediment processes in the Upper Bay.

Secondary

- Maintain existing navigation opportunities in the lower portions of Upper Newport Bay and the Federal channels in Lower Newport Bay.
- Provide and allow public use and recreational opportunities compatible with major objectives, including passive and non-intrusive activities focused on peripheral areas, interpretive foci, and trails.
- Provide unique scientific and education use opportunities to study the restoration of the wetland community."

The following constraints were placed on the Restoration Project.

- Disturbance of threatened or endangered species should be minimized.
- Sediment control measures should be confined to the Bay. Study efforts for this project will not formulate alternative measures to lessen the delivery of sediment from the San Diego Creek watershed. Other studies are being undertaken to investigate the watershed and will include a review of sediment control measures within the watershed.
- Restoration measures will not be pursued that advance one habitat at the cost of another. No substantial change from the relative distribution of habitats following the Unit III dredging project should occur. No net loss of saltmarsh should occur.

During the course of the Feasibility Study, project objectives and constraints evolved somewhat. The primary ecosystem restoration study objectives are:

- Restore, enhance, optimize and maintain the ecological values for fish and wildlife, including sensitive communities in and around the Upper Newport Bay Ecological Reserve, to provide a diversity of use for resident and migratory species." and,

- Restore, maintain and manage a healthy and productive mix of habitat types including subtidal marine, intertidal mudflat, cordgrass dominated low salt marsh and pickleweed dominated mid-salt marsh."

Constraints have been identified through the study process, particularly during meetings with resource agency representatives. At times, the constraints have provided formidable obstacles to attaining some of the study objectives. The most difficult consideration is how to increase the trapping efficiency of one or more sediment basins, or better maintain sediment deposition, thereby minimizing the adverse impacts related to more widespread sedimentation without significantly altering the total balance of existing habitat types. Study objectives have been refined to allow for the full consideration of the constraints placed upon the study by resource agency representatives. The resource agency constraints are as follows:

- Avoid any net loss in salt marsh habitat in the ecological reserve.

Complying with this constraint means that the sediment basin(s) must remain in the same areas that were already used for the construction of the two existing basins. Sediment control alternative measures locate the basins in these general areas. Depths and general dimensions of the basins vary for the alternatives.

- Limit future changes to all habitat types in the ecological reserve.

In addition to no net loss in salt marsh, resource agencies wanted to see less than a 10 percent change in any habitat type. The 10 percent change constraint does not allow for enough flexibility in the preparation of alternative measures and has therefore been modified to be more realistic and attainable. This constraint affects the design of sediment control measures and timeframes for triggering maintenance activities. The percent change in habitat types will be addressed for each alternative.

- Prevent the advance one habitat or species at the cost of another, unless supported by the ecological habitat analyses (HEP).

This constraint ensures that an ecosystem restoration approach is truly followed, instead of any favoritism to certain fish or bird species, and has been a key factor in the development of the modified HEP analysis.

- Minimize and/or avoid disturbance to general wildlife species, especially Federally listed threatened and/or endangered species.

Monitoring studies of sensitive nesting areas within the reserve were performed during the Unit III dredging project. No significant disturbance was identified. The Unit III lessons learned has been applied to the design and construction considerations for each alternative, and is fully addressed in the engineering appendix and the EIS/R.

Consideration of these constraints led to the preparation of the following objectives :

➢ Manage sediment deposition within the Bay to sustain the existing balance of estuarine habitats.

This objective is addressed by the investigation of different designs for sediment basins, and is similar to the objective to limit future changes to habitat types. Basins will be analyzed in order to increase trapping efficiency, allowing for more controlled and localized sediment deposition, lessening adverse impacts to the bay.

➢ Develop a sediment maintenance plan that initiates dredging activities before there is any loss in open water areas within the ecological reserve.

➢ Reduce the frequency of shoaling in navigation channels by improving the design of sediment basins and/or developing a better sediment maintenance plan.

These two objectives and the previous objective are similar in their goal to trigger dredging maintenance activities before there are changes to habitat types and before vessels are running aground due to extensive shoaling. More specifically, there are concerns about open water transitioning to mudflat in the future. This leads to the following specific constraint.

➢ Ensure sediment deposition does not extend above -3 feet Mean Sea Level (MSL) before dredging maintenance activities begin.

This elevation is where open water transitions to mudflat. Extensive open water areas of the Upper Bay filled in over the last dozen years transitioning to mudflat or marsh before maintenance dredging began as part of the Unit III project.

➢ Implement sediment control measures in Upper Newport Bay such that the basins need not be dredged more frequently that about once every 10 years, with the long-term goal of reducing the frequency of dredging to once every 20 to 30 years.

This objective is important to address in the formulation and evaluation of alternative measures, but is not taken verbatim as an objective of this study, allowing for the analyses of alternatives to consider the benefits and detriments of designs that may require more frequent maintenance than once every 10 years. The Sponsor is also interested in extending the average maintenance frequency beyond existing levels.

➢ Maintain ability for the Department of Fish and Game personnel to access least tern habitat areas for vegetation clearing.

Currently, access to the least tern islands by boat is only available at the highest of tides. This is the only effective way for Fish and Game staff to access the habitat areas to clear vegetation. Alternative measures will include consideration of the need for the managers of the reserve to have easy access to these areas.

➢ Remove natural and man-made features within and around the ecological reserve that provide little or no value to the estuarine environment.

This objective includes the removal of dredge spoil from Shellmaker Island, Northstar Beach, and the bullnose piece of land in the northwestern portion of the Unit III basin. Man-made features include the potential removal of the remnant berms (dikes) from the marsh areas in the old salt works of Segment 1, but resource agencies may prefer that this measure be addressed in the updated ecological reserve management plan. The removal or segmenting of the eastern portion of the main dike, which is favored by the resource agencies, will also be addressed by this objective. The mouth of Big Canyon is also an area that may be investigated for restoration, in concert with Fish and Game's updated management plan. There is an old parking lot that was damaged in storms that may be removed. There is also the possibility of the removal of some freshwater plant species in the freshwater marsh at the mouth of the canyon. Participation in these measures will be based on the feedback from the Department of Fish and Game.

- Improve or restore estuarine habitats in areas within the Upper Bay identified by the resource agencies, considering locations in relation to sediment control measures.

The members of the habitat evaluation group (HEG) presented various options for potential restoration opportunities within different areas of the Upper Bay. Public views were also considered in the selection process. The Department of Fish and Game may pursue some proposed restoration measures in their update of the reserve management plan. Agency representatives raised concerns about some of the other restoration measures because of potential disturbance to existing marsh habitats and sensitive species. Examples of measures that are no longer under consideration include the construction of small, dendritic channels through marsh areas to increase tidal circulation through all Upper Bay islands and large marsh areas of Segment 1. Locations of proposed channels were identified using infrared aerial photos of the Upper Bay. Agency representatives were concerned about construction methods and disturbances, and these measures were dropped from further consideration. Measures that will be pursued include the removal or vegetation from tern islands, placing new sand on the tern islands, new tern islands, restoration of former dredge spoil areas on Shellmaker Island, Big Canyon mouth, Northstar Beach and the bullnose section of land in the northwest corner of the Unit III basin. A small channel through a portion of Shellmaker Island is also included as a pilot project for consideration of future similar restoration measures.

- Increase tidal circulation in stagnant water areas, including the channels around the least tern islands, New Island, Middle Island, and Shellmaker Island.

Stagnant water areas typically have low levels of dissolved oxygen and nuisance algae blooms. Alternative measures will investigate ways to increase the tidal circulation in these areas within the Bay to improve the water quality.

- Reduce potential human or predator access to sensitive, threatened, and endangered species sites.

Another benefit to the restoration of the channels around the islands in the previous objective is the isolation of sensitive species from land-based human or predator access. This measure was also going to be used to investigate the restoration of a small channel on the eastern edge of Upper Island, now a peninsula, to isolate sensitive species from Back Bay Drive access. Resource agencies do not want to disturb the Upper Island habitat, so this measure will not be pursued for this project. Segmenting or removing the eastern portion of the Main Dike will also eliminate relatively easy access to sensitive habitat areas by humans, dogs and cats.

- Improve public use and access, and educational and recreational opportunities including trails and interpretive displays.

When the construction of the interpretive center in the northwestern portion of the Upper Bay is completed by the fall of 2000, there will be the need to reconstruct some of the trail systems that have been damaged in the past. Stabilizing the eroding barrancas and restoring a trail on the western bluff of the Unit II basin area may be investigated during this study. There are also opportunities to provide information kiosks near the interpretive center and other heavily used areas in the Upper Bay including Back Bay Drive. The access issues related to slope failures along Back Bay Drive might also be addressed in this study. There is also interest in providing an interpretive center display of some of the study results, including the numerical modeling.

2.2.2 Development of Alternatives

During several brainstorming sessions, the Habitat Evaluation Group (HEG) identified potential sediment management measures and biological restoration features. These potential measures are shown in Table 2.2-1. For the purposes of developing a sediment control plan, the Upper Bay was divided into three segments – Upper (from the Unit I/III basin to the dike, Middle (from the dike to Upper Island), and Lower (from Upper Island to the Pacific Coast Highway [PCH] Bridge). The potential measures were then combined into six preliminary sediment management alternatives and a variety of biological restoration elements. The sediment control alternatives focus on combinations of initial designs for the two existing sediment control basins. Through the screening process, two of the initial six sediment control alternatives were eliminated as described in Section 2.4. The remaining four sediment control alternatives are analyzed in detail in this document. The biological restoration measures can be added to any of the sediment control alternatives. Additional alternatives include different dredging and disposal methods that could be implemented with any of the sediment control alternatives.

2.2.3 Screening Criteria

A screening analysis was conducted to determine the practical, environmental, and regulatory feasibility of the alternative restoration concepts. The purpose of the screening was to eliminate alternatives that either did not meet the project purpose and need or that clearly are not feasible from a cost, technical, or environmental standpoint. An alternative was eliminated from further analysis if:

1. It did not meet the project purpose and need.
2. It was not feasible from a technical perspective.
3. It had clearly unacceptable environmental impacts.
4. It was not feasible from a cost perspective.

Furthermore, an alternative was eliminated if its elements were included in another alternative. Based on the screening, four sediment control alternatives were carried forward for detailed analysis. Each of the sediment control alternatives is analyzed with two alternative dredging methodologies: a large, conventional clamshell dredge and a small hydraulic dredge. As required by the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), the No Project alternative is also analyzed in detail. Only one disposal method, ocean disposal at the LA-3 dredged material disposal site, is considered because other disposal methods were eliminated based on one or more of the screening criteria (see Section 2.4). Finally, a variety of habitat restoration measures are addressed that could be implemented with any of the sediment control alternatives.

2.3 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

The alternatives carried forward for detailed analysis are described below. The alternative numbers are the same used for the alternative screening analysis. Therefore, the alternative numbers are not sequential. To help relate the bathymetry shown in the figures of the alternatives, Table 2.3-1 shows the elevation range assumed in the analysis for each type of habitat.

2.3.1 No Project

The No Project alternative assumes that the 1999 bathymetric conditions, including the recently completed Unit III basin and access channel, will occur in Year zero (Figure 2.3-1). The Unit II basin is smaller and shallower than its original condition following the 1988 Unit II dredging, because the Unit II basin was not dredged in 1998 and 1999. The mudflats surrounding the two least tern islands in the Unit III basin remain as mudflats and have not been restored to open water.

Table 2.2-1
Preliminary Restoration Concepts

Upper Newport Bay Ecosystem Restoration and Sediment Control Study Alternative Measures by Area					
1	**Upper (Unit I/III to dike)**	**2**	**Middle (Dike/Unit II Basin to Upper Island)**	**3**	**Lower (Upper Island to PCH Bridge)**
Maintenance/Sediment Control Measures of Previously Accepted Designs (i.e., Unit I,II, or III basins)					
a	Maintain current Unit III configuration (-14 mean sea level [MSL])	a	Maintain current Unit II basin configuration and depth	a	Maintain access/navigation channel from PCH bridge to the southern end of the Unit II basin for continued maintenance access of basins
b	Maintain Unit III configuration (-14 MSL) and dredge channel between least tern islands (-5 or -6 MSL)	b	Maintain/Dredge Unit II basin to original design depth (-14 MSL), limiting eastern extent to the border of New Island, with engineeringly stable and environmentally acceptable sideslopes around perimeter. Include dredging of Santa Ana-Delhi channel to -6 MSL, with a 50-foot (ft.) (15-meter [m]) bottom width and 2:1 sideslopes.	b	Maintain navigation channel(s) from PCH Bridge to the boat launch ramp, Newport Dunes, Dover Shores and De Anza Marina slips
c	Maintain as Unit I 1986 as-built configuration (-7 MSL)	c	Dredge side channel around New Island to -6 MSL, with a 50-ft. (15-m) bottom width and 2:1 sideslopes		
d	Maintain navigation channel between Unit I/III basin and Unit II basin to allow continued access by dredge and barge	d	Maintain navigation channel between Unit II basin and Upper Island to allow continued maintenance access by dredge and barge		
New Sediment Control Measures					
e	Design basin to maximize trapping efficiency within basin by deepening; and/or moving or removing least tern islands	e	Design Unit II basin to maximize trapping efficiency within basin		
Environmental Restoration Measures					
f	Improve nest sites for least terns by adding sand to the islands	f	Redesign outlet of Santa Ana-Delhi Channel into Upper Newport Bay, including reconstruction of levees	c	Dredge a side channel around the east side of Upper Island, with a 50-ft. (15-m) bottom width and 2:1 sideslopes
g	Construct small channels through marsh areas to increase foraging areas for birds, and improve circulation	g	Construct new least tern island(s) in the Unit II basin, adjacent to the western portion of the main dike	d	Dredge a side channel around the west side of Middle Island, with a 50-ft. (15-m) bottom width and 2:1 sideslopes

Table 2.2-1, Page 2 of 3

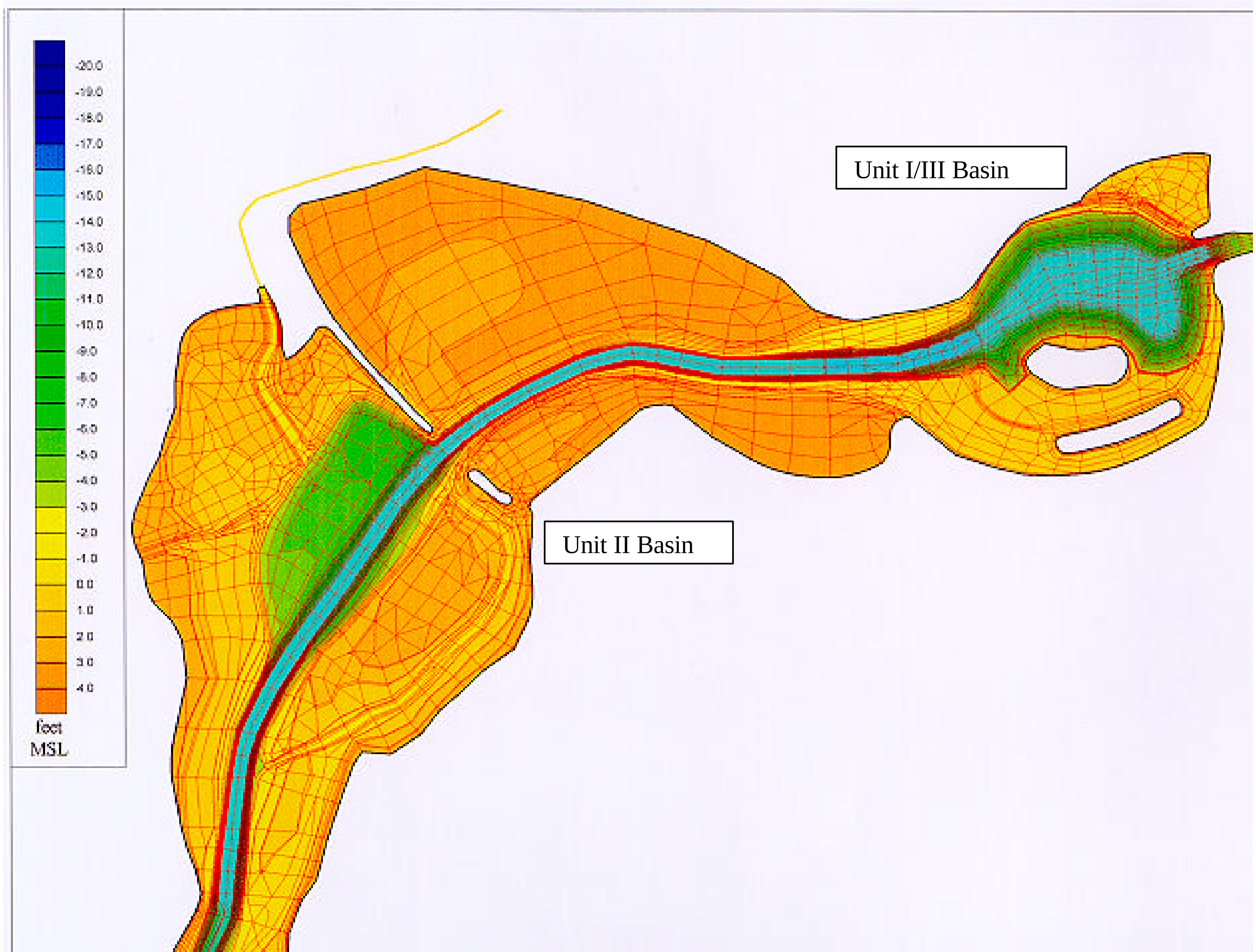
Upper Newport Bay Ecosystem Restoration and Sediment Control Study Alternative Measures by Area					
1	Upper (Unit I/III to dike)	2	Middle (Dike/Unit II Basin to Upper Island)	3	Lower (Upper Island to PCH Bridge)
h	Remove bullnose-section of land at the lower end of the northern side of the Unit I/III basin and restore to open water or mudflat/low marsh	h	Construct small channels through marsh areas to increase foraging areas for birds, and improve circulation	e	Restore side channel around the east side of Shellmaker Island, with a 50-ft. (15-m) bottom width and 2:1 sideslopes
i	Remove exotics/invasives and/or improve quality of marsh habitats	i	Remove dredge spoil to the west of the Unit II basin, in County or California Department of Fish and Game (CDFG) property and restore to low/mid marsh	f	Regrade/restore Northstar Beach area to re-create a historical wetland without adversely impacting rowing center
j	Create a floating island for least terns	j	Remove exotics/invasives and/or improve quality of marsh habitats	g	Construct small channels through marsh areas to increase foraging areas for birds, and improve circulation
k	Enhance upland/riparian areas along northwestern perimeter of Unit I/III basin	k	Create a floating island for least terns in the Unit II basin	h	Remove dredge spoils on upper-west side of Shellmaker Island, restoring 3.5 to 4 acres to intertidal mudflat or low marsh
				i	Remove exotics/invasives and/or improve quality of marsh habitats
				j	Remove/regrade dirt parking lot area to the south of the mouth of Big Canyon and restore to open water, mudflat, or low saltmarsh
				k	Remove fresh water cat tails in Big Canyon
				l	Restore eelgrass beds in lower portion of Upper Bay
Access Limiting Measures					
l	Construct site-specific perimeter barriers to decrease unwanted intrusions (fence or vegetation)	l	Remove both the eastern and western sections of the Main Dike	m	Construct site-specific perimeter barriers to decrease unwanted intrusions (fence or vegetation)
m	Remove sections of old dike works in marsh areas that still provide human and predatorial access	m	Segment the eastern and western sections of the dike to prohibit human and predatorial access; possibly include construction of a low-flow (dip crossing) access for maintenance equipment	n	Limit evening/nighttime access at parking lot by Big Canyon (used in day for educational programs)

Table 2.2-1, Page 3 of 3

Upper Newport Bay Ecosystem Restoration and Sediment Control Study Alternative Measures by Area					
1	**Upper (Unit I/III to dike)**	**2**	**Middle (Dike/Unit II Basin to Upper Island)**	**3**	**Lower (Upper Island to PCH Bridge)**
n	Ban vessels in this area	n	Construct site-specific perimeter barriers to decrease unwanted intrusions (fence or vegetation)	o	Ban vessels upstream of rowing center
		o	Ban vessels in this area	p	Relocate University of California, Irvine (UCI) Rowing Center
Trash Control Measures					
o	Construct a trash boom outside of the Bay for the San Diego Creek Channel	p	Construct a trash boom outside of the Bay for the Santa Ana-Delhi Channel		

Table 2.3-1
Elevation Ranges Assumed for Habitats
(to +10 MSL)

Habitat Type	Elevation Range (Feet MSL)	Elevation Range for Model/GIS (Feet MSL)
Open Water (marine)	<-4.3	<-4
Intertidal Mudflat	-4.3 to +1.5	-4 to +1
Low Saltmarsh	+1.5 to +3.0	+1 to +3
Middle Saltmarsh	+3.0 to +4.0	+3 to +4
High Saltmarsh	+4.0 to +5.0	+4 to +5



NO PROJECT ALTERNATIVE YEAR 0 Figure 2.3-1

With the No Project Alternative, no dredging would occur within the Upper Bay ecological reserve. The Basin Plan Total Maximum Daily Load (TMDL) for sediment in the Newport Bay/San Diego Creek watershed specifies that foothill and in-channel basins be maintained to have a 50 percent capacity at the beginning of any storm season (RWQCB 1998a). For the analysis of the No Project Alternative it is assumed that the amount of sediment delivered from the watershed to the Bay would not change in the future. For example, a 20-year storm would deliver the same volume of sediment under existing conditions and future conditions.

2.3.2 <u>Sediment Control Alternatives</u>

2.3.2.1 Alternative 1

Implementation of Alternative 1 would maintain the Unit III basin at its current depth and configuration but add channels around the tern islands, and restore the Unit II basin and side channel (Figure 2.3-2). The upper basin would be maintained in the Unit III configuration at a depth of -14 ft. (-4.2 m) MSL. The slopes surrounding the basin would be maintained at a ratio of 20 horizontal to 1 vertical (20:1). In addition, a small trapezoidal channel would be dredged between the tern islands. This new channel would have an approximate 50 ft. (15 m) width at the bottom and a depth of -5 ft. (-1.5 m) MSL. This channel configuration is similar to a previous channel design between the islands for the Unit I project in 1985. Two access channels would also be constructed to provide boat access for maintenance of the least tern islands. The access channels would be dredged along the southern tip of the islands and would be 20 ft. (6 m) wide at their bottoms with a depth of -6 ft. (-1.8 m) MSL and 3:1 side slopes.

The design of the channel between the Unit III basin and the Unit II basin would remain the same, with depths of -14 ft. (-4.2 m) MSL between the two basins.

The Unit II basin would be dredged to the original 1988 design depth and configuration of -14 ft. (-4.2 m) MSL with 5:1 side slopes. The eastern extent of the basin would be the existing border of New Island. An inlet from the Santa Ana-Delhi Channel would be dredged to the Unit II basin. This inlet channel would be -6 ft. (-1.8 m) MSL deep, 50 ft. (15 m) wide at the bottom, and would have 2:1 side slopes. The side channel around the eastern side of New Island would also be dredged to -5 ft. (-1.5 m) MSL and would have a 50 ft. (15 m) bottom width and 2:1 side slopes.

2.3.2.2 Alternative 4

Alternative 4 involves deepening the Unit III basin to -20 ft. (-6 m) MSL and expanding its footprint, removing one least tern island from the uppermost basin, expanding the Unit II basin to the south and west, and constructing a new tern island along the western portion of the dike (Figure 2.3-3).

The upper basin would be dredged to -20 ft. (-6 m) MSL. The more northerly tern island (the "kidney-shaped island") would be removed from the upper segment of the Bay and relocated to the middle segment. Approximately 100 ft. (30 m) of mudflats to a depth of -3 ft. (-0.9 m) MSL would be retained around the shoreline perimeter of the upper basin and the remaining least tern island. The mudflats at depths between -3 ft. (-0.9 m) MSL and -20 ft. (-6 m) MSL would be dredged on a 5:1 slope to construct the new basin.

A trapezoidal channel would be dredged between the southern "hot dog" shaped least tern island and the shore to restore tidal action. The channel would be dredged to -5 ft. (-1.5 m) MSL and would have a 20-ft. (6 m)-wide bottom and 3:1 side slopes. A channel to provide boat access for maintenance of the tern island would be constructed along the southern tip of the island. This access channel would have a depth of -6 ft. (-1.8 m) MSL , a 20 ft. (6 m) bottom width and 3:1 side slopes.

The channel between the upper basin and Unit II basin would be maintained to the -14 ft. (-4.2 m) MSL design depth and configuration of the recent Unit III project.

ALTERNATIVE 1

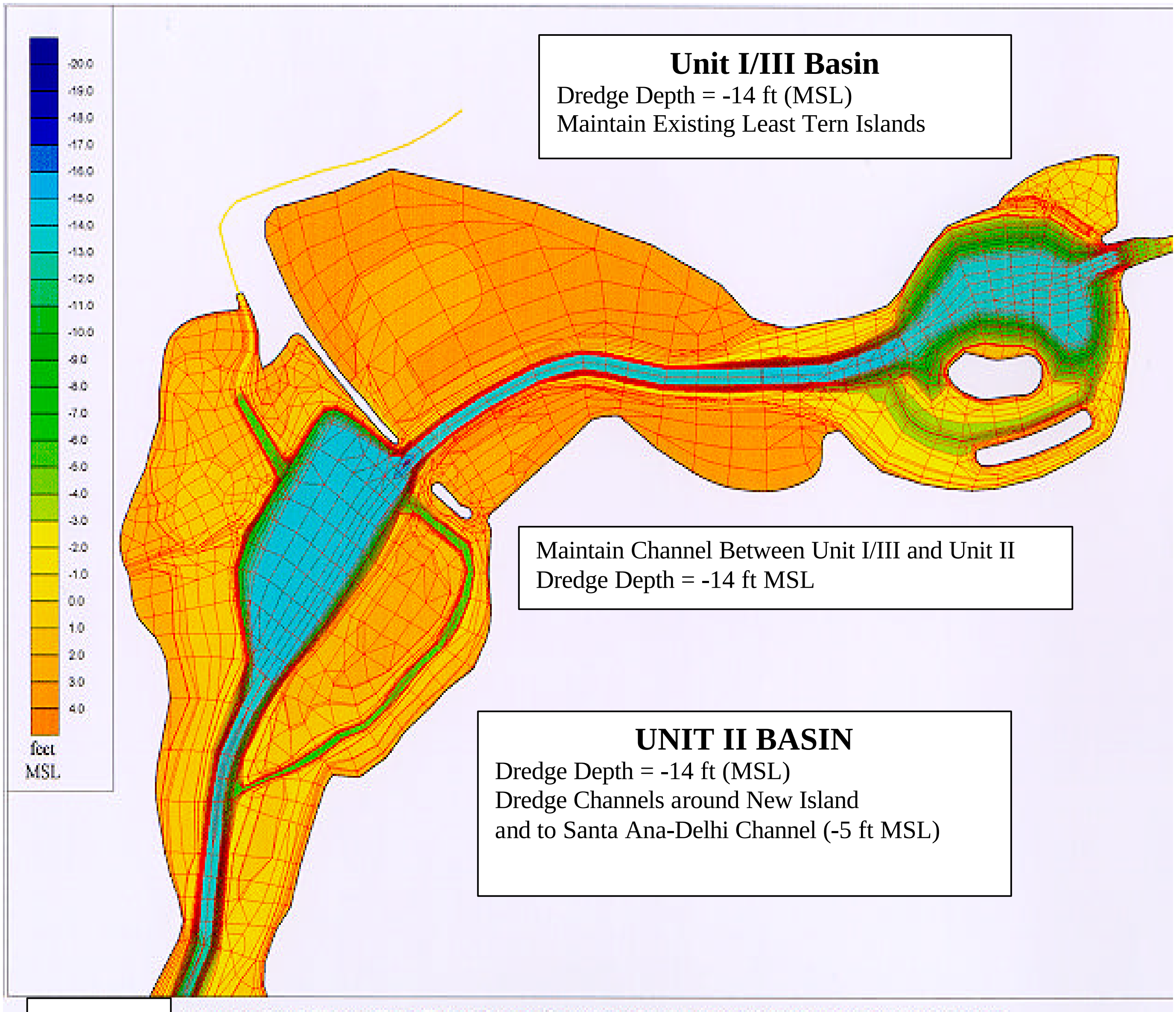


Figure 2.3-2 Alternative 1 Upper Bay finite element mesh and initial condition bathymetric contours.

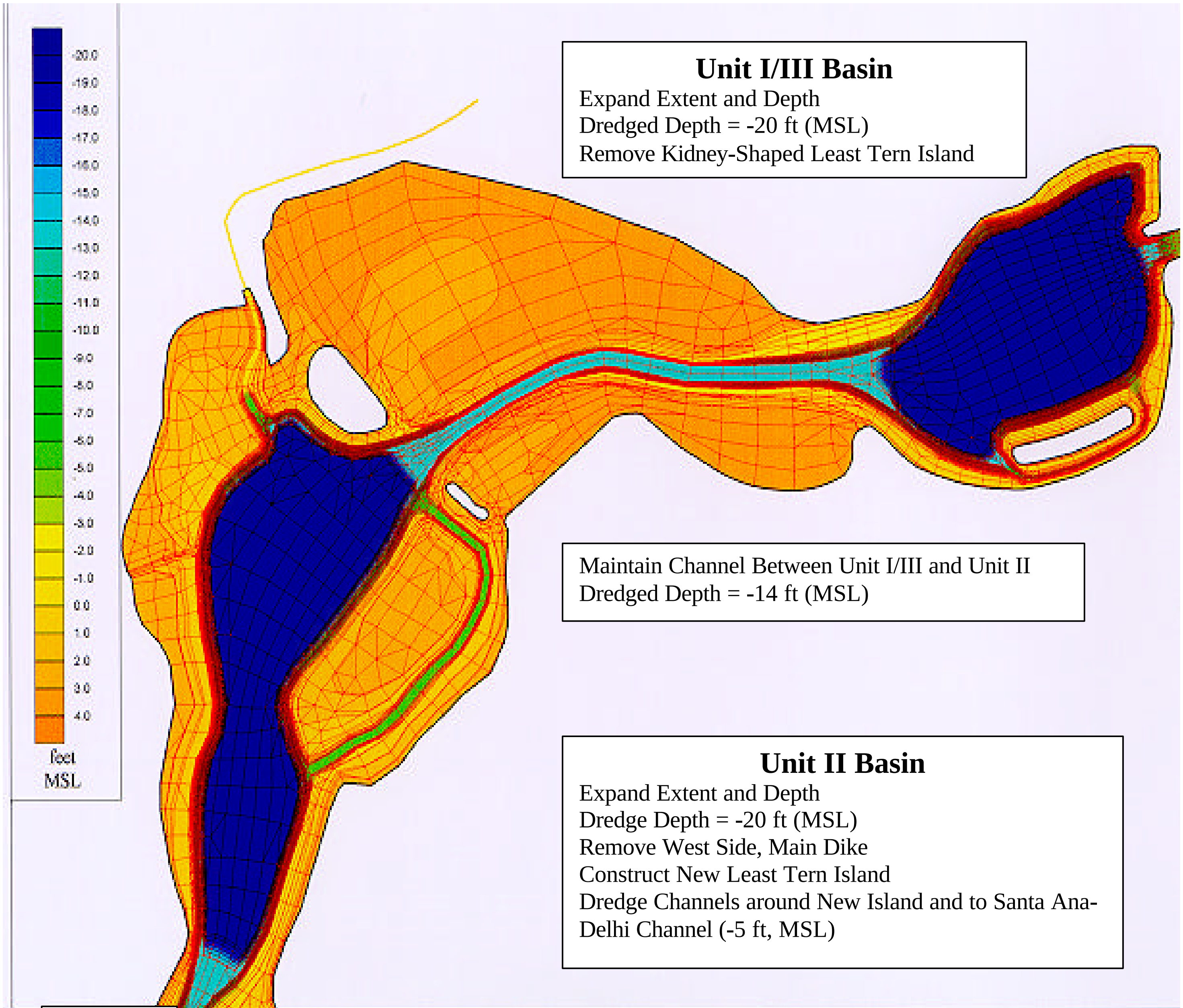


Figure 2.3-3. Alternative 4 Upper Bay finite element mesh and initial condition bathymetric contours.

The Unit II basin footprint would be deepened to -20 ft. (-6 m) MSL and expanded west and south to the 0 MSL contour line. The reconfigured Unit II basin would extend from the relocated tern island near the dike south to the Narrows, between the southern end of New Island and the northern end of Upper Island along the 0 MSL contour. Approximately 100 ft. (30 m) of mudflats would remain around the shoreline perimeter of the basin and New Island to a depth of -3 ft. (-0.9 m) MSL. The mudflats between -3 ft. (-0.9 m) MSL and -20 ft. (-6 m) MSL would be dredged on a 5:1 slope to construct the basin.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the island to provide boat access to maintain the new tern island. The access channel would have a 20-ft. (6 m) bottom width, -6 ft. (-1.8 m) MSL depth, and 3:1 side slopes.

A trapezoidal channel, with 50 ft. (15 m) bottom width, -5 ft. (-1.5 m) MSL depth and 2:1 side slopes, would be reconstructed along the eastern side of New Island. The Santa Ana-Delhi channel would be reconstructed to the same design dimensions.

2.3.2.3 Alternative 5

Alternative 5 would involve the removal of the northern "kidney shaped" island in the upper basin, expanding the footprint of the Unit III basin, and creating a new least tern island along the main dike in the middle segment of the Upper Bay (Figure 2.3-4). The Unit II basin would not be expanded.

With Alternative 5, the upper basin would be maintained at -14 ft. (-4.2 m) MSL. The "kidney shaped" tern island would be removed and relocated to the Unit II basin. Approximately 100 ft. (30 m) of mudflats to a depth of -3 ft. (0.9 m) MSL would be retained around the shoreline perimeter of the basin and the southern island. The mudflats between -3 ft. (-0.9 m) MSL and -14 ft. (-4.2 m) MSL would be dredged on a 5:1 slope to construct the new basin. A trapezoidal channel with 20 ft. (6 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes would be dredged between the southern least tern island and the shore to restore tidal action to the area. An access channel with 20 ft. (6 m) bottom width, -6 ft. (-1.8 m) MSL depth and 3:1 slopes would be constructed along the southern tip of the island.

The channel between the Upper Basin and the Unit II basin would be maintained at its current design of -14 ft. (-4.2 m) MSL depth.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the new island to provide boat access to maintain the island. The access channel would have a bottom width of 20 ft. (15 m), a depth of -6 ft. (-1.8 m) MSL and 3:1 side slopes.

2.3.2.4 Alternative 6

Alternative 6 would involve deepening and expanding the Unit III basin, removing the northern, "kidney shaped" tern island and creating a new least tern island at the main dike, and widening and deepening the Unit II basin (Figure 2.3-5).

Under Alternative 6, the mudflats in the northeast corner of the uppermost segment would be maintained. In addition, approximately 100 ft (30 m) of mudflats would be retained around the shoreline perimeter of the basin and the southern island to a depth of -3 ft. (-0.9 m) MSL. To create the new basin, the mudflats between -3 ft. (-0.9 m) MSL and -20 ft. (-6 m) MSL would be dredged to a depth of -20 ft. (-6 m) MSL with a 5:1 slope.

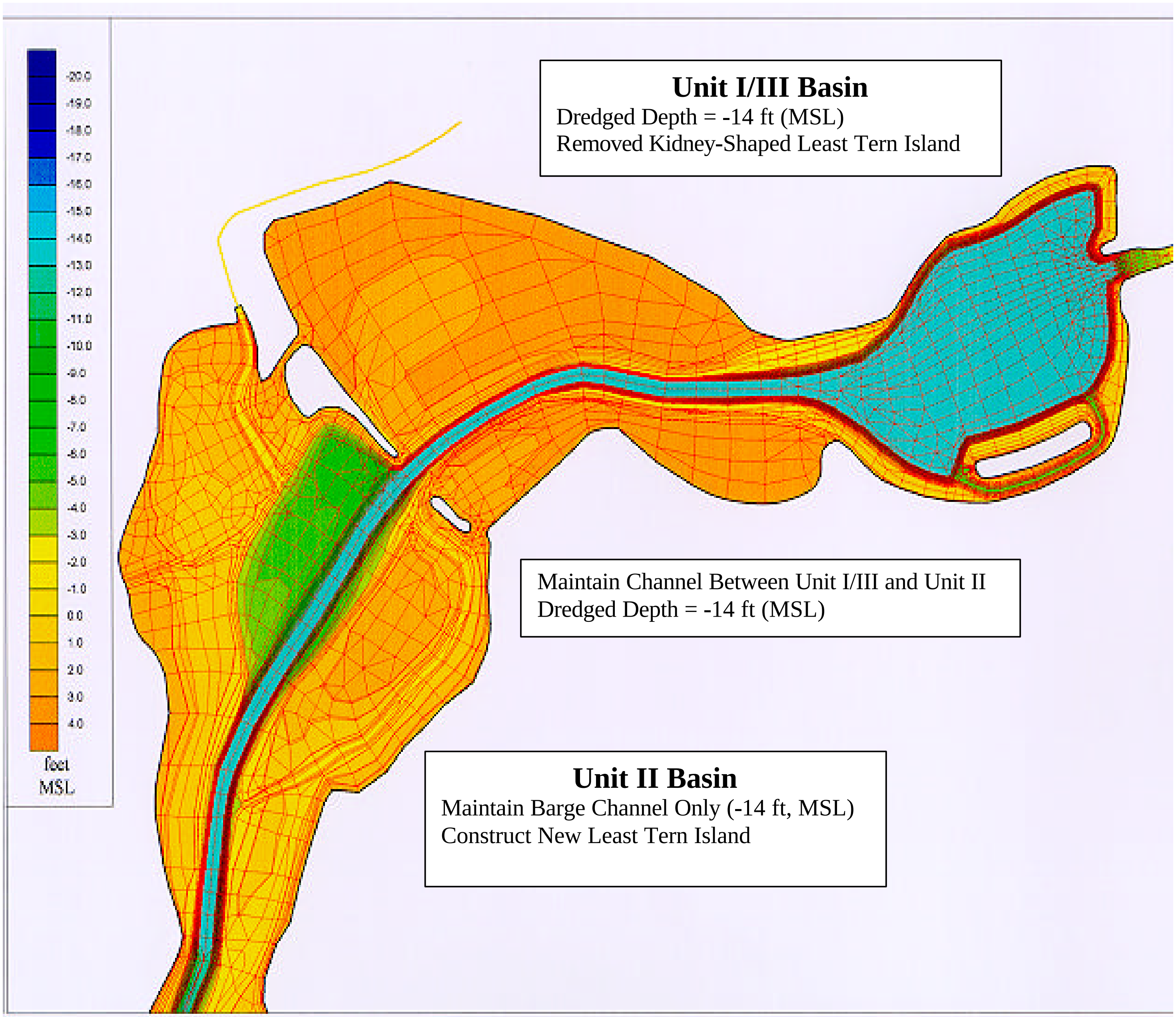


Figure 2.3-4: Alternative 5 Upper Bay finite element mesh and initial condition bathymetric contours

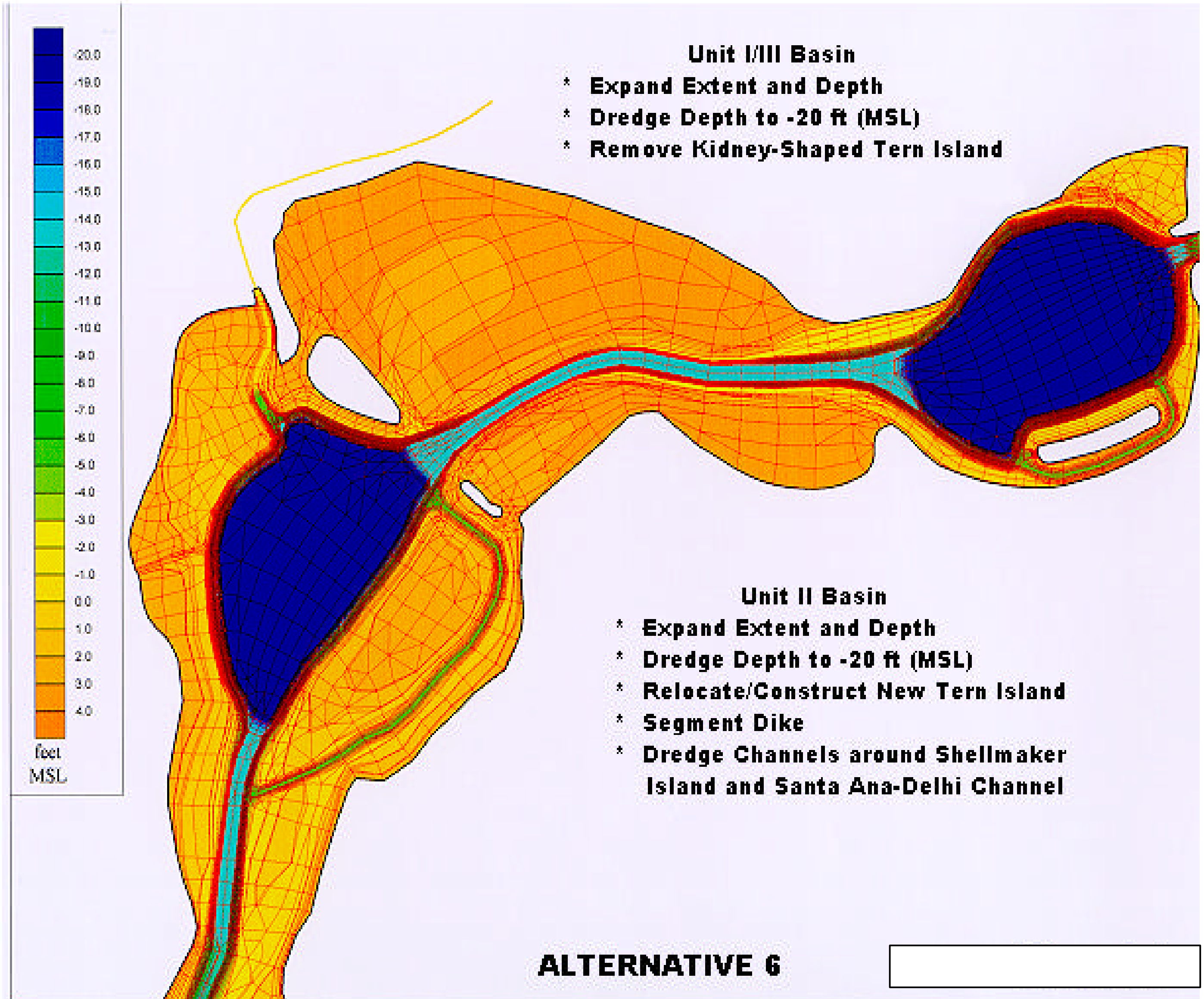


Figure 2.3-5: Alternative 6 Upper Bay finite element mesh and initial condition bathymetric contours

A trapezoidal channel with 20 ft. (6 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes would be dredged between the southern least tern island and the shore to restore tidal action to the area. An access channel with 20 ft. (6 m) bottom width, -6 ft. (-1.8 m) MSL depth and 3:1 slopes would be constructed along the southern tip of the island for maintenance of the tern island.

The channel between the Upper Basin and the Unit II basin would be maintained at its current design of -14 ft. (-4.2 m) MSL depth.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the new island to provide boat access to maintain the island. The access channel would have a bottom width of 20 ft. (6 m), a depth of -6 ft. (-1.8 m) MSL and 3:1 side slopes.

The Unit II basin footprint would be expanded west to the existing 0 MSL contour line from the relocated tern island to the southern end of New Island. The Unit II basin would be deepened to -20 ft. (-6 m) MSL with 5:1 slopes. Approximately 100 ft. (30 m) of mudflat to a depth of -3 ft. (-0.9 m) MSL would be retained around the shoreline perimeter of the basin and New Island.

A trapezoidal channel, with 50 ft. (15 m) bottom width, -5 ft. (-1.5 m) MSL depth and 2:1 side slopes, would be reconstructed along the eastern side of New Island. The Santa Ana-Delhi channel would be reconstructed to the same design dimensions.

2.3.2.5 Comparison of Sediment Control Alternatives

Table 2.3-2 highlights the key differences among the four sediment control alternatives. Alternative 1, which maintains the footprint and depth of the recently completed Unit III basin, has the smallest footprint for the uppermost basin. Alternative 1 is the only alternative that would not relocate the northern least tern island to the main dike. Alternatives 4 and 5 have the largest footprints for the uppermost basin. These alternatives would dredge all of the mudflats in the upper basin area with the exception of an approximately 100-ft. (30 m) band around the shore of the basin and the remaining least tern island. Although Alternatives 4 and 5 have the same upper basin footprint, they differ in basin depth. In Alternative 4, the uppermost basin would be deepened to -20 ft. (-6 m) MSL. In Alternative 5, the upper basin would be maintained at a depth of -14 ft. (-4.2 m) MSL. Alternative 6 would have a slightly smaller upper basin footprint than Alternatives 4 and 5. In Alternative 6, the mudflats in the northeast corner would be retained. Under Alternative 6, the upper basin would have a depth of -20 ft. (-6 m) MSL. All four alternatives would maintain the channel between the two basins at its current depth of -14 ft. (-4.2 m) MSL.

The four alternatives differ in the configuration of the Unit II basin. Alternative 1 restores the footprint and depth (-14 ft. MSL) of the Unit II basin created in the 1988 dredging project. Alternative 4 creates the largest footprint for the Unit II basin by expanding the 1988 footprint to the south and west. The basin in Alternative 4 would have a depth of -20 ft. (-6 m) MSL. Alternative 5 does not restore the Unit II basin at all but only maintains the current dredge/barge access channel through the basin. Alternative 6 expands the original Unit II basin footprint but not as extensively as Alternative 4. In Alternative 6, the footprint is expanded to the west but not to the south. In Alternative 6 the basin is deepened to -20 ft. (-6 m) MSL. Alternatives 4, 5 and 6 would relocate the northern tern island to the main dike.

2.3.3 Dredging Alternatives

2.3.3.1 Large Clamshell Dredge

Under the clamshell dredge alternative, dredging would be conducted from a floating barge by a crane equipped with a 5 cubic yards (cy) (3.8 cubic meters [cu m]) grab bucket or by a CAT 245 backhoe with a 5 cy (3.8 cu m) bucket. The grab bucket would be lowered to the bottom where its jaws are closed over a

Table 2.3-2
Key Differences Among Sediment Control Alternatives

Alternative	Uppermost Basin	Unit II Basin	Least Tern Islands
1	Unit III basin footprint and depth (-4 ft. MSL), creates channel between tern islands.	Original Unit II footprint (-14 ft. MSL), restores side channel around New Island.	unchanged
4	Expands basin footprint to include all but an approximately 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -20 ft. MSL, creates channel between hot dog island and shore.	Expands Unit II basin to south and west, deepens basin to -20 ft. MSL, restores side channel around New Island.	Relocates northern least tern island to main dike.
5	Expands basin footprint to include all but approximately a 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -14 ft. MSL, creates channel between hot dog island and shore.	No restoration or expansion of Unit II basin, only dredging in Unit II basin is -14 ft. MSL barge access channel through the basin and maintenance access channel to tern island.	Relocates northern least tern island to main dike.
6	Deepens basin to -20 ft. MSL, expands Unit III basin footprint but retains mudflats in northeast corner, creates channel between hot dog island and shore.	Expands Unit II basin to the west, deepens basin to -20 ft. MSL and restores side channel around New Island.	Relocates northern least tern island to main dike.

plug of sediment. The grab would be raised out of the water, and the sediment deposited into a disposal scow with 1,500 cy (1,147.5 cu m) capacity. The production rate is estimated to be about 3,000 cy (2,295 cu m) per day. For Alternative 6, which would dredge a deep basin footprint, the clamshell dredge would be more efficient because less time would be expended moving the dredge. For Alternative 6, the production rate is estimated to be 4,000 cy (3,060 cu m) per day. The clamshell dredging method was used successfully for the 1987 to 1988 Unit I/II project and the recent Unit III project. A small tugboat would transport and hold an empty disposal scow near the dredge as another scow is filled while secured alongside the dredge barge. The filled scow would be pushed by the tug to a barge marshalling area adjacent to the south end of Shellmaker Island or at another location near the PCH Bridge. The full scow would be exchanged for an empty one for return to the dredge site in the Upper Bay. The filled scow would be pushed by ocean-going tug out of Newport Harbor to the ocean disposal site at LA-3. The round trip travel time to and from the LA-3 ocean disposal site is 4 hours. Approximately 3 round trips to the disposal site would be made per day. Dredge operations would be conducted 24 hours per day, 6 days per week. A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every two days. A quality control survey boat would be onsite during all dredging operations.

Equipment would be refueled every 2 to 3 days from a fuel barge maintained at Shellmaker Island or at another location near the PCH Bridge. The dredging contractor would maintain an office with 2 trailers accommodating approximately 7 persons on Shellmaker Island. Approximately 9,000 square feet (sq ft) (810 square meters [sq m]) on Shellmaker Island or at another location near the PCH Bridge would be needed for equipment storage. To provide access for the dredge and barge, the channel between the Unit II basin and PCH Bridge would need to be maintained at -14 ft. (-4.2 m) MSL. Table 2.3-3 lists the equipment details and personnel requirements for the large, clamshell dredge alternative.

CDFG has expressed concerns about the use of Shellmaker Island as a staging area. CDFG conducts public outreach and education programs on Shellmaker Island. The presence of contractor equipment and personnel in this area has the potential to interfere with CDFG's programs. Therefore, an alternative location for project staging and operations will be sought. If Shellmaker Island turns out to be the only viable location for certain staging or other operations, all equipment and activities will be coordinated with CDFG to avoid interference with CDFG programs.

Table 2.3-3
Equipment and Personnel for Large Clamshell Dredge Alternative

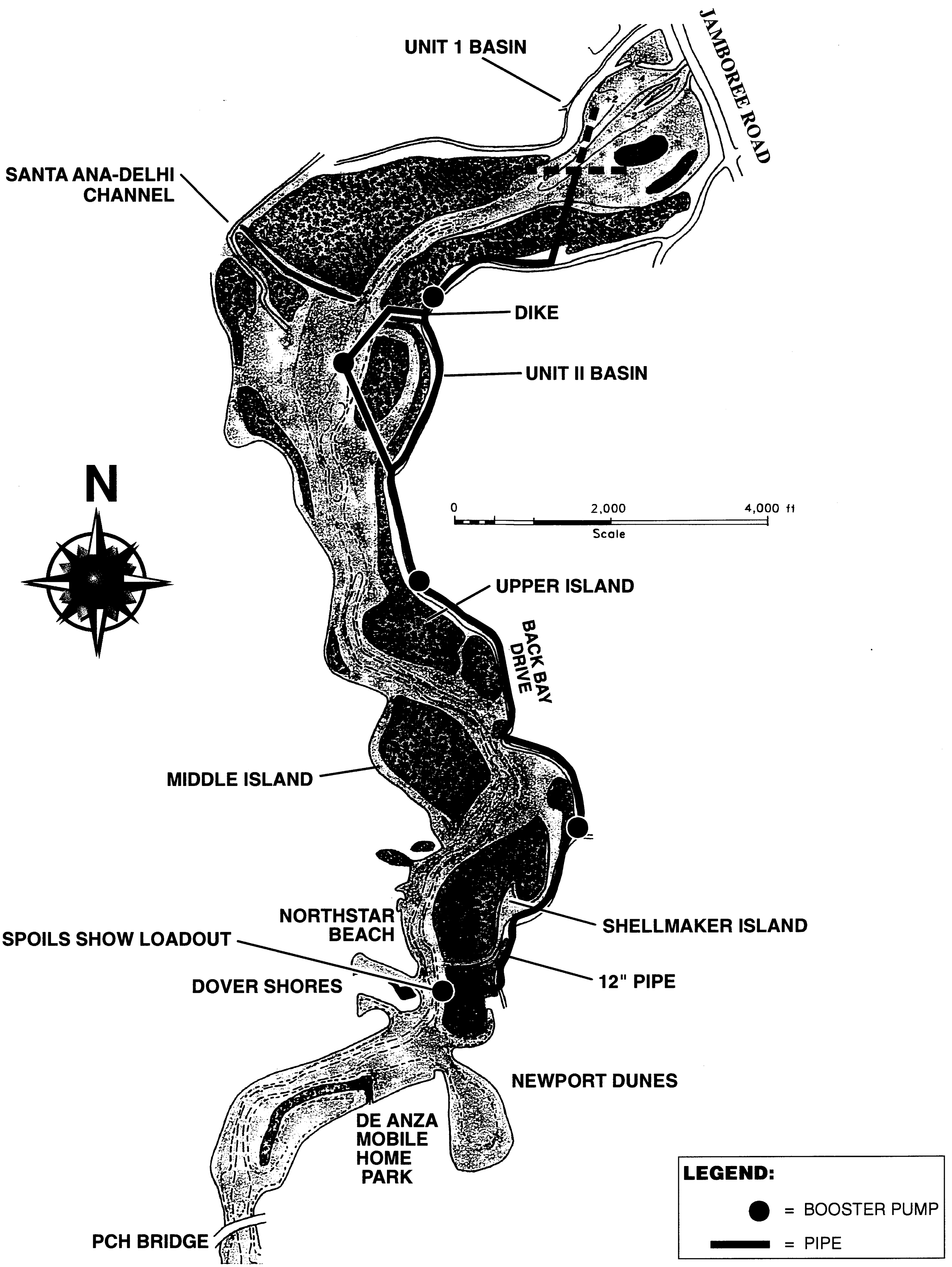
Equipment Type	Number	Dimensions	Specifications	Personnel
Clamshell Dredge on Deck Barge	1	60 ft. x 210 ft. x 6 ft.	5 cy bucket 1,000 hp diesel engine	5 day 4 night
Disposal Scow	3	50 ft. x 150 ft. by 5 ft.	1,500 cy capacity	1 each
Tugboat	2	30 ft. x 60 ft. x 7 ft.	1,600 hp diesel engine	2 each
Work/Guide Boats	2	12 ft. x 25 ft. x 3 ft.	50 hp diesel engine	2 each
Fuel Barge	1	12 ft. x 25 ft. x 6 ft.		2
Survey Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
QC Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
Office/Storage Yard	1	9,000 sq. ft.	Shellmaker Island	7

The advantage of the clamshell dredging method is that the dredged sediments placed within the disposal scow contain only incidental quantities of water. Thus, as soon as a scow is filled, it can depart immediately for the ocean disposal site fully loaded with dredged material. The primary disadvantage of the clamshell dredging method is that a relatively deep draft channel is required to allow free movement of the barges. In 1987 and in 1998-99, the operational depth that was specified and achieved was -14 ft. (-4.2 m) MSL. To allow passage of the clamshell dredge equipment and scows to the Unit II basin site, a channel with a width of 100 ft. (30 m) and bottom elevation of -14 ft. (-4.2 m) MSL was dredged from just south of the PCH Bridge to the Unit II basin, a total distance of 2.4 miles (3.8 km) necessitating additional dredging requirements of about 400,000 cy (306,000 cu m).

2.3.3.2 Small Hydraulic Dredge

Under this alternative, the dredging operations would be conducted using a floating hydraulic dredge of modest size. The small, lightweight, self-propelled dredge could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which would then be pumped through a 12 inch pipeline to a disposal scow located at Shellmaker Island or at an alternative location near the PCH Bridge. Figure 2.3-6 shows the approximate location of the pipeline. The pipeline would cross the marsh in both the Unit I/III and Unit II basin areas. Three booster pumps would be located along Back Bay Drive. The size of each booster pump would be about 400 horsepower (hp). The pumps may be either diesel or electric powered. For this analysis, the worst case, diesel, has been assumed. The disposal scows would be filled adjacent to the south end of Shellmaker Island or at an alternative location near the PCH Bridge. The rate of solids delivery through a 12-inch pipeline from the small dredge to the scow barges would be about 150 cy/hour (hr) (115 cu m/hr), or 3,000 cy (2,295 cu m) per 20 hour work day. The dredge would operate 24 hours per day, 6 days per week.

Because dredged material would be mixed with water for hydraulic transport through the pipeline under this alternative, solid content in the slurry mixture would be limited to about 20 percent. To avoid making approximately 5 times as many trips to the ocean disposal site as would be required under the clamshell dredge alternative, water would be removed from the disposal scow prior to leaving the dock for the ocean disposal site. This operation requires a manifold to allow partial filling of each scow barge while the sediment within the partially filled barge settles. A combination of barges would be used so that the dredge pipe discharge can alternately fill a barge and then be diverted to another barge to allow sediment settling and water decanting. Through progressive filling, settling and decanting, the sediment content in each barge can be maximized. A total of three dump scows (1,500 cy capacity) would be used to allow continuous operations. Certain additives can be discharged into the filling barge in order to reduce sediment settling time. A large water pump would be used to decant the excess water at Shellmaker Island or at an alternative location near the PCH Bridge. Disposal scows would be filled with about 1,000 cy (765 cu m) of the consolidated dredge material and transported by tugboat to the LA-3 disposal site where the material would be discharged. Approximately 3 round trips of 4 hours each would be made per day.



Chambers Group

LOCATION OF PIPE AND PUMPS FOR HYDRAULIC DREDGE OPTION
Figure 2.3-6

The hydraulic dredge, which requires substantially less fuel than the clamshell dredge, would be fueled by truck at Jamboree Road. Like disposal scow trips, fuel barge trips along the Upper Bay Channel would be avoided.

Table 2.3-4 lists the equipment and personnel requirements for the small, hydraulic dredge alternative. Several small hydraulic dredges are available. The Model J-30-32 Wide Hull Dredge manufactured by W & S Development was picked for this analysis. If another small hydraulic dredge were ultimately used, the specifications might be slightly different.

Table 2.3-4
Equipment and Personnel for Small, Hydraulic Dredge Alternative

Equipment Type	Number	Dimensions	Specifications	Personnel
Floating Hydraulic dredge	1	63 ft. x 21.5 ft. x 5 ft.	440 hp diesel engine, cutterhead	2 day 2 night
Disposal Scow	3	50 ft. x 150 ft. x 5 ft.	1,500 cy capacity	1 each
Tugboat	3	30 ft. by 60 ft. x 7 ft.	1,600 hp diesel engine	2
Work Boat	1	12 ft. x 25 ft. x 3 ft.	50 hp diesel engine	2
Survey Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
QC Boat	1	12 ft. x 25 ft. x 6 ft.	50 hp diesel engine	2
Office/Storage Yard	1	9,000 sq. ft.	Shellmaker Island	3

This small dredge alternative has a number of advantages relative to the more conventional clamshell dredge methods. The advantages include the following:

- Low cost (procurement, operations, maintenance);
- Lower level of disturbance in the marsh areas;
- Lack of need for scow barges to transit into the Upper Bay;
- Lack of need to dredge access channel for scow barge access in Upper Bay; and
- Ability to perform fine dredge cuts and maneuver in narrow channels.

The disadvantage of hydraulic dredging is the low solids content of the material and the need to decant excess water to avoid an excessive number of disposal scow trips to the ocean disposal site.

2.3.4 Comparison of Dredging Volumes, Schedule and Maintenance Requirements

For both the large ocean-going dredge and the small land-based dredge, volumes and dredging frequencies have been estimated for both the Initial and Maintenance events for each of the sediment control alternatives. Table 2.3-5 shows the initial dredging volumes and time required to complete the initial dredging. For each alternative, the volumes to be removed are presented for the Unit I/III Basin, Unit II Basin, Channel between Units I and II, the area bordering the Unit II Basin, and the Access Channel Dredging (necessary only for the large clamshell dredge). In addition, the expected duration of dredging is estimated assuming an average output of 3,000 cy per day, a six-day work week, 24-hour operations each day, and a 90 percent efficiency when working (i.e., one day in ten work days would create no dredge output). For the clamshell dredge, Alternative 6 is assumed to have a production rate of 4,000 cy per day.

Table 2.3-6 shows the maintenance dredging requirements for each of the sediment control alternatives for the clamshell dredge method and the small hydraulic dredge method. The timeframes are based on the assumption of 164,000 cy (125,460 cu m) average annual inflow of sediment to the Bay. The earliest dredging year for any of the criteria is selected as the representative maintenance interval. Intervals for maintenance dredging of study alternatives were determined by using the following three criteria in the order shown:

Table 2.3-5
Upper Newport Bay
Initial Dredging Requirements
(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge										
	Dredge Area							Time Required		Start
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Other Channels*	Total	Work Days	Months**	Relative to 1999
No Project	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	100,000	100,000	**828,000**	276	11.8	Year 4
4	1,118,000	1,297,000	20,000	8,000	75,000	100,000	**2,618,000**	873	37.3	Year 4
5	616,000	77,000	20,000	8,000	75,000	100,000	**896,000**	299	12.8	Year 4
6	958,000	866,000	20,000	8,000	75,000	100,000	**2,027,000**	507	21.7	Year 4
Dredge Method: Small, Land-based Hydraulic Dredge										
	Dredge Area							Time Required		Start
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Other Channels*	Total	Work Days	Months**	Relative to 1999
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	-	100,000	**728,000**	243	10.4	Year 4
4	1,118,000	1,297,000	20,000	8,000	-	100,000	**2,543,000**	848	36.2	Year 4
5	616,000	77,000	20,000	8,000	-	100,000	**821,000**	274	11.7	Year 4
6	958,000	866,000	20,000	8,000	-	100,000	**1,952,000**	651	27.8	Year 4

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.
* Other Channels include: East Side, New Island (42,000 cy), West Side, Middle Island (24,000 cy), East Side, Shellmaker Island (34,000 cy).
** Work Days are converted to Months by assuming 6 work days per week with 90% efficiency.

Table 2.3-6
Upper Newport Bay
Maintenance Dredging Requirements
(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge									
	Dredge Area						Time Required		
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Total	Work Days	Months**	Maintenance Frequency Years
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	200,000	**861,000**	287	12.3	7
4	1,118,000	814,000	52,000	28,000	300,000	**2,312,000**	771	32.9	24
5	616,000	131,000	27,000	14,000	200,000	**988,000**	329	14.1	10
6	958,000	554,000	53,000	37,000	300,000	**1,902,000**	476	20.3	21

Dredge Method: Small, Land-based Hydraulic Dredge									
	Dredge Area						Time Required		
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Total	Work Days	Months**	Maintenance Frequency Years
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	-	**661,000**	220	9.4	7
4	1,118,000	814,000	52,000	28,000	-	**2,012,000**	671	28.7	24
5	616,000	131,000	27,000	14,000	-	**788,000**	263	11.2	10
6	958,000	554,000	53,000	37,000	-	**1,602,000**	534	22.8	21

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.
** Work Days are converted to Months by assuming 6 work days per week with 90% efficiency.

1) Maintenance dredging will be initiated if the cumulative percent of sediments trapped in the basins drop below 50 percent. Conversely, if more than 50 percent of cumulative sediments deposit beyond the basin(s), maintenance dredging will be required.

2) If greater than 30 percent of cumulative sediment deposits below PCH bridge, maintenance dredging will be initiated.

3) Sediment accumulation will not be allowed to reach levels where there is a net change in habitat types, such as open water transitioning to mudflat. Analysis of this criterion is limited to Segments 1 and 2 at this time, and is based on the storage capacity of the basins below -3 ft. MSL.

Maintenance would be triggered if any of the criteria were exceeded. The maintenance frequency is based on long-term average sediment inputs and was estimated for the purposes of comparing the relative frequency of dredging for the alternatives. Because sediment input in the San Diego Creek watershed is highly variable, the actual requirements for maintenance dredging may vary. For example, a series of wet years such as occurred in the 1990s, might make maintenance dredging necessary more frequently than shown in Table 2.3-5. On the other hand a series of dry years like the mid to late 1980s might allow the time between maintenance dredging to be extended. Table 2.3-6 shows that with the deeper uppermost basin (20 ft. [6 m]), as proposed for Alternatives 4 and 6, the time between maintenance dredging is more than double that for Alternatives 1 and 5 in which the upper most basin is 14 ft. (4.2 m) deep. Table 2.3-7 shows the total number of dredging days predicted for each alternative in the next 50 years.

Table 2.3-7
Total Dredge Days
50-Year Project Life

Dredge Method: Clamshell Dredge						
		Maintenance				
	Initial	Interval, Years	Cycles	Days/Cycle	Days	Total Days
Alternative 1	276	7	7	287	2,009	2,285
Alternative 4	873	24	2	771	1,542	2,415
Alternative 5	299	10	5	330	1,650	1,949
Alternative 6	507	21	2	476	952	1,459
Dredge Method: Small, Hydraulic Dredge						
		Maintenance				
	Initial	Interval, Years	Cycles	Days/Cycle	Days	Total Days
Alternative 1	243	7	7	221	1,547	1,790
Alternative 4	848	24	2	671	1,342	2,190
Alternative 5	274	10	5	263	1,315	1,589
Alternative 6	651	21	2	534	1,068	1,719
Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day due to greater basin depths.						

2.3.5 Tern Island Relocation

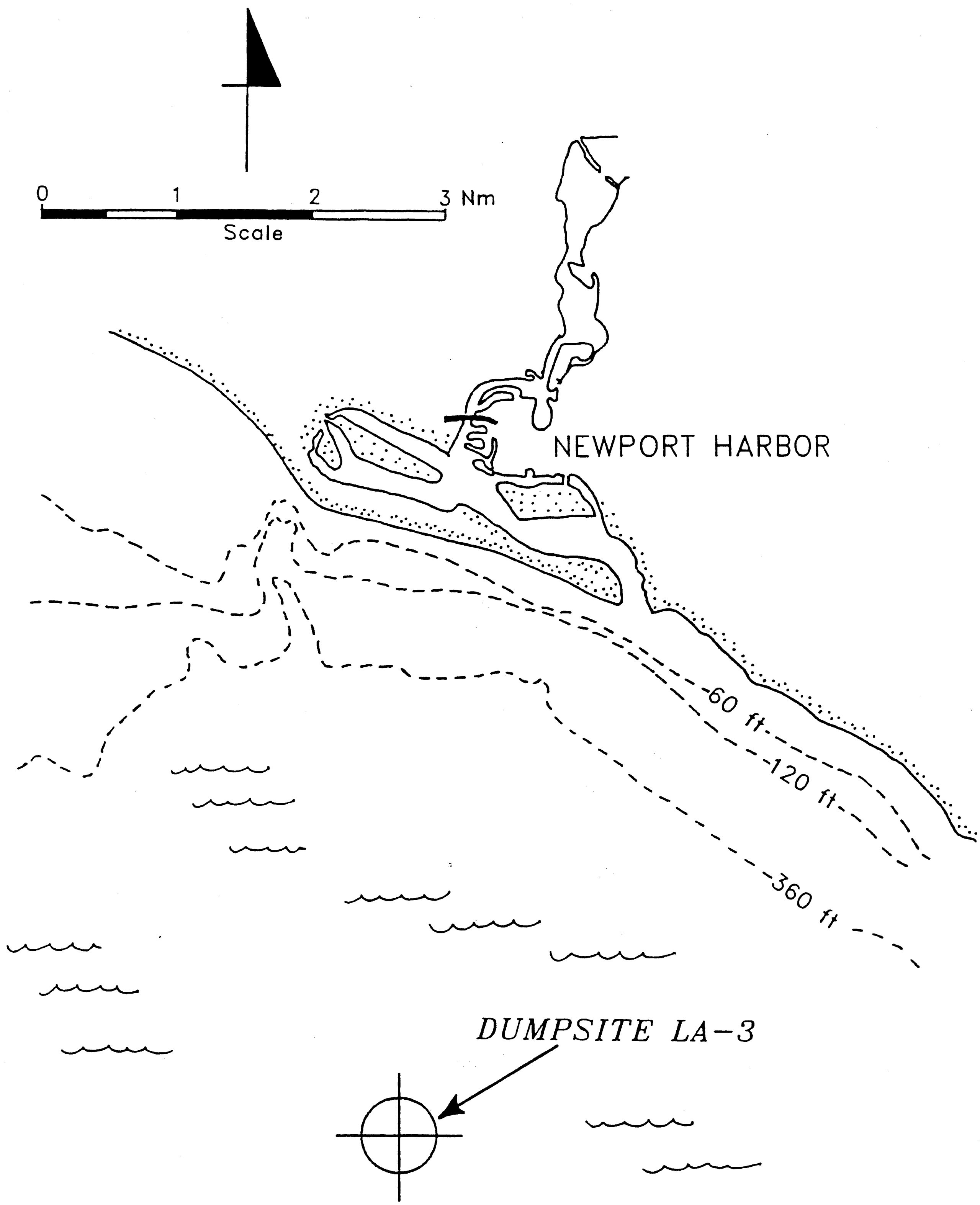
Sediment control Alternatives 4, 5, and 6 include relocation of the more northerly, "kidney shaped" tern island from the Unit I/III basin to the main salt dike near the Unit II basin. Removal of the old island foundation would be accomplished during the upper basin dredging. The dredging requirements for the removal of the base of the existing "kidney-shaped" island are included in the dredging volumes presented in Table 2.3-5. Tern island relocation would occur during the non-breeding season.

The new tern island near the main salt dike would be constructed from material taken from the top of the "kidney shaped" island and material obtained elsewhere. Only the top 5 ft. of the existing island is expected to be suitable for the new island construction. The "kidney shaped" island would provide 40,000 cy (30,600 cu m) for the new island. An additional 23,000 cy (17,595 cu m) of sand would be imported to complete the construction of the new island. A total of 16 barges of 2,500 cy (1,912.5 cu m) capacity would be needed to transport the 40,000 cy (30,600 cu m) scavenged from the old island to the new island site. Rather than use sand from a distant source, it is believed that the 23,000 cy (17,595 cu m) of sand for the two-foot thick surface layer of the new island could be procured from within Newport Bay. Possible areas where good quality sand exists include the following: Interceptor Beach (at the Orange County Harbor Patrol Office, near the Bay entrance), Shellmaker Island, the Newport Aquatic Center (should wetland creation be undertaken there), the "In Channel" Basins of San Diego Creek, and in certain Upper Bay Channels where high sand content was found during the 1998-1999 dredge program. At this time, it should be assumed that the surface sand layer for the new Tern Island will be found within the Bay and that there will not be a need to transport the 23,000 cy (17,595 cu m) of sand from the beach or a distant inland source. For the purpose of this analysis, the reasonable worst case assumption is made that the sand would come from the most distant in-bay source, a beach near the Entrance Channel.

Removal of the upper part of the existing "kidney shaped" island would be done by backhoe (if the small, hydraulic dredging method were selected) or by clamshell dredge. Either backhoe (CAT 245 or equivalent), which could work from the island, or clamshell crane (working from a floating barge) would excavate the sand between +5 ft. (+1.5 m) and 0 ft. MSL on the "kidney shaped" island at a rate of 480 cy/hr (367.2 cu m/hr) per machine. For the 40,000 cy (30,600 cu m) to be excavated, one machine would require 83 hours (9 days, single 12 hour shift). Should the backhoe option be used, two CAT 966 front-end loaders would transport the excavated material onto a barge (80 ft. x 200 ft.) that would be grounded against the island. The capacity of the barge would be 2,500 cy (1912.5 cu m) per load. For the clamshell dredging option the clamshell would load the material directly from the island to the 2,500 cy-barge. Sixteen barge trips would be necessary from the kidney island to the dike area for offloading the 40,000 cy (30,600 cu m) from the old island site. At the site of the new tern island, loaders would tram the material off the barge and it would be spread by a bulldozer and compacted with avibratory roller compactor once the fill extended above water. Once the base material of 40,000 cy (30,600 cu m) was spread and compacted, the remaining surface of 23,000 cy (17,595 cu m) of sand would be transported in 10 barge loads (2,500 cy per barge) from within the Bay (a beach near the Entrance Channel area assumed for this analysis) to the new Tern Island near the Main Dike. It would take approximately 4 days to excavate the sand near the Entrance Channel and move it to the new tern island. Therefore creation of the top part of the tern island would add a total of about 12 to 13 days to the construction time for Alternatives 4, 5, and 6.

2.3.6 Ocean Disposal

As discussed in Section 2.4, ocean disposal at the LA-3 Ocean Dredged Material Disposal Site is the only feasible alternative for disposal of the dredged material. Some dredged material may be designated for onsite beneficial uses such as the construction of least tern islands. The remainder of the material will be transported in the disposal scows pulled by a tugboat to the LA-3 site. Figure 2.3-7 shows the location of the LA-3 disposal site. The time for a disposal scow to make a round trip between Newport Bay and LA-3 is about 4 hours.



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LA-3 OCEAN DREDGED MATERIAL DISPOSAL SITE
Figure 2.3-7

The EPA LA-3 offshore disposal site is one of five sites that have been used for disposal of dredged material within coastal southern California. LA-3 has historically been used to dispose of material dredged from Lower and Upper Newport Bay. The LA-3 site was used for disposal of material dredged in the 1987-88 Unit I/II project and the recent Unit III project. The site is located on the slope of Newport Canyon at a depth of about 1,500 ft. (457 m), approximately 4 miles (6.4 km) southwest of the entrance to Newport Canyon. The bottom topography is gently sloping from 1,350 ft. (405.4 m) to 1,500 ft. (457 m). LA-3 is currently a temporary site, scheduled to close on January 1, 2003 unless a site management plan is completed and approved. Studies are currently being initiated to address permanent designation of the LA-3 site. For this analysis, it is assumed that the LA-3 site will be available for future disposal of dredged material.

2.3.7 Habitat Restoration Alternatives

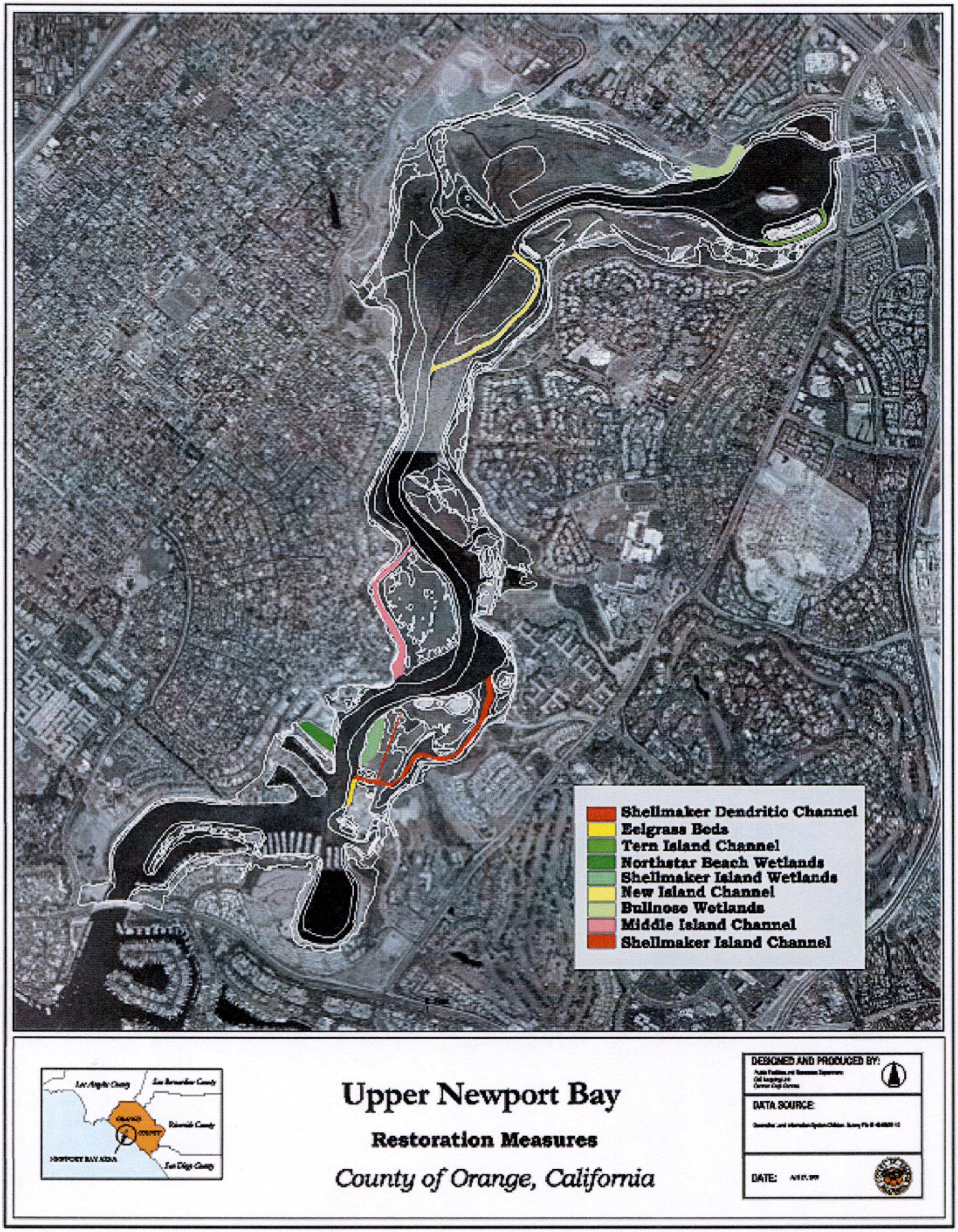
The development of a sediment control plan is the most important measure to preserve habitat values in Upper Newport Bay. Several other potential habitat restoration measures that could further improve habitat quality were identified by the TEG. Six of these measures were carried forward in this document and analyzed as a potential part of the Upper Newport Bay Restoration Project. Figure 2.3-8 shows the location of these restoration measures. These habitat restoration measures could be implemented with any of the sediment control alternatives. In addition to the habitat restoration measures analyzed in this document, education kiosks would be constructed along Back Bay Drive. Education kiosks are not analyzed because they have minimal environmental impact.

2.3.7.1 Addition of Sand to the Least Tern Islands

The existing least tern islands in the uppermost basin have become degraded by the erosion of sand and invasion of vegetation. The quality of the nesting islands could be improved by the addition of clean sand. Sand would be obtained from within the Bay as described in Section 2.3.5 for relocation of the "kidney shaped" island from the upper basin to the main dike. Under Alternative 1, sand would be added to both of the existing tern islands in the upper basin. Under Alternatives 4, 5 and 6 sand would be added only to the southern "hot dog" island because the northern island would be removed. Because least terns need unvegetated sand in which to construct their nests, any existing vegetation on the island(s) would be removed by hand prior to the importation of sand to the top of the island. Sand would be obtained from a beach near the Entrance Channel or elsewhere in the Bay as described in Section 2.3.5. Sand would be excavated from the borrow site with a backhoe and loaded with two CAT 966 front-end loaders onto a barge with a capacity of 2,500 cy (1,912 cu m). The barge would be guided by tug to the upper basin where loaders would tram the material off the barge and spread on the tern island(s) by a bulldozer. The machinery for spreading material would need to be transported to the tern island(s) by barge. For this analysis, it has been assumed that 2 ft. (0.6 m) of sand would be added to the island(s). Under Alternative 1, in which sand would be added to two tern islands, approximately 23,000 cy (17,595 cu m) of material would need to be excavated and moved to the new island. Addition of sand to the tern islands under Alternative 1 would require 10 barge trips and would take about 10 days (5 days to excavate and load and 5 days to unload and spread). Under Alternatives 4, 5 and 6, material would only be added to the remaining southern tern island. Under these alternatives, 10,000 cy (7,650 cu m) of material would be required. About 2 or 3 barge trips would be needed to move the material and the process would take 4 days. Sand would be added during the non-breeding season to avoid disturbance to nesting terns.

2.3.7.2 Construct Small Dendritic Channels through the Marsh

The purpose of this restoration measure would be to increase foraging habitat for aquatic-feeding birds, improve circulation, and restrict access for humans and terrestrial predators. Aerial photographs show evidence of small channels that already exist throughout the marsh. The concept is that these channels would be increased in area to improve their function.



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LOCATION OF HABITAT RESTORATION ALTERNATIVES
Figure 2.3-8

Because of concerns by the resource agencies about the impacts of channel excavation on sensitive marsh species, only a small pilot program is proposed on Shellmaker Island. For this pilot program, a single channel would be dredged through Shellmaker Island. The channel would have a bottom width of 10 ft. (3 m) and 3:1 side slopes.

The excavation of the small channel would be done by a backhoe or other small piece of earthmoving equipment. Approximately 9,650 cy (7,382 cu m) of material would be dredged. Assuming about 3,000 cy (3,825 cu m) of material were excavated in a day, it would take about 3 days to complete the excavation. The backhoe would stockpile the material on Shellmaker Island where it would be loaded by a frontloader onto a disposal scow for discharge at LA-3.

2.3.7.3 Restoration of Wetlands in Filled Areas

Four areas of fill within the Upper Bay have been identified where the potential exists to restore the filled areas to wetlands. These areas are shown on Figure 2.3-8. Each of these wetlands restoration opportunities is discussed below

Northstar Beach. This habitat restoration alternative would create wetlands at Northstar Beach. The excavation would avoid impacting the existing rowing center. One island would be created that would contain an area of about 2.5 acres. The elevation of the island would be -2 ft. (-0.6 m) MSL. The Island would be surrounded a shallow channel, with a depth of -5 ft. (-1.5 m) MSL. Approximately 36,800 cy (28,152 cu m) of material would be excavated to restore wetlands at Northstar Beach. It would take about 13 days to implement this alternative and about 37 scow trips to LA-3 would be required for disposal.

Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin. This alternative would excavate this section of land to -2 ft. (-0.6 m) MSL to restore wetlands function. If this area were restored to wetlands, about 42,000 cy (32,130 cu m) of material would be excavated for this alternative. Excavation of this material would take 14 days, and would require 42 scow trips to LA-3 for material disposal.

Dredge Spoil on Shellmaker Island. This alternative would restore wetlands function by excavating about 3.0 acres of dredge spoils on Shellmaker Island to an elevation of -2 ft. (-0.6 m) MSL. Approximately 34,000 cy (26,010 cu m) would be excavated to create this alternative. At a dredging rate of 3,000 cy (2,295 cu m) per day, it would take approximately 12 days to grade this area. Disposal would require about 34 trips to LA-3.

For any of these wetlands creation alternatives, the material would be excavated either with the clamshell dredge, backhoe, or the hydraulic dredge as described for the dredging alternatives. Some of the material for some of these alternatives may be suitable for beneficial uses such as adding sand to tern islands or beach nourishment. If beneficial uses for dredged material are available at the time of project construction, suitable material would be used for those purposes. Because the suitability of material for beneficial uses is unknown at this time, for this analysis, the assumption is made that excavated material will be placed in a disposal scow and discharged at the LA-3 ocean disposal site.

2.3.7.4 Restoration of Side Channels

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Restoration of side channels would increase habitat for aquatic species, improve circulation, and isolate the islands from terrestrial predators such as dogs, cats and coyotes. For each of these alternatives the side channel would have a bottom width of 20 ft. (6 m), a depth of -5 ft. (-1.5 m) MSL, and 3:1 side slopes. The proposed channels are presently at a depth of about +0.5 to +1.5 ft. (+0.15 m to +0.45 m) MSL on Middle Island and +2.5 ft. (+0.7 m) MSL on Shellmaker Island. Portions of the Shellmaker Island side channel would have a bottom width of only 5 ft. (1.5 m) to avoid disturbing marsh.

About 19,500 cy (148,918 cu m) would need to be dredged to restore the Middle Island channel, and about 24,000 cy (18,361 cu m) would be dredged to restore the Shellmaker Island channel.

Dredging of the side channels would be done during dredging of the Unit II basin area using a hydraulic dredge. Material would be pumped to a disposal scow, dewatered, and transported to the LA-3 site for disposal. It would take about 20 barge trips to dispose of the material from Middle Island and about 24 barge trips to dispose of the Shellmaker Island material. Dredging the Middle Island Channel would add approximately an additional 7 days to the overall dredging program. Adding a side channel to Shellmaker Island would take about 8 days. If side channels were restored to both islands a total of about 15 days would be added to the overall dredging program.

2.3.7.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

Beds of eelgrass (*Zostera marina*) are recognized as a particularly valuable type of marine habitat that enhances the physical and biological environment by stabilizing the substrate, increasing productivity, and providing structure to the otherwise monotonous soft bottom habitat (Phillips 1988). Several studies have demonstrated that the marine life in eelgrass meadows is enhanced in numbers, species, and standing crop compared to unvegetated soft-bottom habitat (summarized in Ware 1993). The lower portions of the Upper Bay formerly supported eelgrass, but beds disappeared following wet years in the 1980s and 1990s. Eelgrass requires high light levels and its disappearance may have been related to turbidity created by sedimentation from San Diego Creek. The implementation of a sediment control plan will reduce sedimentation and may allow the re-establishment of eelgrass.

This restoration measure would restore eelgrass to about 0.6 acres of shallow/soft bottom adjacent to Shellmaker Island. Approximately 4 to 6 divers using SCUBA apparatus would collect eelgrass from existing eelgrass beds around Harbor Island and Balboa Island in the Lower Bay. Plants would be taken to an on-shore assembly station where they would be cleansed of sediment. The sediment-free individual eelgrass shoots would then be fabricated into planting units of 12 to 15 shoots each. About 4 persons would be responsible for the shore assembly of the planting units. The shore assembly station would probably be at Newport Dunes or the southern part of Shellmaker Island. A planting unit would be assembled by securing the shoots together with a loop of biodegradable twine that is connected to a biodegradable anchor such as a popsicle stick. The dive team then replants the bundles at spacing of about 2 to 3.3 ft. (0.6 to 1 m) apart throughout the planting area by placing the biodegradable anchors and root mass into a hand dug hole. Revegetating about 0.6 acres in the lower part of the Upper Bay would take about 3 to 4 days. The only mechanized equipment that would be used would be a small boat (about 25 ft. by 12 ft. by 6 ft.) with about a 50 horse power motor. The boat would travel to and from the donor bed areas near Harbor Island and Balboa Island to the lower part of the Upper Bay, a round trip distance of up to 5 mi (8 km) for the more distant donor beds.

2.3.7.6 Removal of Segments of the Main Dike

The main dike provides a means of human intrusion into the marsh as well as access for terrestrial predators such as dogs, cats and coyotes. This alternative would improve habitat quality by removing this access route. A backhoe would travel along the dike and remove segments. The backhoe would be transported to and from the dike by a small barge. Approximately 500 cy (382.5 cu m) of material would be removed from the dike. If appropriate the material would be used for beneficial uses such as constructing tern islands or beach nourishment within the Bay. Material not designated for beneficial uses would be barged to LA-3 for ocean discharge or trucked to a land disposal site. Implementation of this restoration alternative would take less than one day.

2.3.8 Monitoring

The Upper Newport Bay Habitat Restoration Project includes monitoring before project construction, during project construction and after construction has been completed. Monitoring would include biological monitoring of the habitat restoration areas.

A two season (winter and summer) monitoring program would be implemented once before, once during and once after construction. The monitoring program would include biological surveys similar to the 1997 baseline surveys (vegetation, fish, insect, bird, and mammal/reptile surveys), aerial photography, and GIS mapping of habitats. The post-construction monitoring activities would either be completed three years after construction or following any year that the annual total suspended sediment load for San Diego Creek at Campus Drive exceeds 250,000 tons.

In addition to the monitoring activities described above, topographic and bathymetric surveys would be completed in advance of project construction to refine dredge and excavation quantity estimates. Progress surveys of the dredging would be completed during construction, and the construction contractor would complete a post-construction survey. During construction, monitors would monitor all aspects of the dredging activities and the disposal of material at the LA-3 site.

Finally, during construction water quality and endangered species would be monitored. A water quality specialist would monitor water quality around the dredge operations. During the breeding season, a qualified biologist would monitor the nesting activities of the state and federal endangered light-footed clapper rail and state endangered Belding's savannah sparrow in the vicinity of dredging operations to ensure that the project does not disturb nesting birds.

The sponsor, OCPFRD, will prepare and implement a monitoring program to quantify the future volume and elevation of deposited sediments in the basins. This program would be used to initiate future dredging maintenance activities. The sediment TMDL currently requires topographic and bathymetric surveys of all of Upper Newport Bay, from PCH Bridge to Jamboree Road Bridge, once every three years.

2.4 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

2.4.1 Sediment Control Alternatives

2.4.1.1 Alternative 2

Alternative 2 was a basin design originally presented to the HEG. Under Alternative 2 the upper basin would be designed to maximize trapping efficiency. Both tern islands would be removed. The entire basin would be dredged to -14 ft. (-4.2 m) MSL with 5:1 side slopes. The dredge and barge access channel would retain the Unit III design with depths of -14 ft. (-4.2 m) MSL from the upper basin to the Pacific Coast Highway Bridge. No additional work would be done to the Unit II basin area.

This alternative was eliminated from further consideration because of the impacts to the least tern islands. The loss of two nesting islands for this endangered species was considered a clearly unacceptable environmental impact that violated the initial project constraint of minimizing disturbance to threatened and endangered species. The basic concept of Alternative 2 to emphasize trapping efficiency in the upper basin with minimal disturbance to the lower basin was addressed by creating a new alternative, Alternative 5. Alternative 5, which is carried forward for full analysis in this document, has minimal disturbance to the Unit II basin but a large basin footprint in the upper basin.

2.4.1.2 Alternative 3

Alternative 3 was another preliminary design eliminated from further analysis because of concern about environmental impacts. The main features of Alternative 3 are removal of the existing least tern islands, relocation of one island in the upper basin, expansion of the Unit III basin footprint, expansion of the Unit II basin footprint to the west and south, and addition of two new least tern islands to the Unit II basin.

Under Alternative 3, both of the existing least tern islands would be removed from the upper basin. The entire upper basin would be dredged to -14 ft. (-4.2 m) MSL with 5:1 side slopes. A new least tern island would be constructed in the western portion of the basin, perpendicular to the San Diego Creek inflows.

The Unit II basin would be expanded to the west and south with a footprint similar to that of Alternative 4. Two new least tern islands would be constructed in the new Unit II basin.

Alternative 3 was eliminated from further consideration because it was considered to have clearly unacceptable environmental impacts. Removal of both existing least tern islands, even with replacement of those islands elsewhere in the Upper Bay, was considered potentially to be too disturbing to the endangered California least tern. Alternative 4, which was carried forward for detailed analysis, was similar to Alternative 3. Alternative 4 has expanded basin footprints in both the upper and Unit II basins, but Alternative 4 retains one of the existing least tern islands. Relocation of the northern island was considered acceptable because this island does not currently support nesting by least terns although other non-listed tern species breed there.

2.4.1.3 Other Potential Sediment Control Alternatives Eliminated from Further Consideration

Sediment control alternatives that did not include an upper basin footprint at least as large as the Unit III basin were eliminated from further analysis. A smaller footprint in the upper basin would not meet the project purpose and need to control sediment and maintain habitat diversity in the Upper Bay.

Different combinations of the upper basin and Unit II basin configurations other than those included in Alternatives 1, 4, 5, and 6 were not analyzed. The four sediment control alternatives analyzed in this document were considered to represent a reasonable range of basin configurations for analysis. If the environmental analysis suggests that a different combination of basin configurations would be superior to the combinations included in the four alternatives analyzed here, a different combination could be developed and analyzed for the Preferred Plan.

2.4.2 Disposal Alternatives

2.4.2.1 Land Disposal

Under this alternative, dredged material would be transported by truck to an approved landfill site. This alternative was eliminated from further consideration because it is practically and economically infeasible and because the amount of truck traffic would represent a clearly unacceptable environmental impact.

Upland disposal is typically 3 to 7 times more expensive than conventional ocean disposal. Because of the large volume of material involved, a 3 to 7 times increase in disposal costs would make the project financially unfeasible. Secondly, before dredged material can be trucked to a landfill site it needs to be completely dewatered and treated for high salt content. No site is available along the Newport Bay shoreline to process the large volumes of material that would be dredged to implement any of the sediment control alternatives.

Finally, land disposal would generate an unacceptable volume of truck traffic. To implement the sediment control alternative that would produce the smallest volume of dredged material (Alternative 1 with the small, hydraulic dredge), 40,444 truck trips would be required to transport the material to a landfill site. Based on an estimated dredging time of 276 days, this alternative would add 147 trucks per day to the local roadways.

2.4.2.2 Beach Nourishment

Because many of the local beaches are in need of sand, beach nourishment either by placement of sand directly on the beach or into the nearshore zone, is a potential beneficial use for dredged material. However, EPA and the Corps require that sediment to be used for beach nourishment have particle sizes similar to sediment on the proposed receiver beach. Based on sampling conducted for the recent Unit III dredging project, most of the material to be dredged in Upper Newport Bay has too fine a sediment grain size to be used for beach nourishment. If sediments with clean sand-sized particles are found within areas targeted for excavation, the sediments will be considered for beneficial uses including beach nourishment and construction of least tern islands. For example, sand-sized sediments may exist in the proposed wetlands restoration area on Northstar Beach. For the purpose of this document, however, it is assumed that most sediments within the Upper Bay will be too fine for beach nourishment. Beach nourishment is eliminated, therefore, as a practical alternative for disposal of the majority of the dredged material.

2.4.2.3 Ocean Disposal at the LA-2 Designated Ocean Dredged Material Disposal Site

The LA-2 designated dredged material ocean disposal site is located off Los Angeles and Long Beach Harbors about 20 mi (32 km) north of the LA-3 site. The LA-2 site has received final designation and is heavily used by the Ports of Los Angeles and Long Beach. When it was designated, the LA-2 site was assigned an annual capacity of 200,000 cy (153,000 cu m). The material dredged during the Upper Newport Bay Restoration project would exceed the capacity of this site. Furthermore, the costs of transporting material to this more distant ocean disposal site would be significantly higher than transporting material to LA-3, and might result in the project being financially infeasible for the Sponsor. It would take approximately 20 hours for a round trip by a disposal scow to LA-2. In order to keep pace with a dredging rate of about 3,000 cy (2,295 cu m) per day, more than one disposal scow and tugboat would need to be transporting material to the LA-2 site at a time. Therefore, the air quality and vessel traffic impacts of this disposal alternative would be greater than for ocean disposal at the LA-3 site.

2.4.3 <u>Habitat Restoration Alternatives</u>

2.4.3.1 Visitor Access Management and Invasive Vegetation Management Alternatives

The HEG identified a number of habitat restoration measures related to the management of user access and the management of invasive vegetation. Because the CDFG is the manager of the Upper Newport Bay Ecological Reserve, it is not feasible for this project to implement habitat restoration measures related to reserve management. CDFG is currently updating its management plan. The management plan will evaluate policies related to visitor access and management of invasive vegetation.

2.4.3.2 Restoration of Side Channel on the East Side of Upper Island

Restoration of a side channel in this area would require excavating existing marsh. This alternative was eliminated from further consideration because excavation of marsh areas might impact the endangered light-footed clapper rail. In addition, an initial constraint placed on this restoration project was that no marsh habitat should be lost. If restoration of side channels at Middle Island and Shellmaker Island and the pilot program to restore a dendritic channel to Shellmaker Island indicate that channel construction produces significant habitat benefits with minimal impacts, additional channels may be created as part of future restoration projects.

2.4.3.3 Construct an Additional Trash Boom near Santa Ana-Delhi Channel

This habitat restoration measure has already been implemented by the County of Orange, and, therefore, will not be considered as part of the Upper Newport Bay Habitat Restoration Project.

2.5 CUMULATIVE IMPACTS SCENARIO

NEPA and CEQA both require that cumulative impacts of the proposed project be analyzed and disclosed. Cumulative impacts are those impacts on the environment that would result from the incremental effect of the proposed project when combined with other present, and reasonably foreseeable planned and proposed projects. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

This section presents the anticipated projects considered in the cumulative impact analysis. The areas within which these projects are located range from the lowest portion of Upper Newport Bay to the eastern most limits of the City of Irvine in the Newport Bay Watershed. Potential development activities include residential, commercial, highway improvements, and any projects in San Diego Creek tributaries.

2.5.1 Watershed Development

The San Diego Creek/Newport Bay Watershed covers approximately 154 sq mi (399 sq km) in central and south Orange County encompassing the cities of Irvine, Costa Mesa, Tustin, Santa Ana and Newport itself. The following section takes into consideration development of County unincorporated lands, and the cities of Costa Mesa and Irvine.

2.5.1.1 Orange County Unincorporated Lands

The County has stated that there will be a steady amount of unincorporated land available for development as agricultural preserve contracts are discontinued. The final portions of available land in the county that are not designated open space will achieve first generation build-out sometime after 2020 at which point said land designations will be converted. Residential redevelopment is forecasted to occur, transforming single family to multiple family units and increasing densities of newly developed single and multiple family residential units. Significant commercial and industrial development is expected to occur along major transportation arteries.

2.5.1.2 The City of Costa Mesa

Projected development in Costa Mesa is not included in the Land Use Element of the Costa Mesa General Plan (City of Costa Mesa 1996) because Costa Mesa is almost at build-out with less than 600 remaining acres of undeveloped land.

Future development may involve redesignation of public and semi-public lands (including 129 acres of vacant land and 175 acres of agricultural) as medium to high density residential or commercial-residential. Existing medium and high density residential units legally built in excess of the dwelling units per acre standard may also be rebuilt at higher densities.

2.5.1.3 City of Irvine

The City of Irvine, with its sphere of influence located within the coastal and foothill region of central Orange County, makes up the largest portion of the San Diego Creek Watershed. The fact that only an approximate 50 percent of the potential development identified within the General Plan has occurred or is committed through subsequent planning approvals indicates that Irvine will have a substantial impact on sediment loads in San Diego Creek and Upper Newport Bay.

Build-out for the City of Irvine is projected for the year 2040. The City has developed a Land Use Element in the General Plan that will accommodate the accompanying doubling of its residential population and tripling of its employment population. Based on the City of Irvine Land Use Element (1998 Draft) when fully built out the city will have 15,380 acres of open space, 13,123 acres of residential development, 160 acres of multi-use development, 2,377 acres of commercial development, 6,155 acres of industrial development, 2,422 acres of institutional development, and 4,035 acres of military use.

2.5.2 Development Surrounding Upper Newport Bay

The following section includes development in the area immediately surrounding Upper Newport Bay and its main tributary San Diego Creek.

2.5.2.1 City of Newport Beach

Projected development in the vicinity of Newport Bay is taken from the Land Use Element (LUP) of the Newport Beach General Plan (City of Newport Beach 1996). The LUP is a long-range guide to the development of all lands within the Newport Beach planning area, including both public and private properties, and represents a picture of the community at buildout. The LUP separates the city into statistical divisions and areas (Figure 2.5-1). This cumulative project analysis examines those statistical divisions and areas surrounding the Bay (Statistical divisions J, K, and L).

Westcliff/Santa Ana Heights (Statistical Division J)

The Westcliff/Santa Ana Heights area consists of all land in the City on the west side of Upper Newport Bay. It is separated into Dover Shores , Westcliff Plaza, Westcliff, Harbor Highlands, Westbay, and Santa Ana Heights areas in the City of Newport Beach Land Use Element. A total of 35 acres and 332 residential dwelling units are projected for this statistical division. Westcliff (Statistical Area J3) and Harbor Highlands (Statistical Area J4) are both developed at their allocated maximums. Growth in the Dover Shores Area (Statistical Area J1) would include about 0.05 acres of recreational and marine commercial marina support at the Lower Castaways, 151 dwelling units at the Castaways and a 0.25 acre expansion of the rowing facility at Northstar Beach. Growth in the Westcliff Plaza area (Statistical Area J2) would include about a 3.5 acre expansion of the Westcliff Plaza Shopping Center and small expansions of about 0.1 acre each of facilities at Mariners Park and Mariners School. Growth in the Westbay area (Statistical Area J5) would include expansions of an acre or less of facilities at the Harbor Christian Church, the YMCA and the Newport Beach Golf Course. About 0.23 acres of interpretive facilities would be developed along the west bay (see Section 2.5.5 below). Projected development in the Santa Ana Heights area (Statistical Area J6) would include about 30 acres of commercial and residential development.

Eastbay Area (Statistical Division K)

This area includes all land between Upper Newport Bay and Jamboree Road north of Coast Highway. Eastbay consists of Newport Dunes, the Bluffs, and Eastbluff. Eastbluff (Statistical Division K3) has been developed at its allocated maximum and no further development is allowed. A total of about 20 acres of commercial development and 318 residential dwellings has been projected for the Newport Dunes and Bluffs areas. A hotel development is proposed for Newport Dunes.

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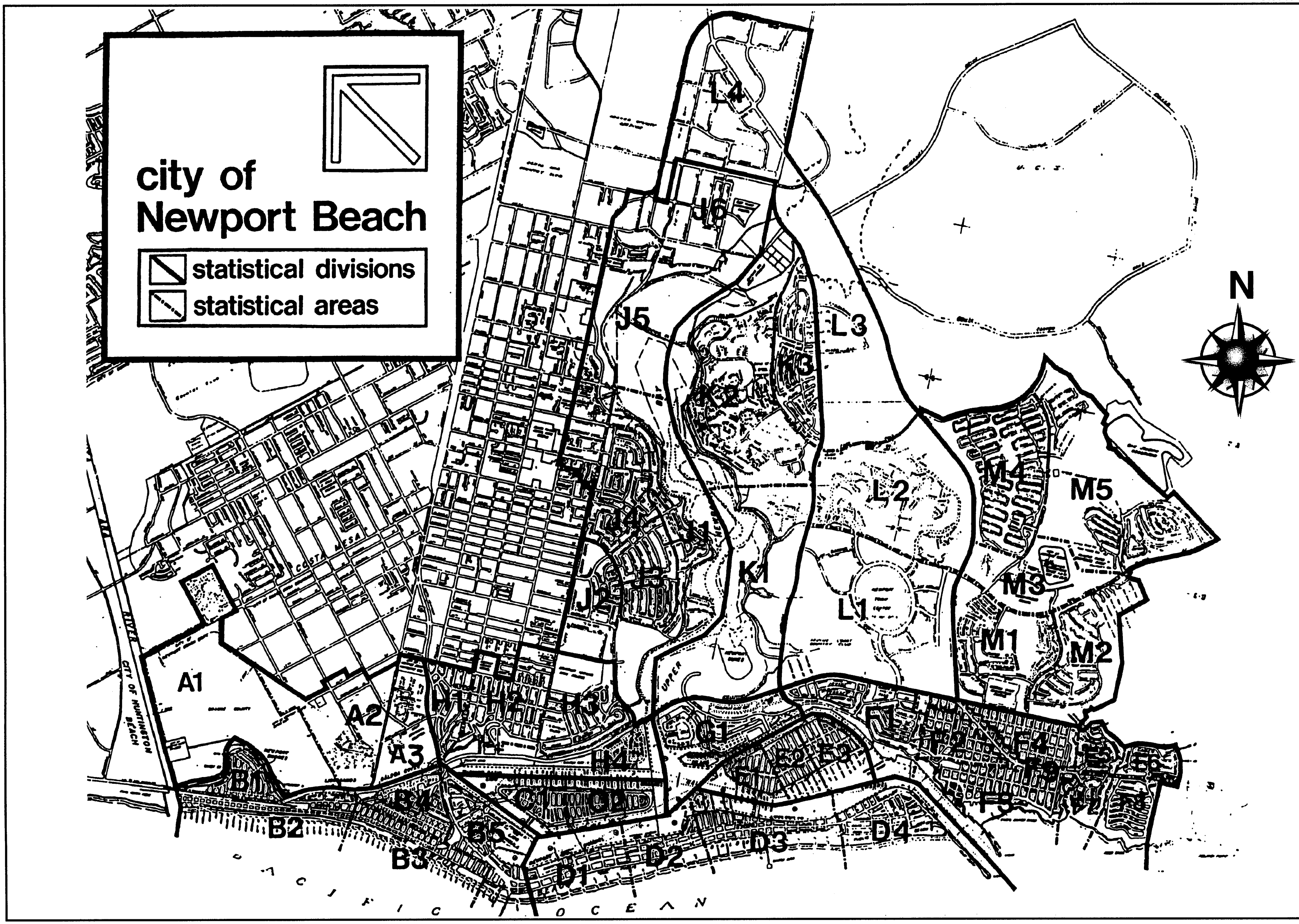

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PLANNING UNITS IN THE CITY OF NEWPORT BEACH
Figure 2.5-1

Jamboree Road/MacArthur Bouldevard Area (Statistical Division L)

This area is comprised of the major commercial and residential planned communities, including Newport Center, Big Canyon, Aeronutronic Ford, North Ford, San Diego Creek North, Jamboree/MacArthur, John Wayne Airport, Koll Center Newport and Newport place, and the Campus Drive Industrial Tract. A total of 47 acres of commercial development and 1,371 residential dwelling units are projected for this statistical division.

2.5.3 Irvine Ranch Water District

The Irvine Ranch Water District (IRWD) is a California water district formed for the purposes of collecting and treating municipal wastewater, and distributing water for domestic and non-domestic purposes in the City of Irvine. The IRWD has the jurisdiction to authorize public works construction projects on its own initiative, with its own funding, and in accordance with its overall system of existing and planned improvements.

2.5.3.1 Wetlands Water Supply Project

The IRWD is currently carrying out Phase 2 of its Wetlands Water Supply Project which involves the long-term operation of reclaimed water ponds in the San Joaquin Marsh and drainage into the San Diego Creek under conditions determined during the 2 year Demonstration Phase 1. The 5 million gallon per day (mgd) flow through system provides residence time for nutrient removal and denitrification of reclaimed human and industrial wastewater which is proposed for subsequent discharge into San Diego Creek between October 21 and March 31.

2.5.3.2 San Joaquin Marsh Enhancement Plan

The IRWD's Marsh Enhancement Plan, which is already underway, involves the excavation and grading of portions of the existing freshwater marsh, seasonal ponds, wet meadow habitat and upland for retention of IRWD reclaimed human and industrial wastewater.

2.5.4 San Diego Creek In-Channel Sedimentation Basins

In-channel sedimentation basins in San Diego Creek are maintained by the Orange County Public Facilities and Resources Department. Maintenance of these basins involves periodic dredging to regain sediment trapping capacities. The maintenance requirement for the in-channel basins is that they maintain 50 percent capacity by November 15 of each year.

In-Channel Basin 1 extends from MacArthur Boulevard to Campus Drive, and has a design capacity of 210,000 cy (160,650 cu m). In-Channel Basin 2 extends from Campus Drive south to the siphon crossing of the IRWD's Michelson Water Reclamation Plant, and has a design capacity of 73,000 cy (55,845 cu m). In-Channel Basin 3 is located between Sand Canyon Channel and San Joaquin Channel, and has a design capacity of 78,000 cy (59,670 cu m).

As part of the San Diego Creek Watershed Study, currently underway, sedimentation basins on San Diego Creek may be increased or other sediment control measures may be implemented.

2.5.5 Upper Newport Bay Regional Park

The Orange County Department of Harbors, Beaches and Parks is in the process of carrying out its General Development and Resource Management Plan for the 138-acre Upper Newport Bay Regional Park. Facilities include a 0.23-acre interpretive center to be located within 500 ft. (150 m) from the centerline of University Drive, east of Irvine Avenue. The project also involves consolidation and improvement of existing hiking, bicycle and equestrian trails; installation of associated parking and access controls; stabilization of erodible, bare areas; enhancement of habitat with native vegetation in place of existing invasive populations; and widening of University Drive east of Irvine Avenue.

2.5.6 Newport Bay Dredging Projects

All dredging projects in Upper Newport Bay are carried out and maintained by the U.S. Army Corps of Engineers. Dredging operations include maintenance of sediment trapping basins and promotion of navigation and recreation. A major dredging of navigation channels in the Lower Newport Bay was completed in 1999. Dredging projected for the foreseeable future would probably be limited to minor maintenance dredging around docks and boat slips.

SECTION 3.0 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the baseline conditions of Upper Newport Bay for the existing conditions and the without-project conditions up to 50 years in the future.

Newport Bay is a combination of two distinct bodies of water, termed "Lower" and "Upper" Newport Bay. The Lower Bay, where the majority of commerce and recreational boating exists, was formerly a coastal lagoon (Stevenson and Emery 1958). Upper Newport Bay is a drowned river valley and is geologically much older than the Lower Bay. The Upper Bay is bounded by high bluffs on the San Joaquin Terrace on the east and the Newport Mesa on the west. The Pacific Coast Highway (PCH) bridge divides Newport Bay into Upper and Lower sections. The Lower Bay is heavily developed (predominantly as residential properties), while the Upper Bay contains both a diverse mix of development in its lower reach, and an undeveloped ecological reserve to the north.

The Upper Bay is primarily a marine saltmarsh with freshwater inflows from San Diego Creek, the Santa Ana - Delhi Channel, local springs, and drainage from adjacent areas. The primary source of freshwater flowing into Upper Newport Bay is San Diego Creek. The San Diego Creek watershed drains an area of 118 square miles (sq mi) (305.6 square kilometers [sq km]). The flows from this stream are seasonally variable, generally averaging about 30 cubic feet per second (cfs) during the dry summer months. Flows from extreme storm events can exceed 20,000 cfs during the 50-year event (Boyle Engineering Corporation 1982). Given the continual (albeit highly variable) freshwater flows into the Upper Bay, water salinities are less than those in the ocean a majority of the time. Thus, the impact of San Diego Creek on the water properties of the Upper Bay is continual, with significant seasonal variations. Because of the variability of flows from San Diego Creek from year to year, the environment of the Upper Bay is also variable, and baseline conditions may change from one year to the next. This section presents a summary of past, present, and projected future conditions and defines the affected environment within Upper Newport Bay. Place names within the Bay are shown on Figure 1.2-2.

3.2 EARTH RESOURCES

3.2.1 Geology

Regional Geology. Upper Newport Bay is located in a region that is tectonically active and complex. The complexity of this region is due to the orientation of the physiographic provinces that have been created in southern California from the movement of the North American and Pacific tectonic plates. These provinces include the Transverse Ranges, the Peninsular Ranges, and the Coastal Ranges. The Transverse Ranges consist of a series of east-west trending ranges and valleys that truncate the prevailing north-northwest trending Southern Coastal and Peninsular Ranges. The Peninsular and Coastal Ranges have dominant northwest trending faults characterized by right-lateral strike-slip separation (UCI 1995).

Local Geology. Newport Bay is located at the southeastern end of the Los Angeles coastal plain, and crosses the southeastern edge of the Inglewood-Newport Uplift. Three formations of bedrock have been exposed during the erosive periods in which the bay was excavated. Because of rapid sedimentation, the formations are visible only on Coney Island (a small outcrop located just south of Shellmaker Island) and surrounding bluffs. The formations include the Monterey, the Capistrano, and an unnamed formation (Corps 1993a). These three formations appear to represent the underlying bedrock formations within the study area, and are underlain by approximately 15 feet (ft.) (4.6 meters [m]) to 45 ft. (13.7 m) of Holocene (within the last 10,000 years) and Pleistocene (from 10,000 to 2 million years ago) alluvium material.

The oldest exposed bedrock in Upper Newport Bay is the Monterey Formation. The Monterey Formation is characterized as a well bedded, diatomaceous shale[1] deposited during the Miocene (about 5 to 24 million years ago). It can be found along the bluffs between the PCH Bridge and Middle Island, and along Coney Island. The Capistrano Formation lies over the Monterey Formation and has been dated at Upper Miocene (about 5 to 15 million years ago) to Lower Pleistocene (about 1 to 2 million years ago). The Capistrano Formation consists of a clay siltstone matrix and is of marine origin. The Capistrano Formation is exposed along bluffs near Upper Island. The unnamed formation consists of a lightly colored, fine to medium grained silty sandstone that overlies the Capistrano Formation. This sandstone has been dated at Late Pliocene (about 2 to 3.5 million years ago) to Lower Pleistocene, and is exposed along the bluffs north of Upper Island.

Faults and Seismicity. The seismicity of southern California is dominated by the intersection of the northwest trending San Andreas Fault system and the east-west trending Transverse Ranges Fault system. Both systems are responding to strain produced by the relative motions of the Pacific and North American tectonic plates.

Active fault zones (i.e., within the last 10,000 years) near Upper Newport Bay include: San Andreas, San Jacinto, Newport-Inglewood, and Whittier-Elsinore (Figure 3.2-1). A brief description of each fault zone and its general proximity to the Upper Newport Bay study area is provided below.

- **San Andreas Fault.** The closest segment of the San Andreas fault zone is located approximately 45 miles (mi) (72 kilometers [km]) northeast of Upper Newport Bay in the San Bernardino and San Gabriel Mountains. This fault system represents the boundary between the Pacific and the North American plates and is the dominant active fault system in California. The largest earthquake on the southern California portion of the San Andreas Fault was the 1857 Fort Tejon earthquake, which caused as much as 30 ft. (9.1 m) of lateral movement or slip. It has been estimated that the San Andreas Fault has a maximum probable earthquake magnitude of 8.3.

- **San Jacinto Fault.** The closest segment of the San Jacinto Fault is located approximately 40 mi. (64.4 km) northeast of Upper Newport Bay. It parallels the San Andreas Fault along the southern side of the San Bernardino Mountains. The maximum probable earthquake projected from this fault system is 7.5 in magnitude.

- **Newport-Inglewood Fault Zone.** This fault system begins in Santa Monica to the northwest and trends southeasterly along the coast through Signal Hill, Seal Beach, Newport Beach, and Irvine. A portion of this fault passes through Upper Newport Bay near Upper Island in a southeasterly direction (FDA 1996). The most recent major earthquake along this fault system was the 1933 Long Beach earthquake with a magnitude of 6.3; the maximum probable earthquake is 7.0 in magnitude.

- **Whittier-Elsinore Fault Zone.** The Whittier-Elsinore fault zone begins in Whittier and extends for approximately 100 miles (160.9 km) in a southwesterly direction along Puente Hills and through the Temescal Valley where it merges with the Elsinore fault system in the Lake Elsinore area (FDA 1996). The closest segment of this fault system is located approximately 17 miles (27.4 km) north of Upper Newport Bay. The Maximum probable earthquake on this fault is 7.3 in magnitude.

Geologic Hazards. "Geologic hazards" is a term used to describe potentially dangerous and destructive actions that may result from a specific geological event, such as an earthquake or volcanic activity. Following is a brief description of various geologic hazards as they relate to the study area:

- **Liquefaction.** Liquefication is the phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of strong, earthquake-induced ground shaking. Saturated, unconsolidated silts, sands, and silty sands within 50 ft. (15.2 m) of the ground surface are most susceptible to liquefaction. All saturated sediment material within Newport Bay is subject to liquefaction.

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[1] Shale (a fine grained sedimentary rock) containing fossilized diatoms (a class of unicellular algae).

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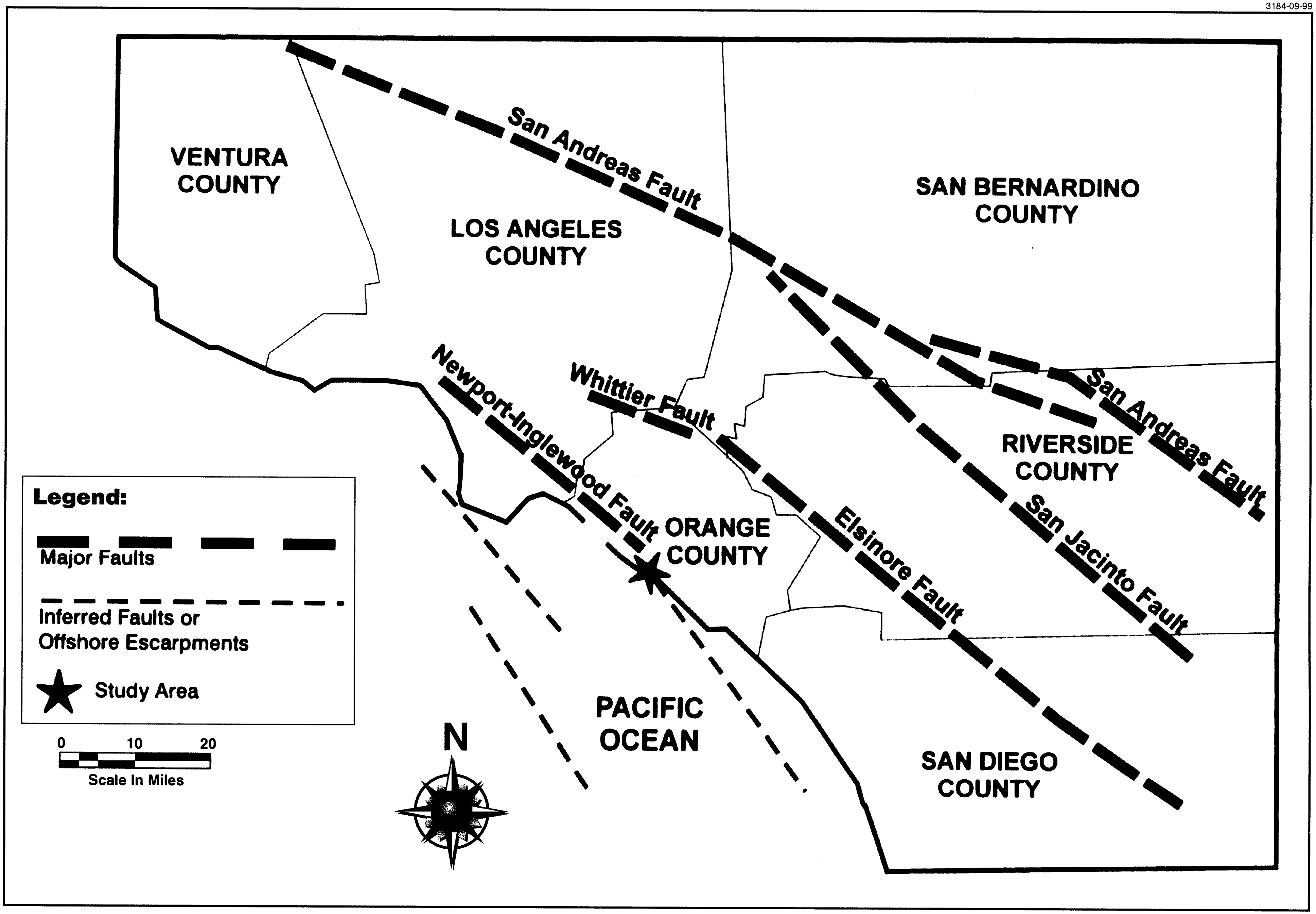

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Source: *Orange County Emergency Management Division, 1986*

ACTIVE FAULT ZONES NEAR UPPER NEWPORT BAY
Figure 3.2-1

- **Subsidence.** Subsidence[2] has occurred in the past in southern California due to four major causes: tectonic activity, groundwater extraction, hydrocompaction of moisture deficient soils, and oil and gas withdrawal. Based on the information in the Orange County General Plan, no major areas of subsidence have occurred in the Upper Newport Bay Area (Orange County 1993).

- **Tsunamis and Seiches.** A tsunami is a sea wave generated by a sub-marine earthquake, major landslide, or volcanic action. These sea waves are long, powerful, low waves which in the open sea create relatively few problems. Newport Beach is shielded by the Channel Islands to the west, and by Point Conception to the north providing a degree of protection to coastal areas and the harbor entrance. Tsunamis hazard for the Upper Newport Bay is negligible.

  A seiche is the oscillation of sloshing of water in an enclosed body of water caused by seismic activity or landsliding. Due to the small surface area of Upper Newport Bay, seiches do not represent a potential hazard (City of Newport Beach 1975).

Regulatory Setting. Geologic resources and geotechnical hazards are governed primarily by local jurisdictions. The conservation elements and seismic safety elements of city and county General Plans contain policies for the protection of geologic features and avoidance of hazard. Building codes in each jurisdiction establish standards for construction of structures depending on the potential for ground movement and faulting. The Alquist-Priolo Earthquake Fault Zoning Act prohibits the construction of buildings within identified fault zones. The Upper Newport Bay study area is not located within an identified Alquist-Priolo Earthquake fault zone (Orange County 1988).

3.2.2 Soils

The following soil series have been identified in the immediate vicinity of Upper Newport Bay (above the mean high tide): Beach, Calleguas, Vista, Myford, Marina, Tidal Flat, Cieneba, Alo, San Emigdio, and Balcom. Figure 3.2-2 illustrates the general soil series locations within the study area and Table 3.2-1 presents the characteristics of the subject soil series. The majority of these soils exhibit a sandy or clay loam texture, have moderate to steep slopes, are moderately to well drained, with runoff medium to rapid (with the exception of the Tidal Flats which are nearly level, poorly drained, and runoff generally ponds). Shrink-swell potential for these soils range from low to high. The erosion hazard for these soils range from slight to high with the exceptions of the Marina and the San Emigdio series, which exhibit slight to moderate erosional hazards. The corrosion risk for uncoated steel is low to high, and for concrete is low to moderate. These soils range in depth from 0 to 80 inches (in) (203.2 cm) below ground surface (USDA 1974).

3.2.3 Sediments

Sediments within Newport Bay vary from coarse sands to fine silts and clays, depending on water current, velocity, and depth. The coarsest sediments are located in shallow areas where strong currents scour the bottom of the channel (i.e., near the Santa Ana Delhi Channel and under the Pacific Coast Highway Bridge). Currents in these areas remove the fine clay and silt sediments leaving mostly sand and shell particles behind. Areas with low current velocities (i.e., deeper waters) are characterized by finer sediments, such as clays and silts.

Examples of composite grain sizes of sediment samples taken in the Upper Bay before the Unit III dredging project (TOXSCAN 1995a,b) and in the Lower Bay before the Corps Lower Bay dredging project (MEC1998) are shown in Table 3.2-2. The data from these studies indicate that the grain size within the Unit I/III and Unit II basins consists of over 60 percent silts and clays. Table 3.2-2 compares the sediment grain size composition within the Bay to sediment grain size at the LA-3 Ocean Dredged Material Disposal Site, which contains sediments comprised of over 90 percent fine-grained materials. Chemical composition of Bay sediments is discussed in Section 3.3.3.

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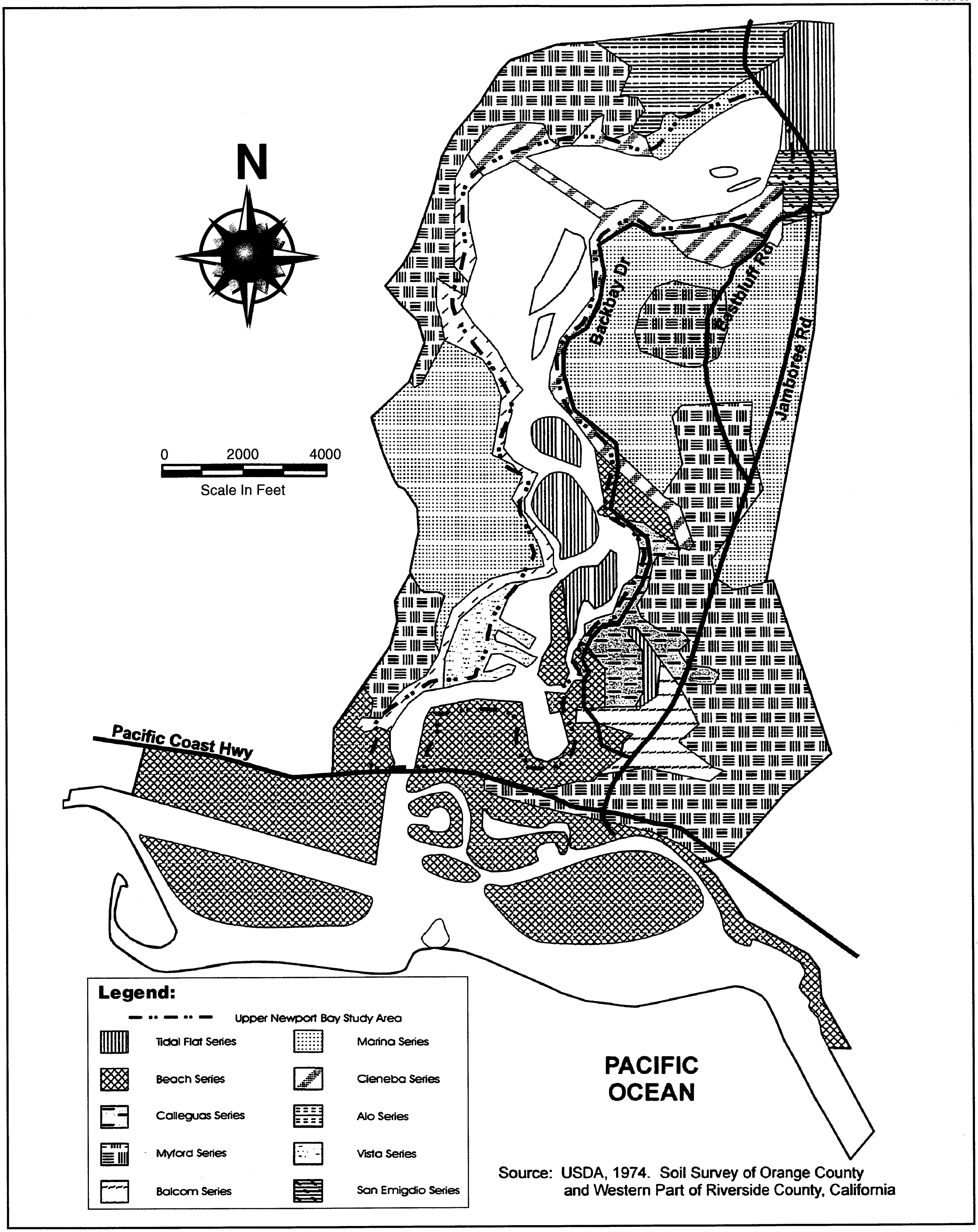
[2] Sinking or settling of the ground surface due to natural or anthropogenic causes.



Source: USDA, 1974. Soil Survey of Orange County and Western Part of Riverside County, California

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GENERAL SOIL LOCATIONS WITHIN THE STUDY AREA
Figure 3.2-2

Table 3.2-1
Soil Series Characteristics in the Vicinity of Upper Newport Bay

Soil Series	Texture	% Slope	Drainage	Runoff	Depth		Shrink Swell Potential	Erosion Hazard	Corrosion Risk	
					in	cm			Steel*	Concrete
Beach	sand, gravel, or cobbles	—	well drained	very slow	—	—	none	high	—	—
Calleguas	clay loam	50 - 75	low	rapid	0 - 15	0 - 38.1	moderate	high	high	low
Vista	coarse sandy loam	30 - 65	well drained	rapid	0 - 39	0 - 99.1	low	high	moderate	moderate
Myford	sandy loam	0 - 30	moderate to well	low to rapid	0 - 79	0 - 200.7	low to high	moderate to high	high	low to moderate
Marina	loamy sand	0 - 9	well drained	slow to medium	0 - 80	0 - 203.2	low	slight to moderate	low	low
Tidal Flat	stratified clayey to sandy	nearly level	poor	generally ponds	—	—	—	—	—	—
Cieneba	sandy loam	30 - 75	poor	rapid	0 - 7	0 - 17.8	low	high	low	low
Alo	clay	9 - 15	well drained	medium	0 - 25	0 - 63.5	high	high	high	low
San Emigdio	fine sandy loam with moderately fine layers	0 - 2	well drained	slow	0 - 61	0 - 154.9	low	slight	high	low
Balcom	clay loam	15 - 30	well drained	rapid	0 - 30	0 - 76.2	moderate	high	moderate	low

Notes: — information not available
* uncoated steel
Source: USDA 1974.

Table 3.2-2
Sediment Grain Sizes in Newport Bay

Composite Samples	% Silt	% Clay	% Sand
Unit I/III Basin: top (surface to -7 MSL)	26.5	34.1	39.4
Unit I/III Basin bottom (-7 MSL to -14 MSL)	26.9	57.3	15.8
Unit II Basin	36.5	26.4	37.1
Access Channel	18.5	21.0	60.5
Dover Shores	25.0	33.3	41.7
Average of Upper Bay Samples	**26.65**	**34.39**	**38.98**
Lower Newport Bay	**33.0**	**44.0**	**23.0**
LA-3 Reference Site	**68.7**	**24.8**	**6.5**

Sedimentation in Newport Bay is the biggest existing and future problem for the ecological reserve. Considerable erosion and transport of sediments from within the Upper Newport Bay watershed accompany winter storms. The primary sources of sediments, of which approximately 85 percent are silt- and clay-sized particles, are erosion within the foothill region of the eastern portion of the watershed, construction sites, and channel banks. Discharges from San Diego Creek are responsible for 94 percent of the sediments delivered to the Upper Bay. The major portion of sediments transported into the Bay is deposited in depositional areas within the Upper Bay, which act as sediment traps or sinks, while a smaller portion, primarily comprising finer grained silts and clays, may be transported to the Lower Bay and eventually to the ocean. Sediment deposition and accumulation subsequently affects water depths, circulation, and habitat distribution.

Past and present watershed changes have greatly altered freshwater inflows to the Upper Bay and have increased sediment inflows. As discussed in Section 1.3, measures were implemented in the 1980s to reduce sedimentation problems in the Bay. These measures included the construction of sedimentation basins in San Diego Creek to trap sediments before they reached the Bay. Even though these measures have reduced sediment inflow volumes, the measures taken cannot trap much of the fine sediments that are transported to the Bay during large storm events. An example is the particularly wet winter storm season of 1997-98 when large volumes of sediment deposited within the Bay during several major storms. Sediments passed by the upper basin, which was filled to capacity prior to the Unit III project, through the Unit II basin, which was filled to approximately 60 percent capacity, and into the navigation channels and slips in the Upper and Lower Bay. Serrano Creek, a tributary of San Diego Creek, is an example of the severity of channel erosion in the watershed. An estimated 400,000 cubic yards (cy) 306,000 cubic meters (cu m) of material eroded from the Serrano Creek channel during these same winter storms.

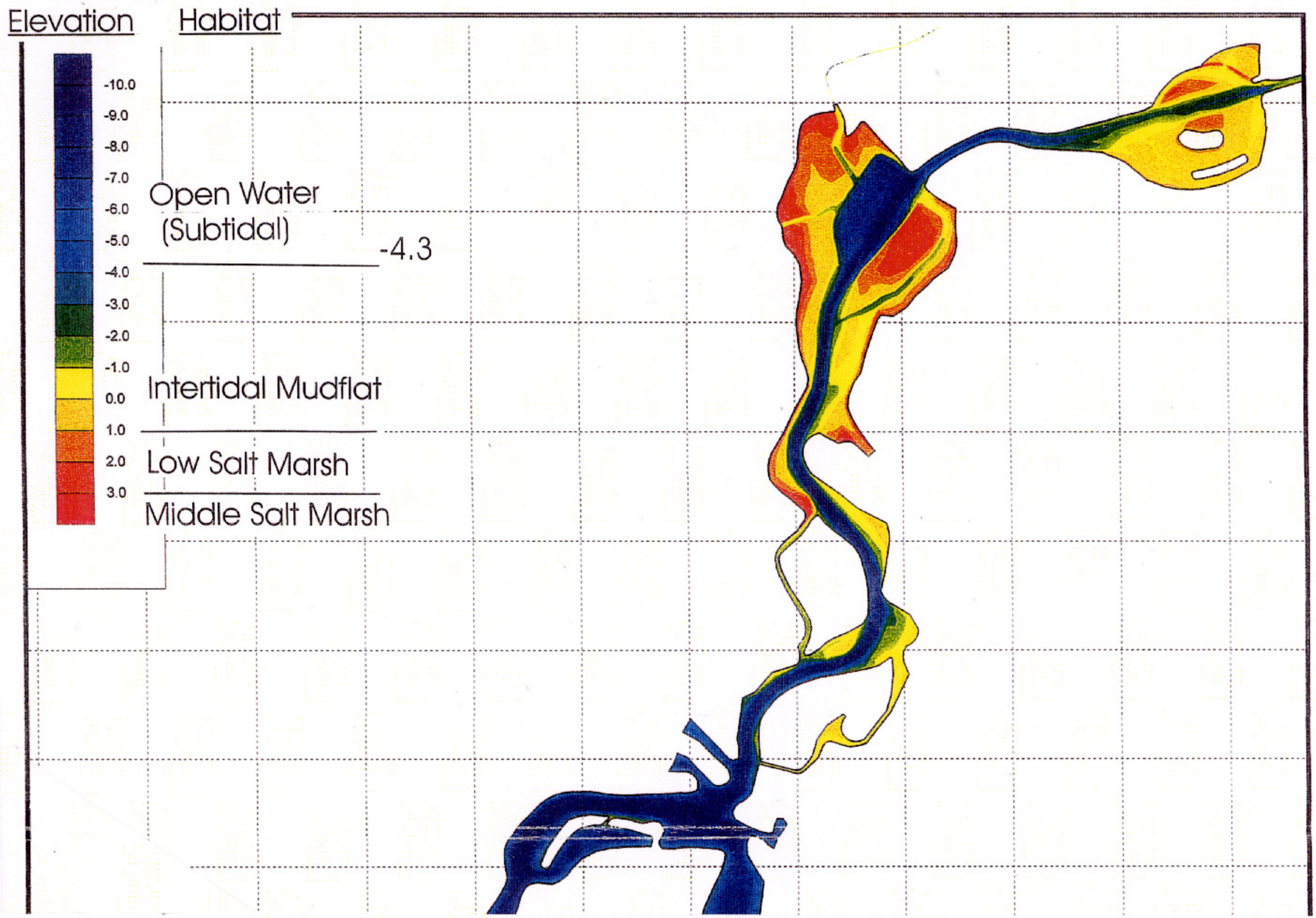
The filling of the Unit I and Unit III basins demonstrates that Newport Bay acts as a trap for fine-grained sediments. A process called flocculation occurs when fine sediments encounter saline waters, even when salinity levels are relatively low. Suspended fine sediments form small masses during flocculation and drop to the bed. This process results in the continued loss of open water areas and shoaling problems, even with the construction of the two in-Bay basins. For instance, prior to the construction of the basins (between 1972 and 1979), sedimentation caused a loss of 180 acre-feet in the tidal prism. Most of the sedimentation occurs within the -0.7 to +1.3 ft. (-0.2 to +0.4 m) Mean Sea Level (MSL) tidal range. Therefore, the transition of habitats within the ecological reserve is from open water to mudflat and eventually to marsh.

The 1997 bathymetry, prior to the Unit III dredging project is shown in Figure 3.2-3. Upper Bay bathymetry following the 1998 to 1999 Unit III dredging is shown in Figure 3.2-4.

Future Without-Project Conditions (50 Years)

As described in Section 1.9, hydrodynamic, sediment and habitat models were used to predict future conditions. Sediment loadings in Upper Newport Bay are expected to be most intense during the next 20 years (to about 2016), presumably related to anticipated construction activities within the adjacent watershed. Subsequent decreases in sediment mass loadings may reflect management practices to restrict loadings and reductions in erosion rates because a relatively larger portion of the watershed will be covered by impermeable surfaces. As an example of future management practices that may reduce sediment loads, the RWQCB (1998a) has developed a Total Maximum Daily Load (TMDL) for sediments in accordance with Section 303(d) of the Clean Water Act. The sediment TMDL objectives include:

1) maintaining both the Unit III and Unit II basins to a minimum depth of -7 ft. MSL;
2) ensuring that sediment control measures to protect the bay habitats do not allow sedimentation to cause more than a 1 percent change from the existing acres;
3) reducing the annual average sediment load in the watershed from a total of approximately 250,000 tons per year to 125,000 tons per year within 10 years, thereby reducing the sediment load to Newport Bay to approximately 62,500 tons per year. It is assumed that the rest of the material would be trapped in the watershed basins;
4) implementing sediment control measures in Upper Newport Bay such that the basins need not be dredged more frequently than about once every 10 years, and the long-term goal of reducing the frequency of dredging to once every 20 to 30 years; and
5) requiring all watershed in-channel and foothill sediment control basins be maintained to have at least 50 percent design capacity available prior to November 15 of each year.



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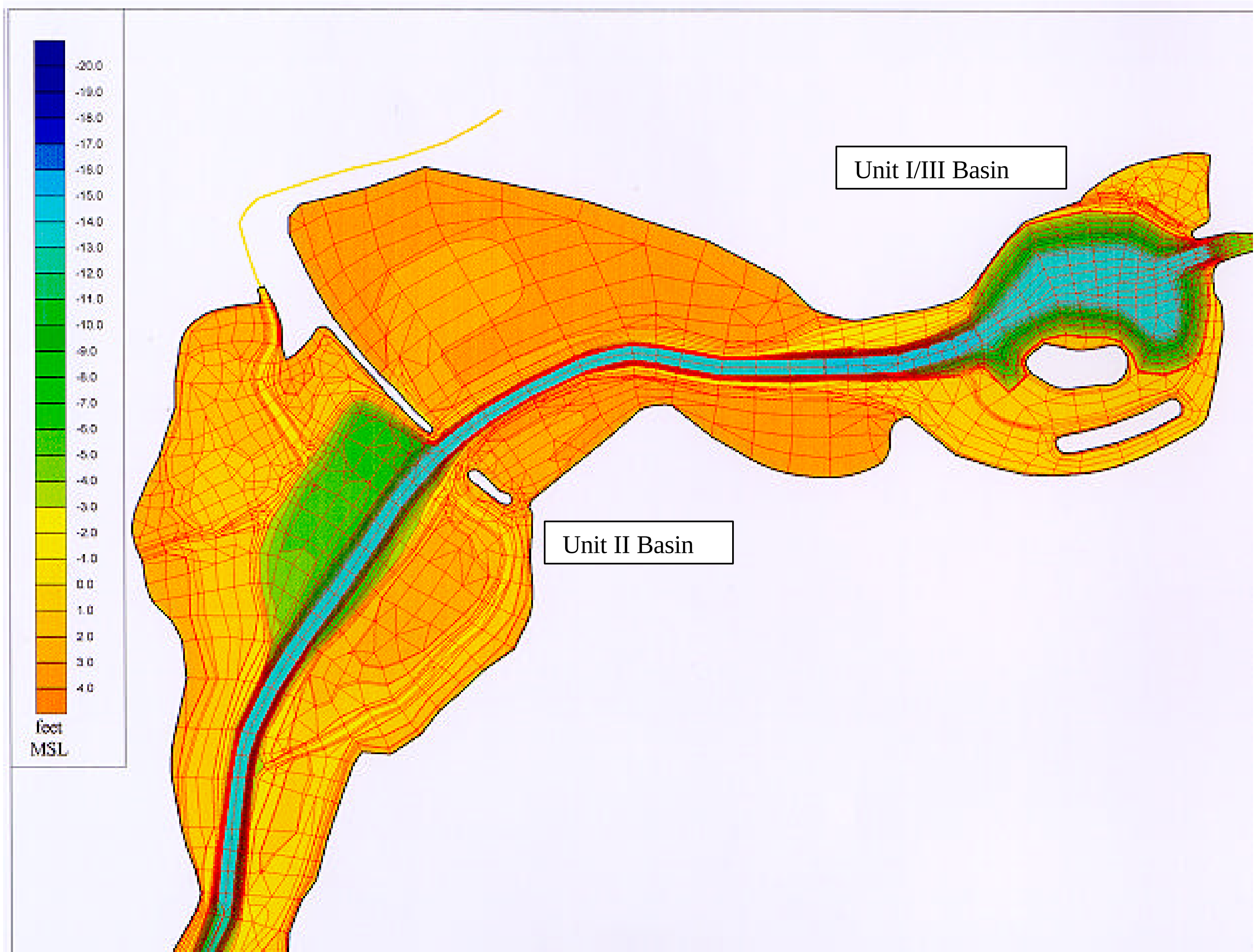
1997 BATHYMETRY
Figure 3.2-3



NO PROJECT ALTERNATIVE YEAR 0 Figure 3.2-4

Other aspects of the sediment TMDL include a monitoring program and a requirement to prepare topographic and vegetation surveys of the bay every three years. Changes to some of the sediment TMDL objectives, as currently written, may be revised based on the findings and recommendations of this feasibility study and the monitoring program.

The projected bathymetry for the 50-year future condition of Upper Newport Bay is based on numerical modeling of hydrological and sedimentation processes performed by Resource Management Associates, Inc. (RMA 1997). The model uses 25-year stream gage records to simulate future sediment yields. Using this approach, future sediment inputs were estimated at 178,000 cy per year (136,000 cu m or 87,000 tons per year), of which an estimated 129,000 cy (99,000 cu m) are expected to be deposited within the Bay. The remainder is expected to be transported to the ocean. The sediment transport model redistributes sediments added to the Upper Bay based on flow and shear conditions simulated by the hydrodynamic model. Initial sedimentation, redistribution, and deposition of newly added and resuspended sediments results in altered sediment elevations (i.e., bottom depths), which are accumulated over the 50-year period and result in predicted net changes in bottom bathymetry. Results of model simulations of bathymetry for the 50-year future condition near the Units III and II basins are shown in Figure 3.2-5.

Under the 50-year future condition, all portions of Upper Newport Bay are expected to shoal relative to present conditions due to sediment accumulation. By year 10, open water areas in the Upper Bay will be filled to the pre-Unit III dredging levels and the Unit II basin open water areas will be the mudflats. By year 50, the Upper Bay would consist of a single channel from the mouth of San Diego Creek to the Lower Bay, with large areas of mudflats within the Units III and II basins which would be exposed at 0 ft. Mean Lower Low Water (MLLW). Depths within the channel will decrease gradually with distance from the head of the Bay from +2 ft. (+0.6 m) MSL to -2 ft. (-0.6 m) MSL in the vicinity of the Narrows. Areas flanking the main channel in the vicinity of the Units III and II basins are predicted to be at an elevation of +2 ft. (+0.6 m) MSL, and the small channels that presently exist in these areas will be completely silted. Flow through the Upper Bay is expected to be largely confined to the main channel.

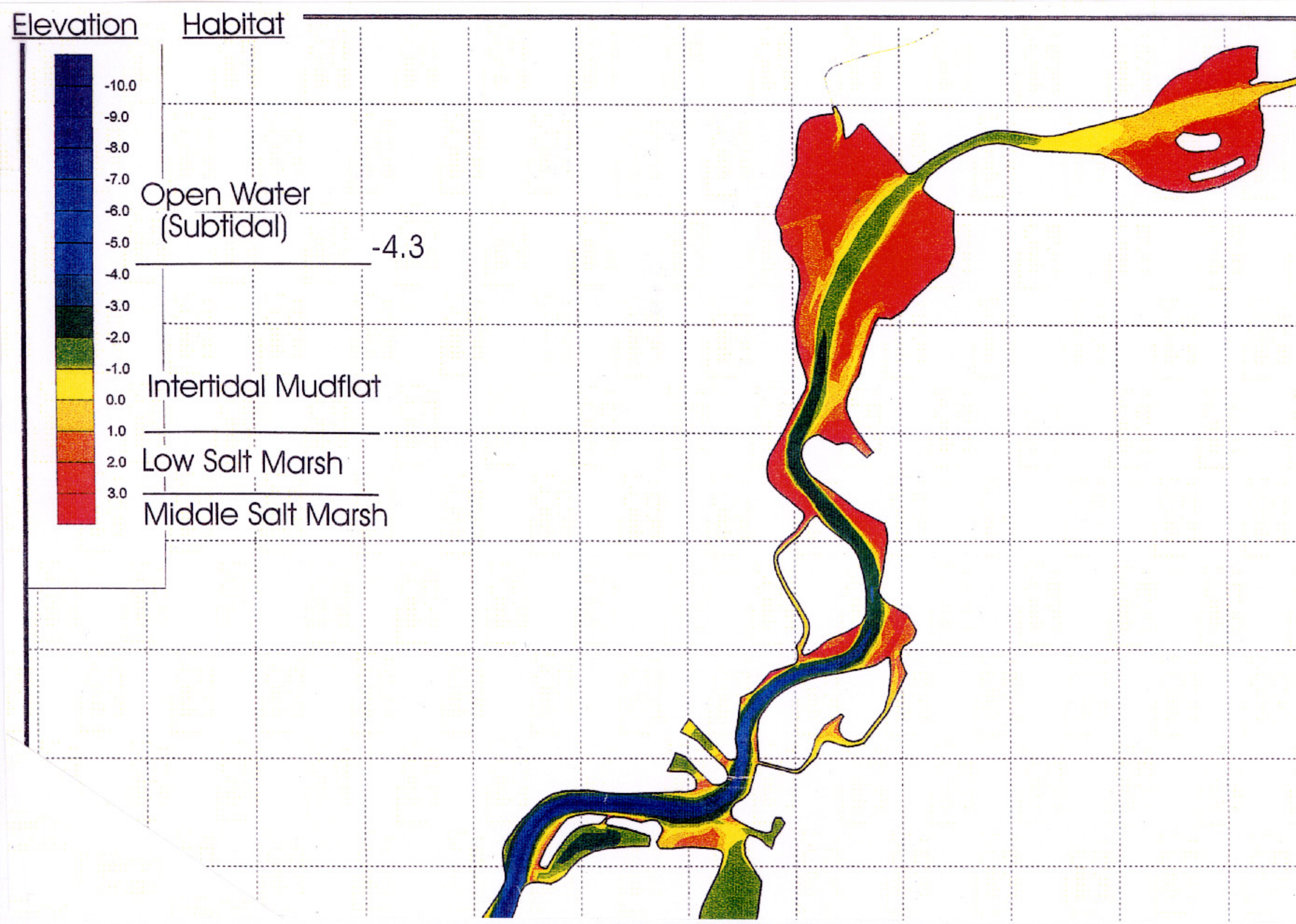
3.3 WATER RESOURCES

The following sections describe existing baseline and future conditions for ground water (Section 3.3.1), surface water (Section 3.3.2), and sediments (Section 3.3.3).

3.3.1 Ground Water

Ground water in areas of the watershed adjacent to Upper Newport Bay (e.g., North Campus area of University of California, Irvine) occurs within two zones separated by a semi-permeable clay layer. The upper zone is semi-perched (spatially and seasonally discontinuous). Depth to ground water in the vicinity of San Diego Creek and the Upper Bay is very shallow (10 to 15 ft.). Gradients and flow directions for the shallow aquifer are not well known, although some hydraulic connection with surface waters in San Diego Creek, and subsequent discharge of ground water to Upper Newport Bay, is likely (R. Herndon, OCWD pers. comm.). The only ground water well in the immediate vicinity of Upper Bay is located near Campus Drive (UCI), and it is used intermittently to supply freshwater from the deeper aquifer to San Joaquin Marsh.

The quality of the basin ground water is affected by elevated concentrations of nitrates, total dissolved salts, and trace volatile organic compounds (VOC) such as trichloroethylene (TCE). Some of the basin ground water, including the shallow aquifer in the Irvine area, contain nitrogen concentrations up to 20 to 30 mg/L, which exceed federal drinking water standards (10 mg/L as nitrogen). Also, total dissolved salt concentrations in some ground water exceed 1,000 mg/L (OCWD 1994), compared with a recommended maximum level of 500 mg/L. Ground water quality in the general Irvine area is also affected by nitrates, total dissolved salts, selenium, and TCE. The presence of excess salts and nitrates are attributable to agricultural practices, and TCE is from historical discharges of solvents and



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FUTURE BATHYMETRY IN 50 YEARS
Figure 3.2-5

degreasers at El Toro Marine Corps Air Station (OCWD 1994). A number of wellhead treatment programs are being conducted by the Orange County Water District (OCWD) to cleanup ground waters and improve the water quality.

The quality of ground water in the immediate vicinity of Upper Newport Bay is not well known because there are no production wells in the area (due to the presence of salt water). Ground water extracted in the Irvine area currently are used for irrigation only, although OCWD is currently working on systems capable of treating ground waters to provide potable quality water (R. Herndon, OCWD pers. comm.).

Future demands for ground water are expected to increase by approximately 10 to 15 percent over the next 15 years. Additional wastewater reclamation is expected to gradually replace imported supplies, and treatment/remediation efforts are also expected to increase, over the next 10 to 20 years (OCWD 1994). After buildout of the area is reached in 2018, subsequent demands for ground water are expected to increase at a relatively lower rate given anticipated population growth.

3.3.2 Surface Water

Upper Newport Bay is considered primarily a marine saltmarsh containing a mixture of ocean water and freshwater runoff. Water quality in Upper Bay is largely controlled by watershed inputs and hydrology, which regulates the circulation and exchange with the Lower Bay and ocean. Human uses of the Lower Bay, such as boating, also affect water quality in the Upper Bay. Surface water inputs and circulation are described in Section 3.3.2.1, and water quality is described in Section 3.3.2.2.

3.3.2.1 Surface Water Inputs

The primary source for freshwater inputs to Upper Newport Bay is drainage from the 154-square-mile (98,560-acre) watershed. San Diego Creek drains approximately 85 percent of the watershed area, and also receives small, periodic discharges of reclaimed wastewaters from the Michaelson Water Reclamation Plant. Secondary sources of freshwater to the Upper Bay include urban and industrial runoff from Santa Ana-Dehli Creek, urban and residential runoff from Big Canyon Creek, and discharges from other minor point sources such as storm drains. Fresh water flow volumes vary seasonally. Average flows during summer months, originating primarily from agricultural runoff, are 1 to 3 cfs (less than 1 cubic meter [cu m] per second). In contrast, maximum flows occur during winter storms. Storms in 1976-77 generated flows up to 25,000 cfs (710 cu m per second) in San Diego Creek and up to 4,800 cfs (140 cu m per second) in Santa Ana-Dehli Creek. The December 1997 storm event generated an estimated peak discharge of 39,000 cfs (1,092 cu m per second) in San Diego Creek.

Prior to 1920, freshwater inputs to Lower Newport Bay were primarily associated with Santa Ana River discharge. Diversion of the river eliminated this source for freshwater and sediments. San Diego Creek was diverted into Upper Newport Bay in the early 1900s, although flow occurred only during the wet season. Compared with historical flows, channelization of San Diego Creek in the early-1960s, along with increased runoff from agriculture and domestic sources, dramatically increased freshwater flows, as well as sediment inputs, to Upper Newport Bay. Future flow volumes in San Diego Creek are expected to reflect watershed inputs. For example, in 1980, land use within the watershed was 23 percent agricultural, 47 percent urbanized, 28 percent open, and 2 percent construction. Projected ultimate conditions are 81 percent urbanized, 11 percent open, 8 percent rural, and no agriculture (Boyle Engineering Corporation 1982). Increasing urbanization will cover proportionately greater areas with impermeable surfaces, which is expected to reduce rates of surface water infiltration and increase runoff. Consequently, peak flows in San Diego Creek are predicted to increase by 20 to 80 percent for ultimate (year 2030) versus 1980 conditions.

Fresh water inputs represent an important source for suspended sediments, nutrients, bacteria, debris, and organic and inorganic pollutants to Upper Newport Bay. Excessive sediment loadings associated with storm water runoff cause siltation and shoaling within Upper Newport Bay, which have significant effects on water circulation and habitat distribution and extent. Historically, watershed runoff has represented an important source of nutrients to Upper Newport Bay. In particular, erosion and transport of fertilizers used by agriculture and nursery facilities represent primary sources of nitrates and phosphates to the Bay. Some improvements have occurred to limit nutrient inputs, although San Diego Creek, Reaches 1 and 2, as well as Upper and Lower Newport Bay, are still considered impaired with respect to excessive nutrients (RWQCB 1997). In 1993, nitrate concentrations in San Diego Creek reportedly were 16 milligrams per liter (mg/L), and exceeded the Basin Plan numeric water quality objective for San Diego Creek, Reach 1 of 13 mg/L of total inorganic nitrogen. Recent (1996/97) monitoring performed by the Irvine Ranch Water District (IRWD) has shown comparable nitrate concentrations in San Diego Creek waters. Nutrient loadings from other streams are considerably lower (Merkel and Associates 1996). Nutrient inputs are important to Newport Bay because excessive loadings can contribute to eutrophication, which promotes large algal blooms that can, in turn, result in significant decreases in dissolved oxygen concentrations in Bay waters. Bacterial and chemical contaminant inputs from watershed runoff also affect the water quality, and debris discharges degrade the aesthetic quality of Bay waters.

The future quality of freshwater inputs to Upper Newport Bay will also reflect changes within the watershed, such as increased urbanization which replaces open lands with impermeable surfaces, decreased agricultural uses which will reduce nutrient and pesticide loadings, and watershed management practices designed to reduce mass loadings of sediments, nutrients, and/or chemical contaminants. For example, the RWQCB has identified a 10-year goal of 50 percent reductions in current annual loads of total nitrogen and phosphorus to curb excess nutrient loadings (RWQCB 1997). Similar goals for reductions in chemical contaminant inputs have not been defined. TMDL objectives established by the RWQCB for sediment, nutrients, and pathogens (RWQCB 1998) will reduce inputs to Newport Bay of those substances. TMDLs will be established in the near future to reduce impacts of toxics.

3.3.2.2 Hydrologic Regime

The hydrologic regime includes water circulation and individual water quality parameters, including temperature, salinity, dissolved oxygen, acidity/alkalinity (pH), nutrients, water clarity, trace contaminants, bacteria, and debris. Water quality objectives for Upper Newport Bay are defined in the 1995 Water Quality Control Plan for the Santa Ana River Basin (Basin Plan), enclosed bays and estuaries (see Table 3.3-1). Most of these objectives are descriptive; few numerical criteria exist. Beneficial uses identified for Upper Newport Bay include water contact recreation, sportfishing, preservation of rare and endangered species, marine habitat, shellfish harvesting, and areas of unique biological habitat. Upper Newport Bay was placed on the 1996 listing of impaired water bodies as defined by Section 303(d) of the Clean Water Act. According to the listing, beneficial uses of Upper Newport Bay are not being attained due to eutrophication, sedimentation, recreational impacts, and threats of toxic pollutants and storm water runoff. Further, bacterial abundances in Upper Bay waters historically exceeded the standards for body contact recreation and shellfish harvesting defined in the Water Quality Control Plan (Table 3.3-1). Therefore, these uses have been restricted in Upper Newport Bay since the 1970s.

The RWQCB has identified Upper Newport Bay as water quality limited due to sedimentation, nutrients, bacterial contamination (which has resulted in shellfish harvesting and water-contact recreation bans in some areas of the Upper Bay), several heavy metals, and pesticides. To address these problems, the RWQCB has defined TMDL objectives to set limits for sediments, nutrients, and pathogens in the watershed and within Newport Bay (RWQCB 1998a,b). The TMDL for sediments was discussed in Section 3.2.3. TMDL objectives for nutrients and pathogens are discussed below. The RWQCB is still in the process of defining TMDL objectives for toxics.

Ambient water quality conditions in Upper Bay reflect present and past influences, quality and volumes of freshwater inputs, tidal exchange, and human uses of the Bay and activities within the watershed. Exceedances of water quality objectives occur intermittently at a number of locations, but not consistently at any specific locations (S. Dawson, RWQCB, pers. comm.). This results, in part, because values associated with specific water quality parameters at individual locations within Upper Newport Bay vary with the tidal cycle (MBC/SCCWRP 1980).

Table 3.3-1
Water Quality Objectives for Enclosed Bays and Estuaries

Enclosed bay and estuarine communities and populations, including vertebrate, invertebrate, and plant species, shall not be degraded as a result of the discharge of waste. Degradation is damage to an aquatic community or population with the result that a balanced community no longer exists. A balanced community is one that is (1) diverse, (2) has the ability to sustain itself through cyclic seasonal changes, (3) includes necessary food chain species, and (4) is not dominated by pollution-tolerant species, unless that domination is caused by physical habitat limitations. A balanced community also (5) may include historically introduced non-native species, but (6) does not include species present because best available technology has not been implemented, or (7) because site-specific objectives have not been adopted, or (8) because of thermal discharges.

Waste discharges shall not contribute to excessive algal growth in receiving waters.

Bays and Estuaries
REC-1 - *Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period*
SHEL - *Fecal coliform: median concentration not more than 14 most probable number (MPN) 100 mL and not more than 10% of samples exceed 43 MPN/100 mL.*

To protect aquatic life, the chlorine residual in wastewater discharged to enclosed bays and estuaries shall not exceed 0.1 mg/L.

Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affects beneficial uses. The natural color of fish, shellfish, or other bay and estuarine water resources used for human consumption shall not be impaired.

Waste discharges shall not contain floating materials, including solids, liquids, foam or scum, which cause a nuisance or adversely affect beneficial uses.

Waste discharges shall not result in deposition of oil, grease, wax or other materials in concentrations which result in a visible film or in coating objects in the water, or which cause a nuisance or adversely affect beneficial uses.

The dissolved oxygen content of enclosed bays and estuaries shall not be depressed to levels that adversely affect beneficial uses as a result of controllable water quality factors.

The pH of bay or estuary waters shall not be raised above 8.6 or depressed below 7.0 as a result of controllable water quality factors; ambient pH levels shall not be changed more than 0.2 units.

Radioactive materials shall not be present in the bay or estuarine waters of the region in concentrations which are deleterious to human, plant or animal life.

Enclosed bays and estuaries shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.

The dissolved sulfide content of enclosed bays and estuaries shall not be increased as a result of controllable water quality factors.

Waste discharges shall not contain concentrations of surfactants which result in foam in the course of flow or use of the receiving water, or adversely affect aquatic life.

The enclosed bays and estuaries of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause a nuisance or adversely affect beneficial uses. The natural taste and odor of fish, shellfish or other enclosed bay and estuarine water resources used for human consumption shall not be impaired.

All bay and estuary waters shall meet the objective specified in the Thermal Plan.

Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health. The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

Increases in turbidity which result from the controllable water quality factors shall comply with the following:

Natural Turbidity	*Natural Increase*
0-50 NTU	*20%*
50-100 NTU	*10 NTU*
Greater than 100 NTU	*10%*

All enclosed bay and estuaries of the region shall be free of changes in turbidity which adversely affect beneficial uses.

Source: Regional Water Quality Control Board, Santa Ana Region 1995

Water circulation, tidal exchange, and bathymetry are important physical factors that affect water and sediment quality within Upper Newport Bay. Circulation is influenced primarily by tidal currents, although seasonally variable freshwater inputs can be important to the vertical and horizontal distributions of water quality parameters. Winds also may contribute to mixing within the Bay and affect water quality through wave-induced resuspension of bottom sediments.

Currents are primarily driven by tides and, during winter storms, freshwater inputs from the major stream flows. Tides are semi-diurnal, with two high tides and two low tides per day. Current speeds vary, but typical speeds are from 0.3 to 1.1 knots, although max ebb currents may reach 2.5 knots during a strong runoff event. Circulation in some parts of the Upper Bay is limited due to channel restrictions. Typical current speeds in the main channel areas of the Bay during non-storm periods are not considered erosive, but they are capable of transporting fine sediments resuspended by waves.

Small waves, typically less than 0.5 ft. (0.15 m), occur in the Bay as a result of sea breezes; slightly larger waves may occur during Santa Ana conditions (strong, easterly winds). Wind-induced turbulence is sufficient to erode and resuspend bottom sediments in shallow areas of Upper Bay.

The OCPFRD conducts monthly monitoring of water quality parameters at 11 stations within Newport Bay. Those data provide a long term baseline of water quality parameters within the Bay and are evaluated in the following discussion. More recent measurements were made by the IRWD in 1996 and 1997 (Table 3.3-2).

Table 3.3-2
Values for Water Quality Parameters Measured by Irvine Ranch Water District at Five Locations in Upper Newport Bay during November 1996 and March 1997

Station	November 1996					March 1997				
	C	D	E	F	G	C	D	E	F	G
Temperature (°C)	17.7	17.5	17.4	17.3	17.4	16.7	15.8	15.2	15.5	15.4
Salinity (ppt)	28.2	30.9	32.0	32.4	32.5	26.5	29.4	28.8	30.6	31.4
D.O. (mg/L)	3.6	4.6	5.4	5.6	5.9	3.8	5.9	5.9	6.2	5.9
pH (S.U.)	7.7	7.7	7.8	7.9	7.9	7.9	7.9	7.9	7.9	7.9
TIN (mg/L)	1.5	0.72	0.35	0.23	0.23	1.8	1.2	1.2	0.84	0.57
Phosphates (mg/L)	0.18	0.11	0.07	0.06	0.07	0.05	0.04	0.04	0.04	0.04
Turbidity (NTU)	4.8	5.5	5.7	5.9	5.1	8.6	5.2	5.2	19	21
TSS (mg/L)	16	24	21	13	17	19	9.2	34	47	39
Total Coliforms (MPN/100mL)	170	30	80	50	22	110	110	70	240	22
Cadmium (μg/L)	0.039	0.066	0.075	0.081	0.070	0.17	0.15	0.16	0.16	0.15
Copper (μg/L)	12.2	1.8	3.1	2.9	2.4	2.16	2.43	1.79	1.90	2.13
Nickel (μg/L)	1.1	1.0	1.0	0.9	0.8	1.67	1.13	1.33	1.33	1.23
Zinc (μg/L)	4.1	7.1	9.8	8.4	6.4	7.23	7.83	9.37	7.78	7.61
Lead (μg/L)	0.041	0.049	0.044	0.042	0.031	0.32	0.30	0.13	0.12	0.10

Data from IRWD Stations C, D, E, F, and G, surface depths, except that metals during Nov. 1996 are composited over surface, mid-, and bottom depths.
Notes: D.O. = dissolved oxygen
TIN = total inorganic nitrogen
TSS = total suspended solids
MPN = maximum probable number
NTU = neophelometric turbidity units

Temperature/Salinity

Minimum water temperatures of 13° to 16°C occur in winter, and maximum temperatures up to 27°C occur in summer, usually on the uppermost portion of the Bay. Differences between surface and bottom water temperatures are more pronounced during late summer due to solar heating of surface layers.

Seasonal ranges in temperature and salinity values are greater in the Upper Bay than in the Lower Bay and the adjacent ocean due to the relatively stronger influences of runoff and smaller moderating influences from ocean waters. Recent measurements of temperature and salinity at five locations in Upper Bay, performed as part of the IRWD monitoring program, are summarized in Table 3.3-2. Figure 3.3-1 shows the locations of the stations. No numeric or descriptive water quality objectives for temperature or salinity are defined in the Basin Plan.

Salinity is influenced by freshwater inputs, tidal exchange with Lower Bay waters, and the effects of evaporation. Strong salinity gradients from Upper Newport Bay towards the entrance channel occur during periods of heavy rainfall, while gradients during other months are less pronounced. However, the uppermost basin generally exhibits reduced salinity near San Diego Creek even during summer months. Salinity values range from a minimum of approximately 1 part per thousand (ppt) in areas influenced by freshwater inputs to maximum values of 34 ppt, which reflect the effects of evaporation in areas of minimal tidal exchange or freshwater influences. Differences in surface and bottom salinity conditions may occur, particularly during winter following storm runoff into the Upper Bay, due to density differences between freshwater and seawater.

Dissolved Oxygen/pH

Water quality objectives for Upper Newport Bay specify that dissolved oxygen shall not be depressed to levels that adversely affect beneficial uses. Although no numerical criterion exist, concentrations above 5 mg/L typically are considered adequate to support biological organisms. However, some marine and estuarine species are tolerant of much lower levels. Dissolved oxygen concentrations in Upper Newport Bay waters have exhibited a wide range from 0.4 to 13.9 mg/L. Supersaturation of Upper Bay waters with oxygen during daylight results from photosynthetic activities of the large standing stock of attached and floating algae. Respiration during the night and decomposition of algae increases the oxygen demand and lowers dissolved oxygen concentrations. Recently, concentrations measured by IRWD at five locations in Upper Bay during four surveys in 1996-97 exhibited a relatively smaller range (from 3.6 to 7.9 mg/L). Nevertheless, some values were still below the 5 mg/L threshold (Table 3.3-2).

Data collected by the County of Orange between 1991 and 1996 showed typical ranges of dissolved oxygen between 5.5 to 9 mg/L (Appendix B). Only one value below 5 mg/L was measured in the Upper Bay.

Water quality objectives for Upper Newport Bay specify that the pH (acidity/alkalinity) shall not be raised above 8.6 or depressed below 7.0. Measurements performed by IRWD during 1996-97 showed a range of pH from 7.1 to 8.1 (Table 3.3-2). Therefore, the pH values for Upper Bay waters did not exceed the objectives. The County of Orange database showed that between 1991 and 1996, pH readings in the Upper Bay were occasionally slightly above or below the objectives (Appendix B).

Nutrients

Water quality in Upper Newport Bay is affected by excessive nutrient loadings associated with watershed inputs. While there are a number of sources of nutrient input, tail waters from the irrigation of agricultural crops and from several commercial nurseries in the watershed have been the predominant source (RWQCB 1998b). High nutrient loadings are considered a problem because they promote excessive growths of mats of green algae (*Ulva*, *Enteromorpha*, and *Cladophera*), which cause depressed dissolved oxygen concentrations and represent a nuisance to recreational users of the Bay. For example, a green algae bloom in 1986 which caused anoxic conditions was attributed to decomposing algae (RWQCB 1997). During subsequent years, following implementation of nutrient controls, algal blooms in the Lower Bay have declined, and blooms of green algae have been confined to the Upper Bay. Measurements performed by OCPFRD of total inorganic nitrogen in waters from the vicinity of Unit II Basin have shown concomitant declines. However, algal blooms still occur in Newport Bay and San Diego Creek.

Recent measurements of nutrient concentrations in Upper Bay waters reported by IRWD are summarized in Table 3.3-2. Total inorganic nitrogen and ortho-phosphate concentrations at five

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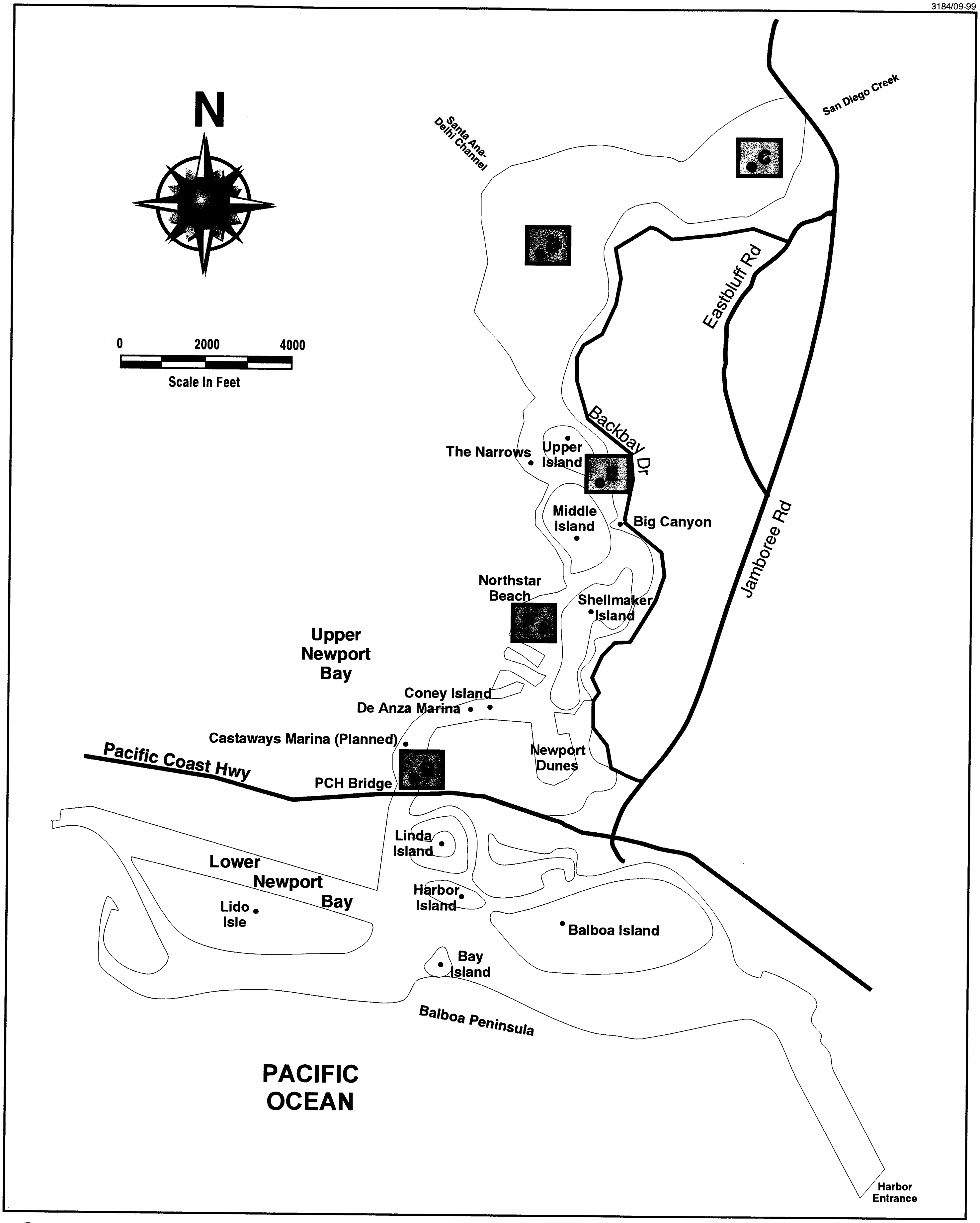

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IRWD WATER QUALITY MONITORING LOCATIONS
Figure 3.3-1

locations within Upper Bay ranged from 0.2 to 2.5 mg/L and <0.04 to 0.18 mg/L, respectively. By comparison, total inorganic nitrogen concentrations measured by OCPFRD in the vicinity of the Unit II Basin during 1996-97 were within 2.5 to 5 mg/L. The reason(s) for these differences in concentration ranges is not evident. Nutrient concentrations in Upper Newport Bay waters generally decrease with distance from the mouth of San Diego Creek towards the Lower Bay. Nutrient levels at individual locations, especially those within tidal channels, vary with the tidal cycle as well as seasonally, with generally higher concentrations during winter due to runoff-derived inputs and lower concentrations in summer due to reduced inputs and greater utilization by plants and algae. In total, present nutrient levels are considered by RWQCB (1997) to represent a lower eutrophic range (2.5 to 5 mg/L) and are responsible, in part, for the Section 303(d) listing of Upper Newport Bay as impaired.

The nutrient TMDL addresses nutrient loading to the Bay, particularly from the San Diego Creek watershed, and the contribution to seasonal algal blooms (RWQCB 1998b). The nutrient TMDL for the Bay and watershed provide loading targets and compliance schedules for seasonal and annual amounts of total nitrogen and phosphorus. There are 5-, 10- and 15-year total nitrogen allocation targets for the watershed and bay, and 5- and 10-year allocation targets for total phosphorus. The nutrient load reduction targets will be incorporated into waste discharge requirements as effluent limits, load allocations, and wasteload allocations to ensure that the total inorganic nitrogen for the bay and watershed are achieved, and the Clean Water Act requirements for the implementation of a TMDL are satisfied.

Water Clarity/Turbidity

The clarity of Upper Newport Bay waters is affected by amounts of suspended sediments and floating algae (e.g., plankton). Suspended sediment concentrations reflect the magnitude of runoff-derived settleable solids, and the effects of wave-induced sediment resuspension in shallow areas of the Bay. Algal and plankton blooms can also reduce water clarity and light transmittance, and produce the highly turbid conditions that occur throughout much of the year (Merkel and Associates 1996).

Recent turbidity levels and total suspended solids concentrations in Upper Bay waters reported by IRWD are summarized in Table 3.3-2. Over the last few years, concentrations of total suspended solids reported by IRWD in Upper Newport Bay sometimes have exceeded 100 mg/L and turbidity levels have ranged from 1 to 29 nephelometric turbidity units. Although no numerical standards exist for total suspended solids, the reported values indicate a wide range in turbidity conditions with potentials to interfere with beneficial uses, such as marine habitat.

Trace Metals and Organics

Watershed runoff also represents a primary source of trace metals and organics, especially chlorinated pesticides and organophosphorus herbicides, to the Upper Newport Bay. However, recent analyses of San Diego Creek waters performed for the IRWD monitoring program showed low or nondetectable concentrations of most of the EPA priority pollutant organic compounds. Historically, pesticides were widely used in agricultural areas, and runoff from these areas contributed to inputs of organic contaminants such as DDTs, endosulfans, and diazanon, as well as selected metals such as selenium, arsenic, and zinc, which were used as pesticides or soil amendments. Watershed inputs of waste oils and automobile exhaust particles also represent a likely source for polycyclic aromatic hydrocarbons to Upper Newport Bay. Like the chlorinated hydrocarbons, these compounds typically have a strong affinity for particles. Thus, the fate of these contaminant inputs are controlled by the transport and eventual deposition of particles within the Bay. Tire wear and automobile exhaust particles deposited on roads within the watershed, which are subsequently washed into the Bay by runoff, also represent important sources for zinc and lead. Mercury inputs may result from erosion of residual tailings from historical cinnabar (HgS) mines within the watershed.

Dissolved metal concentrations in Upper Newport Bay waters have been measured during recent IRWD monitoring surveys (Table 3.3-2). Detectable levels were observed for cadmium (0.039 to 0.17 micrograms per liter [μg/L]), copper (1.8 to 12.2 μg/L), nickel (0.8 to 1.7 μg/L), lead (0.031 to 0.049 μg/L), and zinc (4.1 to 9.8 μg/L), while chromium concentrations were below analytical detection limits. No numerical criteria have been defined in the Basin Plan for concentrations of metals in estuarine waters. However, with the exception of copper, all these levels are below that set by the National Toxics Rule. The National Toxics Rule sets a maximum value for copper of 2.4 μg/L. The long-term water quality monitoring data base of the County of Orange also shows frequent excedences of National Toxic Rule objectives for copper in Upper Newport Bay (Appendix B). On a number of occasions OPCFRD has also recorded concentrations of silver and zinc in Upper Newport Bay that exceed the National Toxics Rule objectives of 1.9 μg/L for silver and 90 μg/L for zinc. Trace organic contaminants have not been measured directly in Upper Bay waters. However, IRWD reported that volatile and semi-volatile organic compounds were nondetectable in San Diego Creek waters, indicating low input rates for these compounds during the monitoring period.

Bacteria

Bacteria originate within Newport Bay and the watershed, and may be due to a combination of animal, avian, and human sources. Historically, sewage discharges from boats were a primary source for bacteria in the Lower Bay (Merkel and Associates 1996). Due to consistently high coliform levels, Upper Newport Bay was closed to body-contact recreational uses in 1974 and to shellfish harvesting in 1978. Recent measurements performed by the Orange County Health Care Agency (OCHCA) during 1996-97 indicated coliform levels from less than 20 most probable number (MPN) per 100 mL to 16,000 MPN/100 mL at four sites in the Upper Bay (Vaughn's Launch, Ski Zone, North Star Beach, and De Anza). Total coliform bacteria levels reported by IRWD for five sites in Upper Bay during 1996-97, summarized in Table 3.3-2, were similar to those measured by the County of Orange. Although these levels can not be compared directly to the REC-1 and SHEL standards (Table 3.3-1), which are based on fecal coliform concentrations, it is evident that coliform concentrations have declined from historical levels in Upper Newport Bay waters, but still may represent a problem.

The pathogen TMDL addresses bacterial contamination of the waters of Newport Bay (RWQCB 1998b). The two beneficial uses that can be affected are water-contact recreation and shellfish harvesting. OCHCA conducts routine bacteriological monitoring and more detailed sanitary surveys, and is responsible for closure of areas to recreational and shellfish harvesting uses if warranted by the survey results. The pathogen TMDL applies waste load allocations for fecal coliform for vessel waste and urban runoff, including storm water. Initial work efforts are directed towards monitoring and assessment of existing conditions.

Debris

Large amounts of floating, man-made debris collects in Newport Bay, especially following storm events. Organic debris from riparian habitats in San Diego Creek is also added to Upper Newport Bay during winter storms. A portion of the debris collects in a debris boom near Northstar Beach. Otherwise, the fate of the debris is controlled by currents and wind and the buoyancy of the material. OCPFRD recently installed a trash and debris boom in the Santa Ana Delhi Channel which has helped reduce input to the Bay from that source. Discharges of wastes containing floating materials which cause a nuisance or adversely affect beneficial uses are prohibited in the Basin Plan.

Future Without-Project Conditions (50 year)

Future water quality conditions in Upper Newport Bay will reflect changes in the magnitude of contaminant mass loadings and the extent to which these materials are flushed due to tidal mixing and exchange with the ocean. Increased urbanization is expected to result in proportionately higher mass loadings of chemical contaminants, bacteria, and debris, although implementation of watershed management practices, particularly those that would meet TMDL objectives set by the RWQCB (1998a,b), may be effective at offsetting or reducing these loadings. Future declines in agricultural activities within the watershed are also expected to result in reduced nutrient and pesticide loadings to Upper Newport Bay.

the State Water Resources Control Board, Bay Protection and Toxic Cleanup Program (BPTCP), and these effects levels are summarized in Table 3.3-3. Sediments collected in the Unit I basin and access channel to the Unit II basin in 1995 prior to the Unit III dredging project are shown in Table 3.3-4.

The State Water Resources Control Board BPTCP identifies, ranks, and characterizes toxic hot spots in California bays, estuaries and ocean waters (SWRCB 1999). One candidate toxic hot spot was identified in Upper Newport Bay in the Narrows below the Unit II basin. The Narrows was identified as a candidate toxic hot spot because sediment toxicity was observed, and chlordane, zinc and DDE exceeded water quality objectives. The Narrows was ranked "moderate" for aquatic life impacts because of the sediment toxicity. The Narrows was ranked "low" for water quality objectives because objectives were infrequently exceeded. The site was considered to have a "moderate" potential for natural remediation indicating that it may or may not improve without intervention. The overall ranking of the Narrows was "moderate" priority.

Table 3.3-3
Summary of Bulk Chemistry for Upper Newport Bay Basins I and II Sediments
Samples Collected in September 1994 by the State Water Resources Control Board

	Unit I Basin	Unit II Basin	ER-L	ER-M
Fines (% <62 μm)	29	62	--	--
Total Organic Carbon (%)	0.44	1.9	--	--
Aluminum (%)	9.7	7.2	--	--
Iron (%)	3.0	1.8	--	--
Antimony (mg/kg)	0.40	0.99	2.0	2.5
Arsenic (mg/kg)	4.8	7.3	8.2	70
Cadmium (mg/kg)	0.52	1.2	1.2	9.6
Chromium (mg/kg)	31	51	81	370
Copper (mg/kg)	11	37	34	270
Lead (mg/kg)	16	30	46.7	218
Manganese (mg/kg)	260	340	--	--
Mercury (mg/kg)	nd	0.074	0.15	0.7
Nickel (mg/kg)	10	26	20.9	51.6
Silver (mg/kg)	0.86	1.0	1.0	3.7
Selenium (mg/kg)	nd	0.15	--	--
Zinc (mg/kg)	60	170	150	410
Total DDT (μg/kg)	28.7	88.9	1.58	46.1
Cis+Trans Nonachlor (μg/kg)	1.05	7.15	--	--
Cis+Trans Chlordane (μg/kg)	1.94	10.7	0.50	6.0
Total PCBs (μg/kg)	7.5	50.6	22.7	180
Total PAHs (μg/kg)	135	1335	4022	44,792

Notes: nd = not detected
-- = no effects levels defined; ER-L (Effects Range - Low): concentrations of contaminants in sediments where adverse effects are rarely observed; ER-M (Effects Range - Median): concentrations of contaminants in sediments where adverse effects are frequently observed.

Grain Size and Organic Content

As described in Section 3.2.3, sediment grain size varies spatially within the Bay, depending on bottom depth and current speeds, from coarse sands in areas with higher current speeds to fine grained silts and clays in more quiescent areas. Organic carbon concentrations in bottom sediments average approximately 0.9 percent, and range from 0.24 to 1.7 percent. In 1994, sediments within the Unit I and Unit II sedimentation basins contain 29 percent and 62 percent, respectively, silts and clays (i.e., fines), with total organic carbon concentrations of 0.44 percent and 1.9 percent, respectively (Table 3.3-3).

Table 3.3-4
Bulk Sediment Chemistry Summary
Unit I Sediment Basin & Access Channel, Newport Beach

Analyte	Unit I Top	Unit I Bottom	Access Comp	LA3 Ref	Detection Limit
GRAIN SIZE (% dry)					
Coarse Sand/Gravel ($\Phi < -1$)	0.0	0.0	0.0	0.0	-
Sand ($-1 \leq \Phi \leq 4$)	39.40	15.82	60.55	6.47	-
Silt ($5 \leq \Phi \leq 8$)	26.54	26.85	18.47	70.89	-
Clay ($\Phi \leq 9$)	34.06	57.33	20.98	22.64	-
INTERSTITIAL WATER					
Salinity (‰)	22.0	14.0	27.0	32.0	-
pH	7.8	8.0	7.7	7.8	-
Total ammonia (ppm)	26.82	29.86	16.88	1.47	-
MISCELLANEOUS CHEMISTRIES					
Total sulfides (ppm, dry)	ND	ND	ND	4.2	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	0.3	0.1
Oil & Greese (ppm, dry)	40	ND	58	57	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	38	25	20
% Solids (%)	64	61	63	52	0.1
TOC (%)	0.44	0.58	0.53	0.67	0.1
METALS (ppm, dry weight)					
Arsenic	2.8	3.1	2.1	4.0	0.1
Cadmium	0.7	1.0	0.6	0.8	0.1
Chromium	36	48	25	55	0.1
Copper	17	28	20	25	0.1
Lead	9.1	14	13	17	0.1
Mercury	0.03	0.13	0.12	0.30	0.02
Nickel	19	26	13	25	0.1
Selenium	0.5	0.8	0.3	0.8	0.1
Silver	ND	0.2	0.1	0.3	0.1
Zinc	56	82	58	73	2.0
ORGANOTINS (ppb, dry weight)					
Monobutyltin	ND	ND	ND	ND	1.0
Dibutyltin	ND	ND	6	ND	1.0
Tributyltin	ND	ND	5	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	1.0
PESTICIDES (ppb)					
4,4' DDD	11	ND	24	3.8	0.5
4,4' DDE	6.6	ND	40	37	0.5
4,4' DDT	ND	ND	ND	ND	0.5
Total PCB (ppb)	ND	ND	ND	ND	20
TOTAL PAH (ppb)	ND	ND	150	56	20

ND = None Detected
Source: TOXSCAN 1995a

The 1995 results showed 60.6 percent silts and clays in the top sediments of the Unit I basin and 84.2 percent in the bottom sediments. The greater percentage of fine sediments in 1995 compared to 1994 may reflect inputs of fine sediments from the 1995 storms. In 1995, the percentage of fines in the access channel was 39.5 percent. The percentage of total organic carbon in the Unit I basin in 1995 was similar to that in 1994 with 0.44 percent in the top sediments and 0.58 percent in the bottom sediments. In the access channel the percentage total organic carbon was 0.53 percent in 1995.

Trace Metal Contaminants

Watershed inputs are considered primary sources of trace metals to Newport Bay sediments. Metal concentrations in sediments from Units I and II basins, analyzed as part of the California State Water Resources Control Board 1994 BPTCP, are summarized in Table 3.3-3. Concentrations of individual metals in the Unit II basin sediments typically are two to three times higher than those in Unit I basin sediments, as expected by the proportionately higher abundances of fine grained sediments. Contaminant concentrations are generally higher in finer grained sediments. As mentioned, no numerical sediment quality criteria exist. However, comparisons to reported effects levels (ER-L and ER-M values) indicate that most sediment metal concentrations in the Units I and II basins were at or below the respective ER-L values, indicating low potentials to adversely affect biota.

Metal concentrations in the Unit I basin in the 1995 samples were similar to the concentrations in 1994. As was true in 1994, the concentration of nickel slightly exceeded the ER-L value (Table 3.3-4). Metal concentrations in the access channel in 1995 were lower than in the Unit I basin most likely because of the larger grain size of the access channel sediments. Metal concentrations in Upper Newport Bay sediments in 1995 were similar to those at the LA 3 reference site. Sediments in Dover Shores in the southern portion of the Upper Bay also were analyzed in 1995, and sediments in the navigation channels of the Lower Bay were analyzed in 1998. Trace metal concentrations in Dover Shores in 1995 were generally slightly higher than those in the Unit I basin but only exceeded the ER-L level for cadmium (TOXSCAN 1995b). Metal samples taken in the navigation channels in the Lower Bay in 1998 similarly showed generally low levels of metals. Cadmium, copper and mercury slightly exceeded ER-L concentrations in some areas (MEC 1998).

Trace Organic Contaminants

Trace organochlorine and petroleum hydrocarbons transported by runoff or atmospheric deposition, or added directly from sources within the Bay, are expected to partition onto particles which, depending on circulation patterns, will be deposited and accumulate in bottom sediments. Concentrations of organic compound classes (e.g., total DDTs, PCBs, PAHs) in sediments from the Units I and II basins are summarized in Table 3.3-3. Concentrations in the Unit II basin sediments are up to ten times higher than those in Unit I basin sediments, as expected by the proportionately higher abundances of fine grained sediments. Comparisons to reported effects levels (ER-L and ER-M values) indicate that sediments, particularly those from Unit II basin, contain elevated concentrations of total DDT, chlordane, and total PCBs that may be expected to cause adverse biological effects. In contrast, concentrations of total PAHs are below the respective effects levels.

TOXSCAN (1995a) reported similar results for the 1995 Unit I basin samples (Table 3.3-4). Total DDT in the Unit I basin was fairly low (17.6 parts per billion [ppb]) although above the ER-L level of 1.58 ppb for DDT. PCBs and PAHs were not detected in the Unit I basin in 1995. Total DDT was higher in the access channel with a concentration of 64 ppb, which is above the ER-M level of 46.1 ppb. PCBs were not detected in the access channel and total PAHs were low with a concentration of 150 ppb. The 1995 Dover Shores samples revealed higher DDT concentrations of between 115 ppb and 202 ppb in that area (TOXSCAN 1995b). PCB and PAH concentrations at Dover Shores were low. Total DDT concentrations in sediments in the Lower Bay in 1998 exceeded the ER-L level but were lower than the ER-M level (MEC 1998). No PCBs were detected in Lower Bay sediments in 1998 and PAH levels were just above detection limits.

Future Without-Project Conditions (50 years)

As discussed in Section 3.2.3, sediment will continue to accumulate in the Upper Bay and, as the Unit III basin is filled, pass under PCH Bridge to the Lower Bay. Sediment loadings in Upper Newport Bay are expected to be most intense during the next 20 years as construction occurs in presently undeveloped areas in the watershed. Contaminants bind to fine sediments so the sediments that accumulate first in the Unit III basin, and then, as the basin fills, more extensively throughout the Bay would be expected to add to the contaminant load in the Bay sediments. Implementation of TMDLs for sediments and, in the future, for toxics may help to reduce the input of sediment-associated contaminants that enter the Bay.

At the present time, the contaminant of greatest concern in Bay sediments is DDT. The DDT most likely is residual DDT that was applied to agricultural soils in the 1950s and 1960s. As agricultural areas are replaced by urban development during the next 50 years, DDT inputs to Newport Bay would be expected to decrease and concentrations in the sediments may gradually decline. On the other hand, the concentration of urban associated metals such as nickel, cadmium, copper and mercury, which presently are slightly elevated in the Bay, may increase to concentrations high enough to have negative effects on Bay organisms. Because sediments would not be trapped in the Unit III basin in the future, these contaminants would probably spread throughout the Bay, eventually causing widespread degradation of Bay sediment quality.

3.4 BIOLOGICAL RESOURCES

3.4.1 Terrestrial Resources

3.4.1.1 Vegetation

Appendix B provides a list of vascular plant species recorded for Upper Newport Bay. The list was compiled by Robert De Ruff (1995) and includes all species recorded in the vegetation survey by MEC described below (MEC 1997). Existing conditions are described following a brief reconstruction of historical conditions below. A concluding section describes projected without-project conditions 50 years in the future.

Historical Conditions

Prior to the formation of the Balboa Peninsula in the mid 1800s, Upper Newport Bay was an open tidal embayment, consisting primarily of subtidal marine habitats, with fringing sandflats, mudflats, and saltmarsh (CDFG 1985; Corps 1993). Formation of the peninsula facilitated sedimentation in the Upper as well as Lower Bay, and extensive mudflat habitats, with smaller areas of marsh, developed over the next 50 to 100 years. The upper and lower parts of Upper Newport Bay rapidly developed mudflat and marsh habitats, whereas marine subtidal habitat was more persistent in the central part of the study area (CDFG 1985; Corps 1993).

Between 1934 and 1969 there was extensive excavation and filling of mudflat and saltmarsh habitats in support of residential development. The Main Dike was constructed across the head of the Bay, and the area upstream was operated as an evaporative saltworks until 1969. With San Diego Creek diverted around the head of the Bay, sedimentation formed an extensive tidal mudflat extending seaward from the base of the Main Dike (Bane 1968).

The Main Dike was breached by flooding from San Diego Creek in 1969. From 1969 to the present, agriculture and land development in the watershed have resulted in heavy sediment loads being transported down San Diego Creek, accelerating the elevation of habitats from marine subtidal to tidal mudflat, to tidal marsh. This trend was interrupted by the 208 Plan dredging programs, which reestablished marine subtidal habitat in areas of marsh and mudflat, but sediment has rapidly accumulated in dredged channels and basins (Corps 1993). Without future dredging, the conversion of marine habitats to mudflat, mudflat to marsh, and saltmarsh to riparian/freshwater marsh habitats is expected to continue.

Existing Conditions

The vegetation of Upper Newport Bay is dominated by saltmarsh, including low, middle, and upper marsh components. Based on 1997 vegetation mapping (see below), saltmarsh vegetation comprises about 310 acres, about 34 percent of the total study area. This current estimate is within 10 percent of the Corps' previous estimate (Corps 1993). Although considered "terrestrial" in vegetation type, the saltmarsh vegetation structure and community function is primarily governed by the rise and fall of the tides. Within this zone, salt-tolerant (halophytic) plants grow at elevations between Mean Lower High Water (+3.4 ft. MLLW) and Extreme High Water (+7.8 ft. MLLW). The types and distribution of saltmarsh plants are zoned according to their respective tolerance to inundation, elevation above the tide, and topography. Other factors that influence the structure of the saltmarsh plant community include the amount of soil organic material, soil salinity, and competitive interactions between species (Zedler 1982).

Among southern California estuaries, Upper Newport Bay supports a comparatively rich native saltmarsh flora (Zedler 1990; Marsh 1985; Orange County EMA 1990). The saltmarsh vegetation occurs within three general zones: low marsh, characterized by the presence of cordgrass (*Spartina foliosa*); middle marsh, dominated by common pickleweed (*Salicornia virginica*) and saltwort (*Batis maritima*); and upper marsh, characterized by spiked shoregrass (*Monanthochloe littoralis*), saltgrass (*Distichlis spicata*), and estuary sea-blite (*Suaeda esteroa*).

Cordgrass is dominant in the low marsh and is exposed to long periods of submergence which few other species can tolerate. It manages to survive on the tidal flats and anaerobic marsh soils by moving oxygen from the leaves through its hollow stem to the roots and rhizomes. Cordgrass tolerates saline conditions and regulates internal salt balance by excreting excess salts through its leaves. Cordgrass is dominant throughout the marsh island complexes and provides critical breeding habitat for the endangered light-footed clapper rail. It occurs in association with both pickleweed and saltwort.

Common pickleweed and saltwort dominate the middle marsh where vegetation is exposed to tidal inundation on the moderate high tides. Pickleweed has the broadest elevational range of any southern California marsh plant and is variable in growth type between low-and-spreading to bushy-and-orect. It is an opportunistic invader, and constitutes a significant part of the middle saltmarsh areas throughout the Upper Bay. Pickleweed is also dominant on salt flats above the Main Dike because it is tolerant of highly saline soils. The high-quality pickleweed marsh is critical breeding habitat for the state-listed endangered Belding's savannah sparrow.

Pickleweed and saltwort can occur as wide meadows or narrow bands of vegetation, depending an topography. In addition, the boundaries of the middle marsh are not distinct and usually intergrade with both low and high marsh vegetation.

Shoregrass, saltgrass, and estuary sea-blite are indicators of the high marsh which extends to Extreme High Water. This vegetation type is extensive in the Upper Bay, and will flood during unusually high tides or storm tides. Other species occurring within this zone include: alkali heath (*Frankenia salina*), sea-lavender

(*Limonium californicum*), the endangered saltmarsh bird's beak (*Cordylanthus maritimus* spp. *maritimus*), and the parasitic saltmarsh dodder *(Cuscuta salina*).

In Upper Newport Bay and other southern California coastal wetlands, pickleweed is usually the first species to invade tidal flats even at lower elevations. Cordgrass follows and becomes the dominant species at lower elevations (CDFG 1989).

The rate of saltmarsh expansion on Upper Newport Bay tidal flats can be estimated on the basis of aerial photographic analysis of the vicinity of the Main Dike between 1984 and 1992. The area north of the Main Dike was returned to tidal influence following the storms of 1969 when storm waters from San Diego Creek breached the salt works dike. Between 1978 and 1982, 110.7 acres of saltmarsh had developed, at an average rate of approximately 7.9 acres per year. Immediately south and east of the Main Dike, sediment deposition between 1969 and 1986 raised the mudflat elevations and allowed cordgrass and pickleweed to colonize the tidal flats. The saltmarsh expanded from 1.7 acres in 1986 to 10.6 acres in 1992 at an average rate of 1.5 acres per year. On the west side near the Santa Ana-Delhi Channel, the marsh expanded 12.1 acres between 1984 and 1992, at a rate of 0.9 acre per year.

1997 Vegetation Survey Methods

Vegetation surveys in Upper Newport Bay were conducted on October 28 and 29, 1997 (MEC 1997). Ten vegetation transects were placed in representative portions of the major wetland ecological communities found in the Bay. These transects were used to characterize the plant composition of each community and to delineate the boundaries between the communities. The seven ecological communities characterized included: open water, tidal mudflat, low saltmarsh, middle saltmarsh, high saltmarsh, salt panne, and freshwater marsh (see Results and Discussion below).

Approximate locations for transects were determined during an earlier site visit using April 1997 color infrared aerial photographs of the Bay (Lung and Associates 1997) provided by the Corps, and observations made from vantage points surrounding the Bay. Final transect placement was determined at the time of vegetation sampling. Transects were distributed in approximately equal numbers in each of four "Areas" of the Bay. An effort was made to place transects within each large area of low, middle, and high saltmarsh, and freshwater marsh, including degraded areas, while remaining aware of local sensitive species concerns.

Transects typically originated at the upper limit of the tidal mudflat boundary and extended through the wetland community(ies) to the lower limit of adjacent upland communities. Transects were placed in areas that helped to accurately define ecological community boundaries while providing a complete inventory of plant species distribution and abundance within each community. Data were collected using a 0.5 meter square quadrat at "stations" every 50 ft. (15 m) along the transect, or closer where distinct community boundaries existed. Data collected at each station included plant species composition, percent cover (to the nearest 5 percent) including percent of bare ground or open water, station location along the transect, and habitat type. All data was recorded on pre-printed data forms. Plants were collected for identification purposes when necessary. The latitude and longitude of transect endpoints and locations of community boundaries along each transect were recorded using a differential Global Positioning System (GPS). Transect locations were also mapped on aerial photograph enlargements in the field. A photograph was taken of each transect.

Vegetation percent cover averages and frequency values for plant species within each ecological community were analyzed from all ten vegetation transects collectively. Vegetation percent cover was averaged for all stations located within each community; the number of stations for each community was: 28 for low marsh, 90 for middle marsh, 18 for high marsh, and 26 for freshwater marsh. Other ecological communities examined for this study (open water, intertidal mudflat, salt panne) had little vegetative cover. Intertidal mudflat areas are covered seasonally by algal species which are exposed at low tide. Frequency values for each ecological community were calculated as the percentage of stations where a given plant species occurred. Frequency provides a measure of distribution for a given plant species throughout a community.

The transect and quadrat data are compared with the earlier study by Vogl (1966) to assess the possibility of recent historical changes in plant communities.

Preliminary ecological community mapping was conducted during the September site visit. This mapping was depicted on acetate overlays on the April 1997 color infrared aerial photographs of the Bay. Mapping was conducted from adjacent roadways, shorelines, and bluffs surrounding the Bay. Ground-truthing of the ecological community map from points within the Bay and along transects was conducted in the field concurrently with transect data collection during the October site visit. Additional verification of mapped community designations was made using elevations depicted on Orange County bathymetry maps (Orange County EMA 1997).

For this report, communities boundaries mapped onto aerial photographs at a scale of 1 inch = 270 ft. were digitized into a Geographic Information System (GIS) and a single composite map was created, enabling quantification of existing habitat acreages in the study area.

Results and Discussion

Figure 3.4-1 shows existing vegetation and other non-vegetated habitats within the study area, based on the 1997 surveys, mapping, and correlation with topographic contours in the OCPFRD GIS database. Table 3.4-1 provides acreages corresponding to Figure 3.4-1.

Table 3.4-1
Existing Habitat Acreages in Upper Newport Bay

Habitat Type	Acreage
Open Water (marine)	175.0
Intertidal Mudflat	274.5
Low Saltmarsh	145.9
Middle Saltmarsh	153.5
High Saltmarsh	9.9
Freshwater Marsh	17.6
Salt Panne	7.0
Uplands	57.6
Developed	71.8
Total	912.8

The predominant plant community in Upper Newport Bay is southern coastal saltmarsh. There are also areas of coastal and valley freshwater marsh, coastal brackish marsh, southern willow scrub, and several upland communities (Holland 1986). Willow scrub and upland communities were not the focus of this study. Vegetation mapping and plant distribution data collection in the marsh plant communities of Upper Newport Bay were conducted by ecological community. The southern coastal saltmarsh plant community was broken into three ecological communities: low, middle, and high saltmarsh. These three ecological communities were defined as having greater than 50 percent cordgrass, common pickleweed, and saltgrass, respectively. The freshwater and brackish marsh plant communities were combined to create a freshwater marsh ecological community. Many areas along the Bay that were determined to have a freshwater influence (through the presence of specific plant species) were classified as freshwater marsh.

Based on current mapping, middle and low marsh communities occupy roughly equal areas of Upper Newport Bay. Middle marsh covers broad swaths of the Bay shoreline and islands at an approximate elevation range of 3 to 4 ft. (0.9 to 1.2 m) MSL. Low marsh occupies narrow to wide shoreline bands, entire islands, and much of the area above the Main Dike within the Bay. Low marsh had an approximate elevation range of 1.5 to 3 ft. (0.45 to 0.9 m) MSL. Unvegetated intertidal mudflats were found immediately below this community. High marsh occupied narrow strips of land varying in width from 2 to 50 ft. (0.6 to 15 m) along the upper edge of the middle marsh community at an approximate elevation range of 4 to 5 ft. (1.2 to 1.5 m) MSL. The freshwater marsh ecological community occurred in canyons and along the Bay shoreline above the reach of tidal influence. This community was found at various points around the Bay, particularly in the upper half of the Bay.

Plant Species Abundance and Distribution

The project site was divided into four areas and two to three transects were placed in each area. The 10 transects were distributed among the north and south shores and on several islands in the Bay. A total of 24 plant species were found within the wetland ecological communities at 162 stations along the 10 transects. Compilations of these data are shown for vegetation percent cover in Table 3.4-2 and frequency in Table 3.4-3. Vegetation percent cover averages shown in Table 3.4-2 may sum to greater than 100 percent. This is due to the multiple layers of vegetation occurring at many stations.

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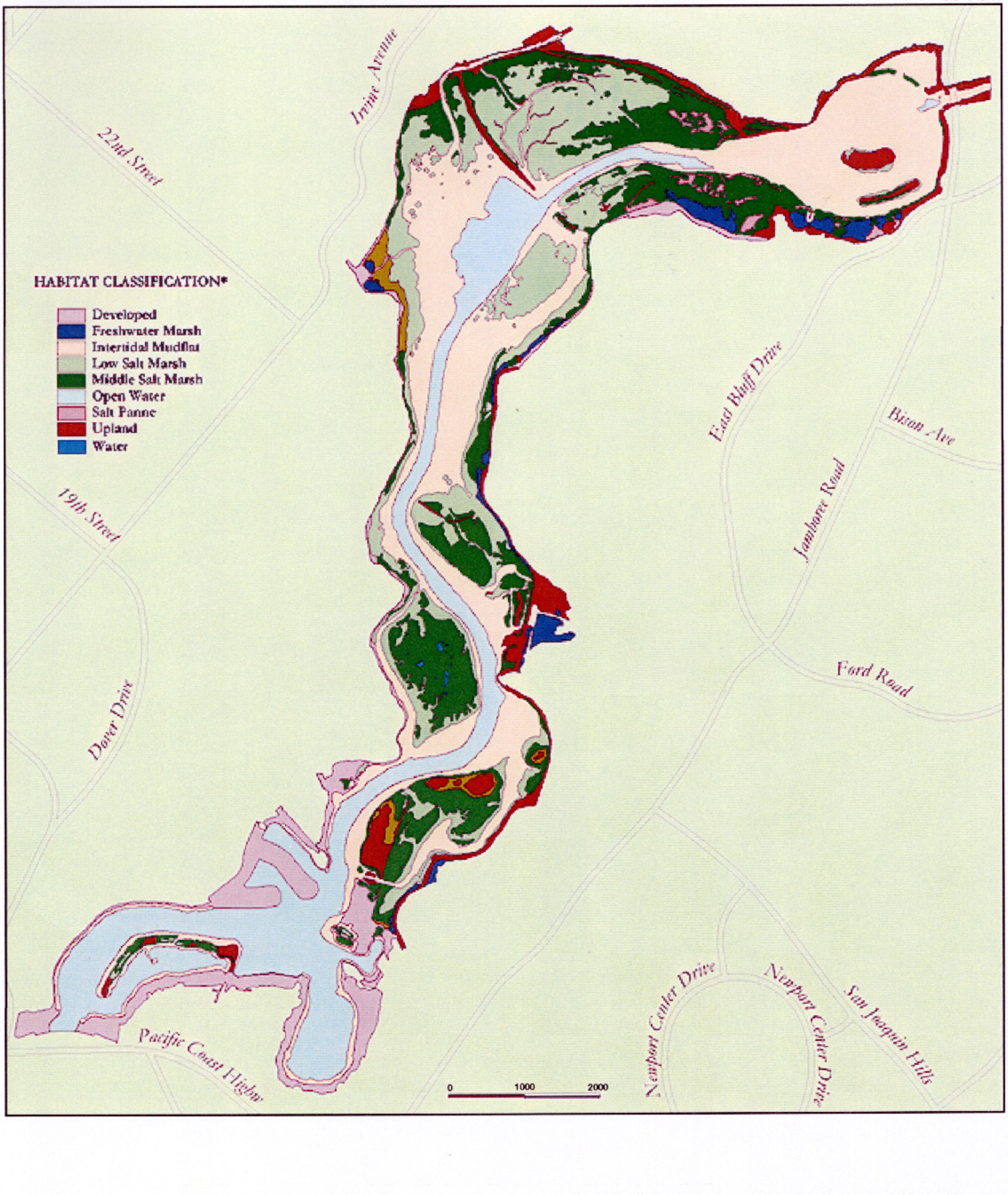

Chambers Group

Source: County of Orange

VEGETATION IN UPPER NEWPORT BAY AS MAPPED IN 1997
Figure 3.4-1

Table 3.4-2
Average Percent Cover for Plant Species Found in Marsh Communities of Upper Newport Bay

Plant Species		Vegetation Cover (%)			
Scientific Name	Common Name	Low Marsh	Middle Marsh	High Marsh	Freshwater
Atriplex watsonii	saltbush			2.8	
Batis maritima	saltwort	1.4	18.1	1.9	
Bromus diandrus	ripgut brome			1.4	
Carpobrotus chilensis	sea fig			0.3	
Cressa truxillensis	alkali weed			0.6	
Cuscuta salina	Dodder		0.9	0.8	
Distichlis spicata	Saltgrass		4.5	42.8	0.6
Frankenia salina	Alkali heath		4.1	5.0	
Jaumea carnosa	Jaumea	1.6	11.7	12.2	2.3
Juncus acutus	Rush				0.2
Limonium californicum	Sea lavender		1.8	0.8	
Monanthochloe littoralis	Shoregrass		4.4	17.5	
Pluchea odorata	saltmarsh fleabane				1.7
Salicornia bigelovii	Dwarf glasswort		1.2		
Salicornia virginica	Common pickleweed	3.2	46.3	10.8	0.2
Salix sp.	Willow				5.0
Scirpus americanus	three-square				0.6
Scirpus californicus	California bulrush				9.4
Scirpus robustus	alkali bulrush				8.3
Spartina foliosa	cordgrass	63.9	7.3	3.6	
Suaeda esteroa	Estuary sea-blite		1.2	0.3	
Triglochin maritima	Seaside arrow-grass		0.1		
Typha angustifolia	Narrow-leaved cattail				21.0
Typha latifolia	Broad-leaved cattail				35.6
Total Plant Cover		70.1	101.6	100.8	84.9
Bare ground		29.3	13.7	6.4	1.5
Open water		2.1	0.5		18.3
Source: MEC 1997					

The dominant plant species found in low marsh areas within Upper Newport Bay is cordgrass. This species had an average cover of 64 percent during the October 1997 surveys. The other plant species seen in low marsh were common pickleweed, jaumea (*Jaumea carnosa*), and saltwort (*Batis maritima*) all with less than 4 percent average cover. As shown in Table 3.4-3, cordgrass was seen at 100 percent of the low marsh stations sampled in this study. The other three species occurred at less than 15 percent of the low marsh stations. Unvegetated ground surface was seen at 93 percent of the low marsh stations with an overall average percent cover of 29 percent in the low marsh community.

The middle marsh ecological community was dominated by common pickleweed with an average cover of 46 percent. Other species with high coverage included saltwort and jaumea with 18 percent and 12 percent cover respectively. Pickleweed occurred at 91 percent of the stations sampled in middle marsh areas. Several other plant species also occurred with high frequency in middle marsh including saltwort (64%), cordgrass (39%), jaumea (37%), and saltgrass (27%). A total of 12 plant species were found in this community. Unvegetated ground surface was seen at 71 percent of the middle marsh stations with an overall average percent cover of 14 percent.

Table 3.4-3
Percentage Frequencies for Plant Species Found in Marsh Communities of Upper Newport Bay

Plant Species		Frequency (%)			
Scientific Name	Common Name	Low Marsh	Middle Marsh	High Marsh	Freshwater
Atriplex watsonii	saltbush			5.6	
Batis maritima	saltwort	10.7	64.4	16.7	
Bromus diandrus	ripgut brome			5.6	
Carpobrotus chilensis	sea fig			5.6	
Cressa truxillensis	alkali weed			5.6	
Cuscuta salina	dodder		5.6	11.1	
Distichlis spicata	Saltgrass		26.7	72.2	7.7
Frankenia salina	Alkali heath		17.8	22.2	
Jaumea carnosa	Jaumea	7.1	36.7	38.9	7.7
Juncus acutus	Rush				3.8
Limonium californicum	Sea lavender		13.3	11.1	
Monanthochloe littoralis	shoregrass		13.3	38.9	
Pluchea odorata	saltmarsh fleabane				11.5
Salicornia bigelovii	dwarf glasswort		5.6		
Salicornia virginica	common pickleweed	14.3	91.1	72.2	3.8
Salix sp.	willow				11.5
Scirpus americanus	three-square				3.8
Scirpus californicus	California bulrush				23.1
Scirpus robustus	alkali bulrush				15.4
Spartina foliosa	cordgrass	100	38.9	22.2	
Suaeda esteroa	estuary sea-blite		5.6	5.6	
Triglochin maritima	seaside arrow-grass		1.1		
Typha angustifolia	narrow-leaved cattail				26.9
Typha latifolia	broad-leaved cattail				46.2
Bare ground		92.9	71.1	50.0	23.1
Open water			1.1		19.2
Total Number of Stations (quadrats)		28	90	18	26
Source: MEC 1997					

The high marsh ecological community was the most diverse community with 14 plant species seen there during this study. The most prevalent species was saltgrass with an average of 43 percent cover in high marsh. Other species with high coverage included shoregrass (*Monanthochloe littoralis*), jaumea, and common pickleweed with 18, 12, and 11 percent cover respectively. Saltgrass and pickleweed both occurred at 72 percent of the stations sampled in high marsh. Other plant species that occurred with fairly high frequency in high marsh included jaumea (39%) and shoregrass (39%). Plant coverage was fairly complete in high marsh where unvegetated ground surface was seen at 50 percent of the stations with an overall average cover of only 6 percent.

The ecological community boundaries were defined based on the dominant presence of certain plant species rather than on actual tidal elevations. Ideally, a combination of these two factors would be used in delineating the low, middle, and high saltmarsh boundaries, but this is not always practical. One area along Transect 3.3 contained a very high percent cover of saltgrass, but there was also a small amount of cordgrass present suggesting a daily tidal influence. These isolated situations may result in different interpretations of community boundaries from studies where these community boundaries were defined differently.

Two species of cattail provided the majority of the plant cover seen in the freshwater marsh plant community. Broad-leaved cattail (*Typha latifolia*) and narrow-leaved cattail (*Typha angustifolia*) had an average of 36 and 21 percent cover respectively. Other common plant species in the freshwater marsh areas included California bulrush (*Scirpus californicus*) and alkali bulrush (*Scirpus robustus*) with 9 and

8 percent cover respectively. Broad- and narrow-leaved cattail occurred at 46 and 27 percent respectively of the stations sampled in freshwater marsh. Other plant species that occurred with moderate frequency in freshwater marsh included California bulrush (23%), alkali bulrush (15%), willows (12%), and saltmarsh fleabane (*Pluchea odorata*) (12%). Plant coverage occurred in a mosaic pattern in freshwater marsh areas with a 2 percent unvegetated ground surface and an 18 percent open water component. Bare ground was seen at only 23 percent of the stations and open water occurred at a frequency of 19 percent.

Average percent plant cover for the major plant species in the coastal saltmarsh plant community of Upper Newport Bay is shown in Table 3.4-4. This table includes coverage data from the current study and an earlier study of the vegetation of Upper Newport Bay (Vogl 1966). The Vogl study included a total of 240 quadrats in each community, producing several times the amount of data collected for the current study. In general the coverage by specific saltmarsh plant species was comparable in the two studies, however there were some significant differences noted.

Table 3.4-4
Comparison of Average Percent Cover for the Major Plant Species in the Littoral Zone of Upper Newport Bay

Plant Species		Vegetation Cover (%)					
Scientific Name	Common Name	Low Marsh		Mid Marsh		High Marsh	
		Vogl	MEC	Vogl	MEC	Vogl	MEC
Batis maritima	saltwort	4	1	15	18	1	2
Cuscuta salina	dodder				1	2	1
Distichlis spicata	Saltgrass			2	5	5	43
Frankenia salina	Alkali heath			3	4	2	5
Jaumea carnosa	Jaumea		2		12		12
Juncus acutus	Rush					2	
Limonium californicum	Sea lavender			1	2	1	1
Monanthochloe littoralis	Shoregrass				4	15	18
Salicornia virginica	Common pickleweed	4	3	23	46	40	11
Scirpus californicus	California bulrush					14	
Spartina foliosa	Cordgrass	38	64	1	7		4
Suaeda esteroa	Estuary sea-blite				1	2	0.3
Triglochin maritima	Seaside arrow-grass			11		1	0.1
Total Plant Cover		46	70	56	100	85	97
Sources: Vogl, 1966; MEC 1997							

In low marsh the dominant plant species seen in both 1966 and 1997 was cordgrass. The average cover was 38 and 64 percent respectively. A possible explanation for this discrepancy ithat the Vogl surveys were conducted in the spring when cordgrass is just beginning its seasonal growth and the current surveys were conducted at the time of year (fall) when this species would be at its peak size and areal coverage. Other minor low marsh species were of comparable distribution and abundance in the two surveys.

The dominant plant species in the Vogl and MEC studies in the middle marsh community were common pickleweed and saltwort. The saltwort coverage was comparable in the two studies, but pickleweed had twice the percent cover in the recent survey (46%) in comparison to the 1966 study (23%).

Again this may be due to seasonal differences in survey timing, number of sampling stations, or changes in the character of the middle marsh community in Upper Newport Bay. Another notable difference between the two studies was the presence of seaside arrow-grass (*Triglochin maritima*) in 1966 in the middle marsh (11%), and its virtual absence today. In contrast, jaumea was absent in this community in 1966, but has a significant presence today (12%). It is unclear what accounts for these differences.

The high marsh ecological community appears to have undergone a shift in plant composition since 1966. At that time, common pickleweed was the dominant plant species with 40 percent average cover (11% currently), but currently saltgrass is the dominant species with 43 percent cover (5% in 1966). It is unlikely that defining high marsh differently or seasonal differences in survey timing account for these significant differences. The nature of the high marsh community in terms of dominant plant species has apparently changed over the past 31 years. Other minor plant species are fairly comparable in the two studies with two exceptions. No jaumea was reported in high marsh areas in 1966, but it now has an average cover of 12 percent. The Vogl study also reported California bulrush as a notable presence in the high marsh with 14 percent cover, but it was not seen in 1997 surveys. The latter difference is likely due to the categorization of areas with bulrush or cattails as freshwater marsh in the current study.

Table 3.4-5 provides a comparison of percentage frequencies between the Vogl and MEC studies. In the low marsh the nearly equal values for cordgrass in contrast to the discrepancy between coverage values (Table 3.4-4) suggest the different seasonal timing of surveys is likely the responsible factor for the latter difference. In middle marsh areas the differences in the presence of jaumea and seaside arrow-grass in 1966 and 1997 mentioned above are again shown in the frequency values. Other middle marsh species have comparable percentage frequencies in both surveys with saltwort and common pickleweed being the most widely distributed species.

Table 3.4-5
Comparison of Percentage Frequencies for the Major Plant Species in the Littoral Zone of Upper Newport Bay

Plant Species		Frequency (%)					
Scientific Name	Common Name	Low Marsh		Mid Marsh		High Marsh	
		Vogl 1966	MEC 1997	Vogl 1966	MEC 1997	Vogl 1966	MEC 1997
Batis maritima	saltwort	5	11	88	64	22	17
Cuscuta salina	dodder			3	6	2	11
Distichlis spicata	Saltgrass			24	27	20	72
Frankenia salina	Alkali heath			26	18	30	22
Jaumea carnosa	Jaumea		7		37	4	39
Juncus acutus	Rush					4	
Limonium californicum	Sea lavender			10	13	20	11
Monanthochloe littoralis	Shoregrass			0.1	13	45	39
Salicornia virginica	Common pickleweed	13	14	84	91	70	72
Spartina foliosa	Cordgrass	88	100	19	39	0.1	22
Suaeda esteroa	Estuary sea-blite	1		6	6	15	6
Triglochin maritima	Seaside arrow-grass			42	1	10	
Sources: Vogl 1966; MEC 1997							

The high marsh frequency data shows a few plant species distribution changes that have occurred over the past 30 years in Upper Newport Bay. Saltgrass was found at 72 percent of the stations during the current study in contrast to 20 percent in the Vogl study (1966). Jaumea was more widely distributed in high marsh areas in 1997 (39%) than in 1966 (4%). Cordgrass is more widely distributed in high marsh areas currently, but this is likely attributable to the classification of one saltgrass dominated area (Transect 3.3) as high marsh when some indicators of daily tidal inundation were present. Seaside arrow-grass was not evident in either middle or high marsh in 1997, but was relatively widely distributed in 1966.

Other Vegetation Types

Transitional/Coastal Dune. Transitional coastal dune vegetation grows in loose, sandy soils above saltmarsh elevations between the bluffs and the marshes and on sandy dredge spoil materials. The native community includes almost pure stands of saltgrass mixed with shoregrass and alkali heath.

However, invasives such ice plant (*Carpobrotus* spp.) and Australian saltbush (*Atriplex semibaccata*) are abundant and locally dominant. Other transitional-dune species found in upper Bay include four-winged saltbush (*Atriplex canescens*) and sea lavender (Marsh 1985 and 1990). Bayside Marsh Peninsula and Shellmaker Island have good examples of transitional-coastal dune vegetation, as a result of the deposition of dredge spoils within these areas.

Riparian/Freshwater Marshes. Riparian and freshwater vegetation occur along the Santa Ana-Delhi Channel and San Diego Creek; at the mouths of storm drains along Back Bay Drive; in the Big Canyon Creek drainage; immediately north of the Aquatic Center at North Star Beach (as a result of surface drainage from West Newport); on the west side of the Bay near Irvine Avenue; and, paradoxically, on Shellmaker Island where a stand of arroyo willows (*Salix lasiolepis*) has colonized the higher elevations of dredge spoils surrounded by saltmarsh. Figure 3.4-1 shows the distribution of the major freshwater marsh habitats in the study area.

Freshwater marshes in Upper Newport Bay can be classified as upper emergent wetlands, lower emergent wetlands, and surface drainage wetlands.

Upper emergent wetlands occur sporadically around the Bay as a result of both surface drainage runoff and natural freshwater flow. These riparian areas are dominated by willows (*Salix* spp.) and mule fat (*Baccharis salicifolia*). Other plant species present include celery (*Apium graveolens*), watercress (*Rorippa nasturtium-aquatica*), rushes (*Juncus* spp.), and sedges (*Carex* spp.).

Lower emergent wetlands are characterized by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.). In addition to the upper and lower emergent wetlands, significant fresh water and brackish water marshes have developed along the periphery of the Bay, due to increased runoff that drains the highlands of West Newport and East Bluff. These riparian areas are characterized by dense stands of bulrushes, rushes, cattails and sedges. Mitigation work in Big Canyon has also created a significant open freshwater pond and areas of low emergent fresh water vegetation. Some wetland habitat is being invaded by pampas grass (*Cortaderia* sp.), particularly along Back Bay Road and the west side of the Bay. Attempts are being made to remove pampas grass from some areas.

During periods of heavy runoff, such as the winters of 1977-1978 and 1982-1983, brackish marsh vegetation (*Scripus* spp.) is able to invade the lower saltmarsh. Once established, the ability of these species to compete with saltmarsh vegetation is dependent upon continued freshwater flows.

Upland Vegetation. Cliffs, bluffs, and the mesa above the Upper Bay represent upland habitat. The drier slopes contain coastal sage scrub vegetation, typically including bush sunflower (*Encelia californica*), prickly pear (*Opuntia littoralis*), black sage (*Salvia mellifera*), and various wildflowers. North-facing mesas usually support denser vegetation, including large shrubs such as lemonadeberry (*Rhus integrifolia*) and toyon (*Heteromeles arbutifolia*). The mesa also supports introduced annual grasses and weeds resulting from earlier agricultural activities (Corps 1993).

Future Without-Project Conditions (50 Years)

As described in Section 3.2.3, during the next 50 years sediment will continue to accumulate in the Bay and the bathymetry of the Upper Bay will change. As sediment fills the basins, open water habitat will be converted to intertidal mudflat. Then, as sediments raise the elevation of mudflats, mudflat will transition to low saltmarsh. Following the Unit III dredging project (Year 0 for the sediment modeling), there will be 216.4 acres of open water in the Upper Bay, 217.2 acres of intertidal mudflat, 141.7 acres of low saltmarsh and 182.6 acres of middle saltmarsh. Table 3.4-6 shows the habitat changes that will occur during the next 50 years based on the sediment modeling. By Year 20, both in-bay basins will have become largely mudflat. The only open water within the ecological reserve will be along channel extending to the developed areas above PCH Bridge. By Year 50 almost no subtidal habitat will remain north of the Main Dike and the marinas near the PCH Bridge will have become filled with sediment. Within the next 50 years under the without-project conditions, 81 percent of the subtidal open water habitat in the Upper Bay will be lost.

Table 3.4-6
Future Without-Project Condition Habitat Changes

Habitat	Year 0	Year 20	Year 50	Percent Change
Open Water	216.4	135.2	42.5	-81.2
Mudflat	217.2	294.7	321	+47.8
Low Saltmarsh	141.7	144.4	171.3	+20.9
Mid Saltmarsh	182.6	184.1	193.9	+ 6.2
High Saltmarsh	9.3	9.3	38.1	+310

3.4.1.2 Mammals

Historical and Existing Conditions

Upper Newport Bay provides habitat for nearly 20 species of mammals. The recent survey (MEC 1997) confirms previous generalizations regarding the presence of common species.

Several species live in the tidal saltmarsh, including the California vole (*Microtus californicus*), house mouse (*Mus musculus*), and the western harvest mouse (*Reithrodontomys megalotis*). The California ornate shrew (*Sorex ornatus*), a coastal wetland endemic is unconfirmed, but possible in Upper Newport Bay (Marsh 1990). Other mammals of the high marsh and the upland areas include California ground squirrel (*Spermophilus beecheyi*), Audubon's cottontail rabbit (*Sylvilagus audubonii*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale gracilis*), gray fox (*Urocyon cinereoargenteus*), and coyote (*Canis latrans*) (Thompson 1977; CDFG 1985; Marsh 1990). Coyotes in the Upper Bay (CDFG 1985; Marsh 1990) are important generalist predators and may limit the abundance of smaller carnivores, thereby having a beneficial effect on marsh-nesting birds. Historically, mule deer (*Odocoileus hemionus*) occurred within Upper Newport Bay (CDFG 1985). Their disappearance is a consequence of the urbanization of the surrounding watershed rather than changes within the Bay.

With urbanization, domestic cats and dogs have become common. The ongoing sedimentation within Upper Newport Bay has caused shoaling in several channels that separate marsh islands from the mainland shore. Under low tide conditions, lack of water in these channels allows predators, particularly foxes and domestic cats and dogs to easily access the islands. Predation of bird species on these islands occurs as a result; small mammal populations may also be reduced by cat predation (Corps 1993). Non-native red foxes (*Vulpes fulva*) have not been reported in Upper Newport Bay, but their occurrence is not unlikely given their tolerance of human activity and their spread throughout much of coastal southern California. Red foxes, if present, would prey heavily on marsh-nesting birds.

Future Without-Project Conditions (50 Years)

With changes in habitat conditions as predicted above in Section 3.4.1.1, most mammalian populations should increase, reflecting the greater acreage and accessibility of terrestrial habitats and relatively greater areas of riparian and freshwater marsh habitat at the expense of marine and mudflat habitats. As channels separating islands of marsh from the mainland continue to shoal, mammalian predators will have increased access to marsh areas.

3.4.1.3 Birds

Historical and Existing Conditions

As described in Section 3.4.1.1, prior to the mid-1800s, Upper Newport Bay was an open tidal embayment, with most of its acreage consisting of marine subtidal habitat. Under those circumstances, waterbirds with marine affinities, such as terns and diving ducks, were probably more strongly represented in the avifauna than at present. Shore, marsh, and wading bird populations were probably less well represented, and probably increased as a result of subsequent sedimentation that created additional areas of mudflat and marsh. Subsequently, however, habitat for shore, marsh, and wading birds has been filled for residential development, and converted back to marine subtidal habitat elsewhere through dredging projects (CDFG 1985; Corps 1993).

Appendix C.1, from Marsh (1990), lists birds that are known to occur in or adjacent to Upper Newport Bay. The list includes all species reported in the more recent surveys discussed below.

Marsh and waterbirds were surveyed monthly from March 1992 through March 1996 by members of the Sea and Sage Audubon Society and Upper Newport Bay Naturalists in support of California Department of Fish and Game (CDFG). Data from these surveys were made available for this review by Mr. Richard Kust of Sea and Sage Audubon.

1997 Survey - Methods

An avifaunal survey was conducted specifically for this study during September 1997 (MEC 1997). Birds were censused on September 8, 1997, for a period of about 7 hours, from 0545 to 1230 hour by Campbell BioConsulting. Observations were made from a boat and from land vantage points using existing trails and footpaths. Special emphasis was given to legally threatened and/or endangered species with most sightings mapped on a 1997 aerial photograph of the study area. All species were identified, counted, and coded to a habitat type in the field. The Upper Bay was split into four contiguous areas (Figure 3.4-2) so as to give a somewhat broad yet identifiable pattern of distribution of the birds found during the survey. The habitat categories used were open water, mudflat, low marsh, mid marsh, high marsh, freshwater marsh, salt panne, ruderal, and other. For individuals only transiting through an area, a code of aerial was given. These habitat categories are defined as follows:

- Open Water - waters of Upper Newport Bay;
- Mudflat - unvegetated tidal flats;
- Low Marsh - less than 50 percent California cordgrass (*Spartina foliosa*);
- Mid Marsh - less than 50 percent pickleweed (*Salicornia* spp.);
- High Marsh - less than 50 percent coastal saltgrass (*Distichlis spicata*);
- Freshwater Marsh - dominated by cattails (*Typha* spp.), bulrush (*Scirpus* spp.), rush (*Juncus* spp.);
- Salt Panne - unvegetated with evidence of salt deposits in high marsh area;
- Ruderal - disturbed habitat (weedy or invasive opportunistic species);
- Other - upland, chaparral, riparian, etc.; and
- Aerial - used for those species such as swallows and swifts that do not rely closely on a habitat type, and for individuals transiting through an area.

The most recent vegetation mapping of the study area (preceding Section 3.4.1.1), as well as the Corps' Modified HEP analysis (Appendix A) are based on a similar habitat classification.

A second, anecdotal look at the avifauna of the area was made on September 11, 1997, by Philip Unitt and by Veranus Biological Services, Inc. The time spent in the field was from 1330 to 1745 hours and the species and number of individuals were noted in each of the four areas. Habitat usage was not evaluated.

In addition to the current survey work, a search was made for literature on the avifauna of Newport Bay. Information gathered from these sources was synthesized and combined with the current survey results in order to present a complete picture of the bird community in the Bay.

The purpose of the September 1997 survey was to census species abundance, habitat use, and distribution. Because only a single survey was conducted, the resulting numbers and species list represent only a snapshot of bird utilization of Upper Newport Bay. Cumulative abundance and diversity through the year are expected to be considerably greater than that found during the current survey. For

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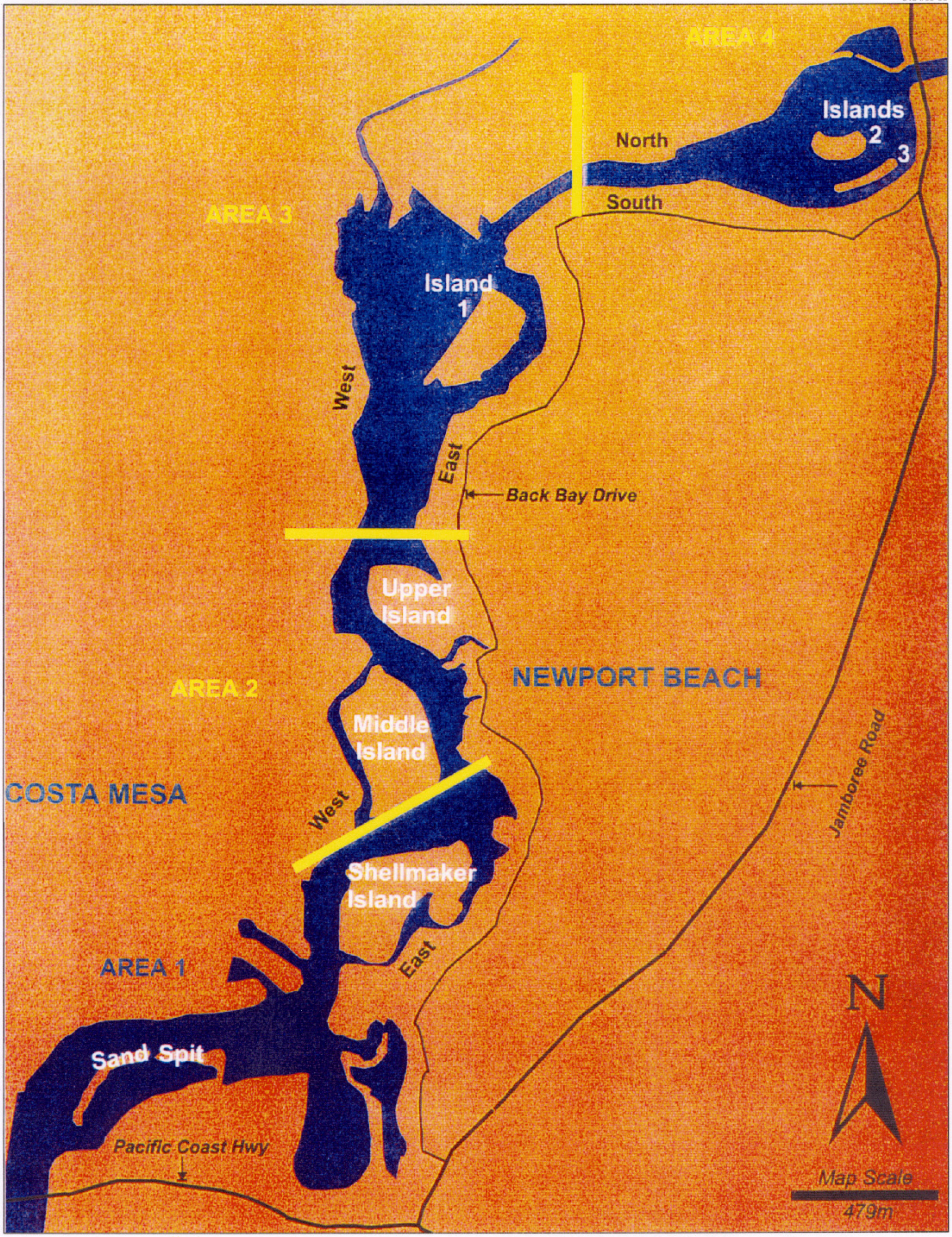


Chambers Group

Source: MEC 1997

1997 BIRD TRANSECTS AREAS
Figure 3.4-2

example, many migrant and over-wintering waterfowl had not yet arrived when the survey was performed and hence, the value of the open water to birds was probably underestimated. The current survey provided a qualitative assessment of areas of the Upper Bay most used by birds. In order to provide a more complete description of the avifaunal community a compilation of available literature was made and interpreted in conjunction with the results of the current survey. Effort was made to link species occurrence and habitat usage, and emphasis was given to those species that are a regular component of the avifauna.

The primary survey was conducted on September 8, 1997, and consisted of identifying and counting birds according to habitat. The results of that survey are summarized herein. Bird observations made on September 11 during the course of other field activities are considered ancillary. Raw count data for both observational dates are presented in Appendix C, Table 1, which also includes results of the literature compilation.

1997 Survey Results - Species Abundance and Distribution

The project site was divided into four areas, which were surveyed separately (Figure 3.4-2). A total of 6,120 birds representing 80 species were counted during the September 8, 1997, survey of Upper Newport Bay (Table 3.4-7). Nine additional species were observed on September 11, bringing the total to 89 species (see Appendix C, Table 3, for count data). "Water-associated" birds accounted for 95 percent of birds. Shorebirds were the dominant group, representing 86 percent of the total observations. Dabbling ducks and skimmers/terns were the next most abundant birds (4 and 2% of the total, respectively). "Terrestrial" species accounted for 5 percent of the total.

Table 3.4-7
Distribution of Bird Groups by Survey Areas at Upper Newport Bay, September 8, 1997

Bird Category	Number of Species	Percent Composition	Abundance by Area				Grand Total
			1	2	3	4	
Water Species							
cormorants/pelicans	2	0.4	6	0	16	2	24
ospreys	1	<0.1	2	0	0	0	2
skimmers/terns	4	2.3	12	0	112	18	142
egrets/herons	5	1.3	21	5	21	35	82
grebes	4	0.4	1	1	13	7	22
dabbling ducks/geese	8	3.8	33	41	85	75	234
diving ducks	1	<0.1	0	0	1	0	1
rails/gallinules/coots	4	0.2	1	6	5	0	12
shorebirds	18	86.1	273	1	3,341	1,654	5,269
gulls	2	0.6	14	8	8	4	34
Subtotal	49	95.1	363	62	3602	1,795	5,822
Land Species							
passerines	21	4.5	25	33	157	61	276
doves	1	<0.1	0	1	0	0	1
hummingbirds	3	<0.1	0	3	1	1	4
hawks/vultures	6	0.3	10	0	4	2	16
Subtotal	31	4.9	35	37	162	64	297
TOTAL	80	100	398	99	3,764	1,859	6,120
Source: MEC 1997							

Areas 3 and 4 in the upper portion of the Bay had the most birds. Although not shown in the count data, the high number of shorebirds and skimmers that were observed on the mudflat in Area 3 were later found under higher tidal conditions on the islands located in Area 4. Area 1, in the lower portion of the Bay from PCH to Middle Island was moderately used by birds. Area 2, which generally extended from Middle Island to the Narrows had the lowest abundance of birds. The low abundance of birds in Area 2 probably related in part to the limited availability of mudflat and survey methods. Marsh habitats were only lightly surveyed, as requested by the U.S. Fish and Wildlife Service (USFWS), and due to time constraints.

The most abundant water-associated birds included least and western sandpiper, dowitcher, marbled godwit, willet, black-bellied plover, black skimmer, semipalmated plover, mallard, and cinnamon teal (Table 3.4-8). Red-winged blackbird, savannah sparrow, and song sparrow were the most abundant passerines.

Historical Perspective

There are approximately 182 species that regularly inhabit Newport Bay over a calendar year, with only about 18 percent, or 33 species, being residents (i.e., those species with individuals residing year-round). The large number of non-resident bird species indicates Newport Bay's value not only to the local resident bird community but to a large number of migratory species that play intricate roles in other areas of the continent. Appendix C, Table 2, summarizes the bird species that regularly occur at Newport Bay.

Habitat Use

This subsection presents results from the September 1997 survey of bird habitat use, as well as a general discussion of how the birds that are regularly observed at Newport Bay use the habitat. Literature sources included Caffrey 1997, Hamilton and Willick 1996, Unitt 1984, Gallagher 1997, and NAS 1997. Count data by species and habitat for the September 1997 survey are presented in Appendix D, Table 3.

Table 3.4-9 presents the total number of birds observed in each of the censused habitats during the September 1997 survey. Areas 3 and 4 of the Upper Bay had the most birds. Mudflat, saltmarsh (low and middle), open water, and ruderal habitats had a higher bird utilization in Area 3 than in any other area of the Bay. The high number of shorebirds in Area 3 was primarily found on the mudflat. Mudflat and other (e.g., riparian, upland) habitats were the most occupied in Area 4. Area 1 had a moderate abundance of birds; most were observed on a mudflat area near the boundary between Areas 1 and 2. Area 2 had the fewest number of birds, which may have been related to the limited availability of mudflat in that channelized area of the Bay and the limited nature of the survey.

Data from the recent surveys generally reinforce previous characterizations of the avifauna of the Upper Bay (CDFG 1985; Marsh 1990; Corps 1993). Bird use of Newport Bay is heaviest from fall through spring, when large numbers of migratory and overwintering waterbirds are present. A smaller number of waterbirds, notably terns and species that breed in freshwater marsh habitats (see below) are summer residents. Following is a summary of avian use of various habitats of the Bay. Discussions are based largely on MEC (1997), with additional information on numbers or seasonality derived from the Sea and Sage Audubon Society data (Kust, unpublished data).

Open Water. Open water habitat is used by a number of bird groups including loons, grebes, pelicans, cormorants, herons, geese, ducks, mergansers, terns, gulls, and some species of raptors. All rely on food sources found in open water; i.e., fish, invertebrates, and/or vegetation. The most abundant species in recent years have been dabblers and shallow-diving ducks, including green-winged teal, northern pintail, American wigeon, and ruddy duck (Kust, unpublished data). The gray-black American coot, a medium-sized, hen-like bird that feeds on algae and plant detritus is another common duck-like bird of the mudflats and open water. Ducks are abundant from all through early spring (Corps 1993; Kust, unpublished data). Other common species found foraging in this habitat include pied-billed grebe, eared grebe, western grebe, California brown pelican, double-crested cormorant, mallard, cinnamon teal, northern shoveler, lesser scaup, bufflehead, western gull, elegant tern, Forster's tern, California least tern, and black skimmer. Usage by all groups except terns (including black skimmer), which are summer residents, is heaviest from fall through spring (Kust, unpublished data).

Table 3.4-8
Bird Species Count Data by Survey Area at Upper Newport Bay in September 1997

Common Name	Species	September 8, 1997				September 11, 1997
		Area				Total Count
		1	2	3	4	
eared grebe	*Podiceps nigricollis*	0	0	0	1	
western grebe	*Aechmophorus occidentalis*	0	0	1	0	
Clark's grebe	*Aechmophorus clarkii*	0	0	1	0	
pied-billed grebe	*Podilymbus podiceps*	1	1	11	6	*(7)
California brown pelican	*Pelecanus occidentalis californica*	3	0	5	0	*(5)
double-crested ormorant	*Phalacrocorax auritus*	3	0	11	2	*(4)
great blue heron	*Ardea herodias*	6	0	5	2	*(9)
green-backed heron	*Butorides striatus*	0	0	0	0	*(1)
cattle egret	*Bubulcus ibis*	0	0	1	0	
great egret	*Casmerodius albus*	4	0	5	4	*(4)
snowy egret	*Egretta thula*	9	3	8	28	*(8)
black-crowned night-heron	*Nycticorax nycticorax*	2	2	2	1	
ducks, unidentified	*Anas* spp.	0	0	0	2	
mallard	*Anas platyrhynchos*	21	8	16	29	*(65)
gadwall	*Anas strepera*	0	0	3	7	*(35)
northern pintail	*Anas acuta*	0	19	16	12	*(5)
green-winged teal	*Anas crecca*	9	3	7	5	
blue-winged teal	*Anas discors*	0	4	0	0	*(13)
cinnamon teal	*Anas cyanoptera*	3	7	38	14	*(3)
northern shoveler	*Anas clypeata*	0	0	5	6	*(3)
ruddy duck	*Oxyura jamaicensis*	0	0	1	0	
turkey vulture	*Cathartes aura*	3	0	1	0	*(9)
white-tailed kite	*Elanus caeruleus*	1	0	0	2	*(2)
sharp-shinned hawk	*Accipiter striatus*	1	0	1	0	
Cooper's hawk	*Accipiter cooperii*	0	0	0	0	*(1)
red-shouldered hawk	*Buteo lineatus elegans*	0	0	0	0	*(2)
red-tailed hawk	*Buteo jamaicensis*	2	0	0	0	*(3)
northern harrier	*Circus cyaneus*	1	0	1	0	
osprey	*Pandion haliaetus*	2	0	0	0	*(2)
American kestrel	*Falco sparverius*	2	0	1	0	*(5)
peregrine falcon	*Falcon peregrinus*	0	0	0	0	*(1)
light-footed clapper rail	*Rallus longirostris levipes*	1	0	5	0	*(3)
Virginia rail	*Rallus limicola*	0	1	0	0	*(5)
common moorhen	*Gallinula chloropus*	0	1	0	0	*(1)
sora	*Porzana carolina*	0	0	0	0	*(7)
American coot	*Fulica americana*	0	4	0	0	*(5)
semipalmated plover	*Charadrius semipalmatus*	0	0	27	57	
killdeer	*Charadrius vociferus*	0	1	5	12	*(10)
black-bellied plover	*Pluvialis squatarola*	4	0	100	74	*(8)
long-billed curlew	*Numenius americanus*	3	0	9	0	*(8)
whimbrel	*Numenius phaeopus*	1	0	0	0	*(2)
spotted sandpiper	*Actitis macularia*	3	0	1	1	*(4)
yellowlegs spp.	*Tringa* spp.	0	0	0	1	
greater yellowlegs	*Tringa melanoleuca*	1	0	2	1	*(6)
willet	*Catoptrophorus semipalmatus*	71	0	181	76	*(236)
red knot	*Calidris canutas*	0	0	0	22	
least sandpiper	*Calidris minutilla*	10	0	231	215	*(1900)
western sandpiper	*Calidris mauri*	19	0	2597	930	*(9)
sanderling	*Calidris alba*	0	0	0	1	

Table 3.4-8, Page 2 of 2

Common Name	Species	September 8, 1997				September 11, 1997
		Area				Total Count
		1	2	3	4	
dowitcher spp.	*Limnodromus* spp.	106	0	61	200	*(37)
short-billed dowitcher	*Limnodromus griseus*	11	0	0	3	
marbled godwit	*Limosa fedoa*	44	0	125	53	*(88)
American avocet	*Recurvirostra americana*	0	0	1	4	
red-necked phalarope	*Phalaropus lobatus*	0	0	1	4	
western gull	*Larus occidentalis*	12	0	2	1	
ring-billed gull	*Larus delawarensis*	2	8	6	3	*(21)
Forster's tern	*Sterna forsteri*	7	0	15	5	
common tern	*Sterna hirundo*	1	0	0	0	
caspian tern	*Sterna caspia*	1	0	0	2	
elegant tern	*Sterna elegans*	0	0	0	0	*(1)
black skimmer	*Rhynchops niger*	3	0	97	11	*(136)
mourning dove	*Zenaida macroura*	0	1	0	0	*(19)
hummingbirds	*Trochilidae*	0	0	1	0	
Anna's hummingbird	*Calypte anna*	0	2	0	1	*(22)
Allen's/Rufous hummingbird	*Selasphorus sasin/rufus*	0	1	0	0	
black phoebe	*Sayornis nigricans*	1	0	1	0	*(7)
Say's phoebe	*Sayornis saya*	1	0	0	0	
barn swallow	*Hirundo rustica*	1	0	1	2	*(7)
loggerhead shrike	*Lanius ludovicianus*	0	0	0	0	*(1)
house wren	*Troglodytes aedon*	0	3	0	0	*(9)
Bewick's wren	*Thryomanes bewickii*	1	1	0	0	*(11)
marsh wren	*Cistothorus palustris*	0	2	4	0	*(22)
northern mockingbird	*Mimus polyglottos*	1	0	0	0	*(4)
bushtit	*Psaltriparus minimus*	0	0	10	0	*(57)
wrentit	*Chamaea fasciata*	0	1	0	0	
common yellowthroat	*Geothlypis trichas*	0	8	1	1	*(34)
red-winged blackbird	*Agelaius phoeniceus*	0	1	44	31	*(122)
brown-headed cowbird	*Molothrus ater*	0	0	2	0	
house finch	*Carpodacus mexicanus*	0	10	10	0	*(28)
California towhee	*Pipilo crissalis*	0	1	0	0	*(8)
Savannah sparrow	*Passerculus sandwichensis*	2	0	73	1	
Belding's Savannah sparrow	*Passerculus sandwichensis beldingi*	1	0	9	7	*(11)
large-billed Savannah sparrow	*Passerculus sandwichensis rostratus*	0	0	2	0	
song sparrow	*Melospiza melodia*	1	5	0	3	*(61)
house sparrow	*Passer domesticus*	0	0	0	0	*(45)
European starling	*Sturnus vulgaris*	1	0	0	0	*(19)
common raven	*Corvus corax*	3	1	0	2	*(12)
American crow	*Corvus brachyrhynchos*	12	0	0	14	*(27)
California gnatcatcher	*Polioptila californica*	0	0	0	0	*(9)
Totals		398	99	3764	1859	*(3202)
Number of Species	80	46	26	51	45	61
Source: MEC 1997						

Table 3.4-9
Summary of Bird Count Data by Habitat at Upper Newport Bay, September 8, 1997

Habitat	Area				Total
	1	2	3	4	
Open water	15		24	13	52
Mudflat	288		3,509	1,692	5,489
Low marsh	7	1	54		62
Mid marsh	5		70	9	84
Upper marsh					
Freshwater marsh		72	10		82
Salt panne	10	9	1	4	24
Ruderal	8	3	13	3	27
Perches	5		3	1	9
Other	1	12		33	46
Aerial	59	2	80	104	245
Total	398	99	3,764	1,859	6,120
Source: MEC 1997					

Mudflat. Birds characteristic of this habitat are shorebirds and rails. Many of these species probe or surface forage for invertebrates that inhabit the intertidal substrate while some, like the American avocet, sift the water of the intertidal zone. The species commonly found foraging in this habitat include great egret, snowy egret, light-footed clapper rail, black-bellied plover, killdeer, black-necked stilt, American avocet, willet, marbled godwit, western and least sandpiper, dunlin, and dowitcher. The shorebirds, among which the peeps (western and least sandpipers) are the most numerous occur by the thousands during fall and spring migration periods (Kust, unpublished data; MEC 1997). With the exception of avocets, killdeer, and black-necked stilts, the shorebirds are migrant species that do not breed at Upper Newport Bay. Savannah sparrows, including the Belding's subspecies, also commonly forage on the mudflat for insects. These species as well as many of those mentioned under open water also depend on mudflats as loafing/ resting sites away from disturbance.

Another group of birds, raptors, forage primarily on the birds feeding or loafing on the mudflat. These raptors include northern harrier, sharp-shinned hawk, Cooper's hawk, merlin, and peregrine falcon.

Low Marsh. Low marsh provides nesting habitat for the endangered light-footed clapper rail. This habitat is used by a variety of species for a variety of purposes, with the prey base largely composed of invertebrates and vegetation. Herons and egrets, including four species, are prominent in this habitat in Upper Newport Bay. These birds are seen resting in the marsh or fishing in tidal creeks and the shallow waters of the mudflats at high tide (Corps 1993). Great blue herons and snowy egrets are present year-round, while black-crowned night herons and great egrets are more common seasonally (Kust, unpublished data). Many of the shorebirds will forage and loaf/rest in the transition zone between low marsh and mudflat, where the vegetation is not too dense and mudflat is easily accessible. The endangered light-footed clapper rail forages and nests in low marsh. Other rails that dwell within the Bay include the sora, Virginia, and the black rail (classified as rare by the state of California) (Corps 1993). Raptors common to the mudflat also frequent this habitat for suitable prey.

Mid Marsh. Herons and egrets commonly forage in this habitat as does the light-footed clapper rail. Some of the large wading shorebirds (marbled godwit and willet) forage where the vegetation is sparse, and several species of passerines use the habitat (e.g., marsh wren, song sparrow, and several subspecies of savannah sparrow). The endangered Belding's savannah sparrow nests in the mid marsh as does the common mallard and possibly gadwall. Most raptors including great horned owl, red-tailed hawk, American kestrel, merlin, and peregrine falcon forage over this habitat, as well.

High Marsh. This habitat is utilized by a mixture of water-associated and terrestrial species. Herons, egrets, hawks, falcons, and owls will commonly forage for vertebrates (reptiles, amphibians, mammals, etc.) in this zone. Common passerines that forage for insects and vegetative parts (e.g., seeds) include black phoebe, American crow, Bewick's wren, marsh wren, common yellowthroat, savannah sparrow, and song sparrow. Nesting species include mallard, black-necked stilt, American avocet, Forster's tern, common yellowthroat, song sparrow, red-winged blackbird, house finch, and brown-headed cowbird.

Freshwater Marsh. Many species characteristic of this habitat also occur in saltmarsh. Herons and egrets, again, are common to the habitat with green heron a possible breeder. Pied-billed grebe, eared grebe, western grebe, green-winged teal, northern pintail, blue-winged teal, cinnamon teal, northern shoveler, gadwall, American wigeon, ruddy duck, light-footed clapper rail, Virginia rail, sora, common moorhen, and American coot are regularly observed at Upper Newport Bay at various times of year. Shorebirds will also forage in freshwater marsh if mudflat is available, and these species include western and least sandpipers, dowitcher spp., marbled godwit, willet, greater yellowlegs, black-necked stilt, American avocet, and belted kingfisher. Of these water-associated species, pied-billed grebe, mallard, blue-winged teal, cinnamon teal, common moorhen, black-necked stilt, and American avocet are known breeders. Passerines characteristic of freshwater habitat include black phoebe, tree swallow, northern rough-winged swallow, cliff swallow, barn swallow, marsh wren, common yellowthroat, red-winged blackbird, savannah sparrow, song sparrow, and house finch. The breeders of this group are tree swallow, marsh wren, common yellowthroat, song sparrow, and red-winged blackbird.

Many of the same raptors as found in the preceding habitats will also forage in freshwater habitat.

Salt Panne. The importance of this habitat is not necessarily for foraging, but rather loafing/resting and nesting. Shorebirds, terns, gulls, and to some degree dabbling ducks require open, undisturbed areas for resting. Salt panne, if away from humans, meets those requirements. As for breeding, many of the shorebirds and terns require this habitat for nest placement. These species include Forster's tern, California least tern, black skimmer, black-necked stilt, American avocet, and possibly snowy plover.

Because this habitat is characteristically open and used by large numbers of individuals for loafing and nesting, it provides an excellent foraging base for raptors such as peregrine falcon, merlin, American kestrel, northern harrier, great horned owl, barn owl, and red-tailed hawk. Non-raptors that also take advantage of the open nesters include American crow and common raven.

Ruderal. This habitat is comprised of many plant species that have been brought together by ground and/or vegetative disturbance that in some cases provides a transition between "water-associated" and upland habitats. Although the majority of the bird species using this habitat are terrestrial species, great blue herons and great egrets may forage there for mammals, reptiles, and amphibians, and mallards and killdeers will nest in it. Terrestrial species more characteristic of the habitat include mourning dove, Anna's hummingbird, Say's phoebe, black phoebe, Cassin's and western kingbirds, horned lark, bushtit, Bewick's and house wren, northern mockingbird, common yellowthroat, savannah sparrows, song sparrow, Lincoln's sparrow, and white-crowned sparrow. All of these species can be found foraging in ruderal habitat, and some also breed in this habitat; e.g., mourning dove, Anna's hummingbird, loggerhead shrike, song sparrow, and house finch, also breed.

Any of the raptors listed in Appendix C will forage in this habitat, but white-tailed kite and American kestrel will also nest in it.

Other. This category encompasses other kinds of terrestrial habitats found in the bay such as coastal sage scrub, southern willow riparian, and upland. These habitats are not expected to play a role in the development of an enhancement project; refer to Appendix C for species associated with this category.

Aerial. This is a category created for those species such as swallows and swifts that forage in the air. Species typical of this category and found in Upper Newport Bay include white-throated swift, Vaux's swift, northern rough-winged swallow, tree swallow, barn swallow, and cliff swallow. All of these species, excluding Vaux's swift, breed in the area either on steep cliffs, trees, or man-made structures such as overpasses and bridges.

Sensitive Species

Newport Bay provides habitat to 28 legally sensitive species, with only 3 being residents. Categories of sensitivity defined by the state of California and the federal government are: state-endangered, state-threatened, state fully protected species, state species of special concern, federally endangered, and federally threatened. The legal status of birds regularly observed at Upper Newport Bay is listed by species in Appendix C. Sensitive species are discussed in more detail in Section 3.4.3.

Future Without-Project Conditions (50 Years)

Under the future without-project conditions, bird species such as diving ducks, gulls and terns, and grebes dependent on open water will lose much of their open water habitat because of sediment deposition in open water areas. On the other hand, birds such as shorebirds, rails, herons and egrets, dependent on intertidal mudflat and marsh habitats will gain habitat.

The loss in volume of open water and increased freshwater influence, and degradation of water quality because of the reduction in the tidal prism will decrease the benthic and water column fish populations that the Upper Bay will support. The increased freshwater influence is also predicted to lower the diversity of the benthic invertebrate community. The reduced invertebrate and forage fish populations will reduce the food base for waterfowl and diving birds. Waterfowl and boaters will compete for the more limited open water areas in the Upper Bay. Overall if no action is taken, the diversity of the habitat mix in the Upper Bay will be reduced and there will be a corresponding loss in species richness.

The modified HEP analysis that was performed to determine habitat value to various indicator species under existing, future without-project and project alternative conditions, is presented in Appendix A. The results are discussed in Section 4.0 and are summarized here for the future without-project scenario.

The modified HEP analysis selects a suite of indicator species to represent the species dependent on each habitat and calculates a Habitat Quality Index (HQI) for each indicator species for each habitat under existing and future with- and without-project conditions. The HQI is multiplied by the number of acres of each habitat to provide the total Habitat Units (HUs) for each indicator species. The modified HEP analysis showed that, under the future without-project conditions, all of the bird species selected as indicators of open water habitat would lose HUs. The California least tern, selected to represent the gull and tern guild, would lose not only most of their open water foraging habitat but the quality of the remaining habitat would be expected to decline because the increased freshwater influence would decrease the prey base of small schooling fish. Under the without-project conditions, least terns were predicted to suffer a 23 percent decline in HUs within 20 years and a 49 percent loss by Year 50. In addition as open water acreage and habitat quality declines in the uppermost basin, they would have to fly further from their nests to forage. Western grebes also were predicted to suffer a loss in both habitat quantity and habitat quality because, as sedimentation converts open water areas to mudflats, an increasing percentage of the grebe's habitat occurs in the main channel where birds frequently are disturbed by boaters. The HEP model predicts that western grebes would suffer a 17 percent loss of HUs by Year 20 and a 42 percent loss by Year 50. Lesser scaups, selected to represent diving ducks, are also predicted to suffer a net loss in HUs. Under the future without-project conditions, lesser scaup are predicted to suffer a decrease in their preferred prey of clams because clams would be expected to decline as a result of the increased freshwater influence. The loss of the basin areas would also expose lesser scaups to more disturbance from boaters in the main channel. On the other hand, the shoaling of the deepest portions of the open water habitat would convert some areas to the shallower water depths preferred by scaups. Overall, the HEP model predicted lesser scaups would have a 26 percent loss of HUs by Year 20 and a 72 percent loss by Year 50.

The HEP model predicted that all species including Northern pintail, great egret, American avocet and shorebirds, that primarily utilize intertidal mudflats would gain HUs because of the gain in acres of mudflat under the future without-project conditions. Even though a net gain in HUs is predicted, there would be a loss in habitat quality for some species. For example, habitat quality for shorebirds is predicted to decline because the increased freshwater influence would be expected to decrease the diversity of their invertebrate prey. Bird species dependent on marsh would gain HUs because there would be a gain in the amount of marsh habitat under without-project conditions. Although not quantified in the main HEP model, some decline in the quality of marsh habitat for birds may occur under the future without-project conditions because increased shoaling of channels between marsh islands and the mainland might facilitate access to these areas by mammalian predators. If water quality declines in back channels because of a decrease in tidal influence, these areas may be less productive as foraging habitat for species such as great egrets that eat marine fishes and invertebrates. Moreover, tidally influenced saltmarsh may be cutoff from tidal action in the future as accreted sediments block tidal channel creeks. As a result, the amount of cordgrass, which is highly dependent on tidal action, may be reduced. Future loss of cordgrass would represent loss of preferred habitat for the endangered light-footed clapper rail.

Prolonged freshwater runoff into the Bay would benefit brackish and freshwater channel communities at the expense of the marine community, providing low value marine habitat. Low channel salinity resulting from a decreased tidal prism would enhance the growth of a riparian corridor of willows, sycamores and mule fat along the channel banks in a manner which would be similar to conditions above the Main Dike prior to restoration work. Riparian and brackish water species would increase and bird species that frequent riparian and freshwater marsh habitats would benefit.

3.4.1.4 Reptiles and Amphibians

Historical and Existing Conditions

Historically, the uplands surrounding Upper Newport Bay provided habitat for native reptiles that have become increasingly uncommon in coastal southern California, among them the red diamond rattlesnake (*Crotalus ruber*) and coast horned lizard (*Phrynosoma coronatum*) (Marsh 1990). These upland habitats adjacent to the study area have been extensively developed or degraded. In contrast, freshwater marsh habitat within the study area has probably increased relative to historic conditions, providing habitat for several native and non-native amphibians. These species may also have historically occurred at the mouths of drainages that emptied into Newport Bay prior to extensive land development. Existing conditions are summarized below.

Appendix D provides a list of the 13 reptile and 6 amphibian species that have been reported from the Upper Bay (CDFG 1985; Marsh 1990). Several of the common species (see below) were observed during a November 1997 survey (MEC 1997).

Reptiles are found in the non-tidal areas in and around the Bay. Common reptiles include the western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), gopher snake (*Pituophis melanoleucus*), and common kingsnake (*Lampropeltis getulus*). The southwestern pond turtle (*Clemmys marmorata*), a state and federal species of concern, is likely in San Diego Creek upstream of tidal influence (Marsh 1990). Other species observed during the 1950s and 1960s include coachwhip (*Masticophis flagellum*), California kingsnake (*Lampropeltis getulus californiae*), and western skink (*Eumeces skiltonianus*) (T. Mulroy, personal observations). Their existence in the study area at present is uncertain.

The western whiptail (*Cnemidophorus tigris*), silvery legless lizard (*Anniella pulchra*), and San Diego horned lizard (*Phrynosoma coronatum blainvillei*) are state or federal species of concern that may occur in the study area. These species occur in terrestrial and dune-like habitats of hills and coastal lands and have been considered possible, though not confirmed, in sandy upland habitats surrounding the Bay and on Shellmaker Island (Marsh 1990; Fuller 1992). Six amphibian species inhabit the freshwater ponds and seeps that surround Upper Newport Bay. These include the Pacific slender salamander (*Batrachoseps attenuatus*), Pacific tree frog (*Hyla regilla*), western toad (*Bufo boreas*), and the introduced bullfrog (*Rana catesbiana).*

Future Without-Project Conditions (50 Years)

Because of the affinities of reptiles and amphibians for freshwater/riparian habitats, the expected long-term increase in acreage of these habitats, at the expense of marine and intertidal habitats would probably result in increased populations of reptiles and amphibians.

3.4.1.5 Insects

Insects represent an extremely large and complex component of the saltmarsh ecosystem, and can be very useful as indicators of the health and quality of a habitat (Zedler 1982; Louda 1988; Williams 1993). Many important saltmarsh functions are performed by insects. Insects form the primary forage base for many birds, reptiles, and mammals. Pollination by insects (especially Lepidoptera and large Hymenoptera) is required by many plant species, including the endangered saltmarsh bird's beak (*Cordylanthus maritimus*) (PERL 1990), which occurs at Upper Newport Bay. Dispersal of pollen and seeds by insects helps maintain habitat diversity. Many species of wasp have larvae that parasitize other insects, and can play an important role in controlling herbivorous pest species. Predators such as spiders and beetles also aid in controlling pest species. Detritivores, mainly ants, isopods, and Collembola, have an important function in the breakdown of organic matter. Herbivores (including leaf and systemic feeders) may have a negative impact on ecosystem function, but add to the forage base. Burrowing insects (e.g., rove beetles, family Staphylinidae) have a significant role in soil aeration and incorporation of organic matter (PERL 1990).

Historic and Existing Conditions

K. Marsh (1990) has summarized previously available information on the insects of Upper Newport Bay. G.A. Marsh's collection from the DeAnza Peninsula (MBC et al. 1984), covering habitats ranging from subtidal mud and sand flats through the range of intertidal saltmarshes to some marginal southern dune scrub habitat at the crest of the downbay-pointing land finger, is apparently the only systematic survey of arthropods that has been done in the Bay. Among 680 arthropods collected were crustaceans (beach fleas, wood lice, sowbugs, and pillbugs), spiders and pseudoscorpions, along with 39 taxa of insects from 10 orders, and 22 families. The bulk of the pit-trap and netted samples were beetles, flies, and hymenopterans (ants, wasps, and bees). Less frequently encountered were silverfish, jumping bristletails, bark lice, orthopterans (grasshoppers, crickets, cockroaches), true bugs, lacewings and ant lions, and moths and butterflies. The single most abundant species present was the California harvester ant (*Pogonomyrmex californicus*).

Beetles collected by G.A. Marsh included several rare though non-listed taxa, including the ciliate plume beetle (*Coelus ciliatus*), mudflat tiger beetle (*Cicindela trifasciata sigmoidea*), and the red belly tiger beetle (*C. haemorrhagica pacifica*). Nagano (1982) cites four additional Cicindela tiger beetles from the Bay or region that are regionally rare: *C. gabbi*, *C. hirticollis gravida*, *C. latesignata latesignata*, and *C. l. obliviosa*. All of these are restricted to marine and estuary shorelines. The mudflat tiger beetle was the dominant shoreline insect at the DeAnza Peninsula.

Butterfly species reported from Upper Newport Bay are discussed by K. Marsh (1990). Most of these are species observed in upland or riparian/freshwater marsh habitats bordering the Bay. The wandering skipper (*Panoquina errans*), a federal species of concern, occurs in high marsh habitats, where the larvae develop on saltgrass.

1997 Insect Survey

Insects were surveyed at Upper Newport Bay during one 48-hour period using pan traps and sticky flag traps. The purpose of the survey was to determine the types and relative abundance of insect groups, and the distribution of functional insect groups in relation to the different wetland habitats (MEC 1997).

The abundance of insects and the relative ease with which they may be captured requires that a survey be very focused. For the September 1997 survey, only 3 stations were established, and very few replicate traps were set to keep the numbers of insects identified within the scope of the project. Stations 1 and 2 in Areas 3 and 4 (refer to Figure 3.4-2), respectively, each contained suitable conditions to sample all wetland habitats except mudflat. Mudflat in Areas 3 and 4 became inundated under the neap, high tide conditions of the survey. Station 3 in Area 2 was selected for mudflat sampling since it did not become fully inundated by the tides during the survey. It should be noted that this mudflat area, as well as the salt pannes at Stations 1 and 2, were all quite small and the influence of nearby vegetation probably impacted the composition of the collected insects.

A total of 2,326 insects (including spiders and isopods) representing 17 orders were captured and identified in the survey (Table 3.4-10). The pan traps caught a much greater number and diversity of insects than the sticky flag traps. The sticky flag samples were limited to small flying insects, which also were well represented in the pan traps. Most of the collected insects were adults.

Table 3.4-10
Total Abundance of Insects Collected by Pan and Sticky Flag Traps in Different Habitats at Upper Newport Bay in September 1997

Area	Mudflat	Low Marsh	Mid Marsh	Upper Marsh	Freshwater Marsh	Salt Panne	Total
2	356						356
3		104	170	230	243	164	911
4		165	88	185	250	371	1059
Total	356	269	258	415	493	535	2326
Source: MEC 1997							

Areas 3 and 4 were similar in overall abundance. As expected, fewer insects were collected in Area 2, which was represented by a single habitat. The most insects were collected in the salt panne and freshwater marsh habitats. Moderate numbers were caught in the upper marsh and mudflat habitats. The fewest number of insects were captured in the low and mid marsh habitats.

Habitat Use

The relative importance of the various insect orders in the different habitats is provided in Table 3.4-11. Mean abundances of the taxonomic categories within each order for the pan trap samples are given in Table 3.4-12 since that was the most effective gear for capturing insects at Upper Newport Bay. Families within the order Diptera were organized into suborders. For instance, Nematocera include Culicidae (mosquitos), Chironomidae (midges), and Psychodidae (moth flies), and Brachycera include Dolichopodidae (long-legged flies).

Diptera (mainly flies) and Hymenoptera (mainly ants) were the dominant components of the insect fauna (Table 3.4-11). The relative importance of these two orders varied among the different habitats. Dipterans and Hymenopterans were nearly equally important in mudflat, mid-marsh, and freshwater marsh habitats. Dipterans dominated the low marsh, and Hymenopterans were more prevalent in upper marsh and salt panne habitats. Thysanopterans (thrips) ranked third in abundance, and were most abundant in mid marsh, upper marsh, and freshwater marsh habitats. Other orders such as Coleoptera (beetles), Collembola (springtails), and Homoptera (aphids, hoppers, scale insects, white flies) were collected in moderate abundance in various habitats.

Numbers of detritivores increased from low to upper marsh, and were most abundant in freshwater marsh, mudflat, and salt panne habitats. The abundance of detritivores (mostly ants) in the mudflat and salt panne habitats could be due to the small size of these areas, with the ants using them as transportation corridors. The other major detritivore group, the Collembolla (springtails), were much less abundant in the mudflat and salt panne habitats.

Table 3.4-11
Percent of Total Abundance of Insect Orders by Habitat at Upper Newport Bay in September 1997

Order	Mudflat	Low Marsh	Mid Marsh	Upper Marsh	Freshwater Marsh	Salt Panne
Acarina	0.3	0.0	1.6	1.0	0.4	17.0
Araneida	0.3	0.0	4.3	1.9	0.0	1.3
Coleoptera	4.5	1.1	5.0	3.6	0.8	2.2
Collembola	0.6	0.4	1.6	6.7	7.5	4.1
Dermaptera	0.0	0.0	0.0	0.0	0.0	1.5
Diptera	40.2	74.7	26.0	14.9	39.1	18.9
Hemiptera	0.6	0.4	0.4	0.5	3.9	0.0
Homoptera	3.9	1.5	5.8	10.4	4.9	4.5
Hymenoptera	39.6	13.8	33.7	47.2	27.8	40.9
Isopoda	8.1	0.0	0.0	0.2	1.6	5.2
Lepidoptera	0.3	0.0	0.0	0.2	0.0	0.4
Orthoptera	0.3	0.0	0.0	0.0	0.0	0.0
Psocoptera	0.0	0.0	0.0	0.2	0.0	0.0
Strepsiptera	0.0	0.4	0.0	0.2	0.0	0.0
Thysanoptera	0.6	7.8	21.7	12.0	14.0	3.7
Thysanura	0.8	0.0	0.0	0.7	0.0	0.2
Total Abundance	356	269	258	415	493	535
Number of Orders	13	8	9	14	9	12
Source: MEC 1997						

Herbivores were most abundant on mid marsh, upper marsh, and freshwater marsh habitats, which support the greatest variety of vegetation. Low marsh habitat, dominated by cordgrass, had relatively few herbivores. As expected, few herbivores were collected on the mudflat and salt panne habitats.

The multiple function group consisted primarily of flies, which were most abundant in freshwater marsh, but were otherwise spread throughout the habitats randomly. Parasite and predator components were the least abundant in all habitats, as would be expected. Low numbers of pollinators was partly due to the relatively large size of the insects in this functional group, and their ability to escape from the traps. A summary of insect utilization of the different habitats is presented below.

Mudflat. A total of 13 orders, representing 24 taxa, were collected from the mudflat habitat. Dipteran flies, midges, and mosquitos accounted for 40 percent of the collected insects in this habitat. Members of that order feed in a variety of ways, hence, that group was classified as a multiple function guild. Equally abundant were Hymenoptera (40%), represented mainly by ants (*Formicidae*). Sowbugs (*Isopoda*), which like ants are detritivores, ranked third (8%). Ground beetles (*Carabidae Coleopterans*) also were moderate in abundance (4%). The small size of the mudflat sampling site and its proximity to vegetated habitats probably influenced the relatively high diversity of the insect fauna, and the relatively high abundance of detritivores within this habitat. It would be expected that the more expansive mudflats in Areas 3 and 4 would support a relatively less diverse insect fauna except where the habitat transitions into marsh.

Low Marsh. The low marsh habitat had the least diverse insect assemblage with 8 orders, representing 15 taxa. Dipteran midges, mosquitos, and moth flies accounted for 75 percent of the total number of insects in this habitat. Hymenoptera (mainly ants) were ranked second (14%). Herbiverous thrips (*Thysanoptera*) were of moderate importance (8%).

Table 3.4-12
Mean Abundance of Insects by Functional Guild and Habitat that were Collected by Pan Traps at Upper Newport Bay in September 1997

Order	Family	Common Name	Functional Guild	Mudflat	Low Marsh	Mid Marsh	Upper Marsh	Freshwater Marsh	Salt Panne
Acarina	Unidentified	Mites & ticks	Multiple	0.5		2.0	+2.0	1.0	45.5
Araneida	Unidentified	Spiders	Predator	0.5		5.5	3.5		3.5
Coleoptera	Carabidae	Ground beetles	Predator	3.5		0.5	1.0		
	Curculionidae	Snout beetles	Herbivore					0.5	
	Elateridae	Click beetles	Detritivore						0.5
	Staphylinidae	Rove beetles	Predator	3.0	1.0	0.5	0.5		
	Unidentified	Beetles	Predator			3.0			
	Unidentified	Beetles	Multiple	1.5	+	+1.0	+4.0	+	+3.5
Collembolla	Entomobryidae	Springtails	Detritivore	1.0		1.0	3.0	8.0	2.5
	Poduridae	Elongate-bodied springtails	Detritivore		1.0	1.0	10.0	10.0	8.0
	Sminthuridae	Globular springtails	Detritivore				1.0	0.5	0.5
Dermaptera	Unidentified	Earwigs	Detritivore						4.0
Diptera	Brachycera	Predaceous flies	Predator	2.5		2.0	1.5	2.5	8.0
	Cyclorrapha	Muscoid, brine, & house flies	Multiple	*26.0	*3.0	*3.5	*5.5	*1.0	*13.5
	Nematocera	Midges, mosquitos, moth flies	Multiple	*17.0	*25.0	*5.0	*2.0	*42.0	*6.0
	Unidentified	Flies	Multiple	+1.0	+2.0	+0.5	+1.5	*5.5	+1.5
Embioptera	Unidentified	Webspinners	Predator				0.5		0.5
Hemiptera	Tingidae	Lace bugs	Herbivore					0.5	
	Unidentified	Flies	Herbivore	1.0	1.0	+	1.0	9.0	
Homoptera	Aleyerodidae	White flies	Herbivore	+0.5	+	*	0.5	+0.5	0.5
	Aphididae	Aphids	Herbivore	+2.5	+	+1.0	+11.5	*2.5	3.5
	Cicadellidae	Leaf hoppers	Herbivore	1.0	+	0.5	6.5		1.0
	Coccoidea	Scale insects	Herbivore	+0.5		+	0.5	+	5.0
	Delphacidae	Plant hoppers	Herbivore		1.0		+0.5		
	Psyllidae	Psyllids	Herbivore	0.5		+		+	+1.5
Hymenoptera	Apoidea	Bees	Pollinator			0.5			0.5
	Formicidae	Ants	Detritivore	62.5	36.0	38.0	79.0	+61.5	95.0
	Vespidae	Wasps	Predator	0.5		0.5		0.5	
	Vespoidea	Wasps	Predator			1.0	1.5		
	Unidentified	Wasps	Parasite	+5.5	+	3.5	*13.0	+3.5	+11.0
	Unidentified	Wasps	Predator					1.0	
Isopoda	Unidentified	Sowbugs	Detritivore	14.5			0.5	4.0	14.0
Lepidoptera	Hesperiidae	Skippers	Pollinator				0.5		
	Unidentified	Butterflies & moths	Pollinator	0.5					1.0
Orthoptera	Gryllidae	Crickets	Detritivore	0.5					
Psocoptera	Unidentified	Bark lice, book lice	Detritivore				0.5		
Strepsiptera	Unidentified	Twisted winged parasites	Parasite		1.0		0.5		
Thysanoptera	Unidentified	Thrips	Herbivore	+	*	*	*1.0	*4.5	7.5
Thysanura	Unidentified	Bristletails	Detritivore	1.5			1.5		0.5
Total Mean Abundance				148.0	71.0	70.5	154.5	158.5	239.5

* Moderate to high abundances in sticky flag trap samples.
+ Low abundances in sticky flag trap samples
Source: MEC 1997

Mid Marsh. A total of 9 orders, representing 24 taxa, were sampled in the mid marsh habitat. Hymenoptera (mainly ants), Diptera (flies, midges, mosquitos), and Thysanoptera (thrips) all were moderately abundant, accounting for 34, 26, and 22 percent of the total insects within this habitat, respectively. Spiders (*Araneida*) and beetles (*Coleoptera*) occurred in relatively high abundance (4 and 5%, respectively) in this habitat as compared to the other habitats sampled in the Upper Bay.

Upper Marsh. The upper marsh habitat had the most diverse insect assemblage with 14 orders, representing 28 taxa, being collected. Hymenoptera (mainly ants) were most abundant (47% of total). Other important detritivores included springtails (*Colembolla*), which accounted for 7 percent of the total abundance. Herbivores were well represented by Homoptera (mainly aphids and leaf hoppers) and Thysanoptera (thrips), which represented 10 and 12 percent of the total insects within the habitat.

Freshwater Marsh. The freshwater marsh habitat yielded 9 orders of insects representing 22 taxa. Multiple function Dipterans (flies, midges, mosquitos) were dominant (39%) members of the habitat, as were Hymenoptera (28%) and Collembolla (7%) detritivores. Thysanopteran (thrips) herbivores also were important (14%) members of the insect assemblage in this habitat.

Salt Panne. A total of 12 orders, representing 25 taxa, were collected in the salt panne habitat. Hymenoptera (mainly ants) dominated (41%) the insect assemblage within this habitat. Springtails (*Collembola*) and sowbugs (*Isopoda*) together contributed nearly 10 percent to the detritivore category. Multiple function Dipterans (flies, midges, mosquitos) and Acarinans (mites and ticks) were important components of the habitat; they accounted for 19 and 17 percent of the total abundance within this habitat.

The salt panne habitat was quite rich, which was probably due to the small size of the sampled habitats and their proximity to vegetated habitats. Insect assemblages from wetlands with large salt pannes or mudflats would be expected to be much less diverse, but with higher numbers of Staphylinid (rove) beetles and Saldids (shore bugs), which are specifically adapted to a moist, hypersaline environment (Zedler 1992).

Future Without-Project Conditions (50 Years)

Sedimentation and increased freshwater influence would be expected to benefit insects. Saltmarsh insects such as the wandering skipper and species that utilize fresh- and brackish water marshes and riparian habitats would probably increase in the future as these habitats would increase at the expense of marine subtidal and mudflat habitats.

3.4.2 Marine Resources

This section describes the marine resources of Upper Newport Bay. Descriptions of marine vegetation, plankton, invertebrates, fishes, birds, and marine mammals are presented below.

3.4.2.1 Vegetation

Historical and Existing Conditions

Non-vascular plants often occur as a surface mat that covers the mudflats and are important contributors to the overall primary productivity of wetlands (Zedler 1982). Algal mats occur year-round, but cover is most extensive during spring and summer when increased levels of nutrients and warmer water temperatures favor algal growth. Common forms include green algae (*Ulva* and *Enteromorpha*), colonial diatoms, and blue-green algae. The bottom cover of algae is consumed by herbivorous snails, fish, and birds and decomposed by bacteria which recycle nutrients back into the Newport Bay ecosystem. Subtidally, green algae are replaced by deeper occurring red algal taxa, such as *Gracilaria*, and the brown alga *Cystoseira*, particularly in the deeper and swifter flowing current areas located in the main channel between the PCH Bridge and Shellmaker island (Corps 1993).

The flowering, marine vascular plant eelgrass (*Zostera marina*) forms meadows on mudflats and subtidal sediment in bays and estuaries. The meadows are important nursery habitat for marine fishes that seek the shelter of the beds for protection and forage on invertebrates that colonize the eelgrass blades and sediments.

Eelgrass distribution is currently limited to Lower Newport Bay between the Newport Harbor entrance channel and the PCH Bridge. It disappeared from the Upper Bay between the late 1960s and the mid 1970s. Although the reason for its disappearance was never conclusively determined, increased siltation, higher turbidity, dredging, and the effects of destructive floods likely contributed to its disappearance. Eelgrass beds were historically present in many areas of the Upper Bay between the PCH Bridge and Shellmaker Island (Barnard and Reish 1959; Pojepal 1969; Allen 1976). As late as 1984, eelgrass beds had not recovered and attempts to restore eelgrass to the Bayside Peninsula and Shellmaker Island by transplantation were unsuccessful (Ware 1985).

Future Without-Project Conditions (50 Years)

The predicted shallowing of marine habitats may temporarily provide suitable conditions for the establishment of algal or eelgrass beds in areas that were formerly too deep, but these areas would be unstable in the long-term because of continuing sedimentation. Turbidity from sediments passing into the lower reaches of the Upper Bay would inhibit eelgrass growth. Total primary production by benthic algae and eelgrass (if present) would diminish as the acreage of subtidal and mudflat habitats decreases, although this may be offset by increases in production by saltmarsh and riparian/freshwater marsh plants.

3.4.2.2 Plankton

Historic and Existing Conditions

Phytoplankton and zooplankton assemblages of Upper Newport Bay consist of a combination of marine, brackish, and freshwater taxa (Corps 1993). MBC and SCCWRP (1980) reported 98 phytoplankton taxa in Newport Bay between November 1979 and March 1980 with concentrations ranging between 6,872 cells/liter in November to 64,734 cells/liter in March (Corps 1993). Due to the transient nature of plankton communities, temporal and spatial trends in distribution and abundance are best known for common species or groups only.

Consistent with typical salinity gradients, marine species such as *Thalassionema nitzshioides* decline from Lower to Upper Newport Bay, whereas brackish taxa such as *Navicula* spp. exhibit the reverse trend. Freshwater phytoplankton are common in Upper Newport Bay during periods of runoff (Corps 1993).

Diatoms are most abundant in winter samples, whereas dinoflagellates are most commonly collected during spring and summer (Corps 1993). Diatoms, including, *T. nitzshioides*, *Asterionella japonica*, *Ceratium furca*, and *Cerataulina bergonii* are some of the most abundant phytoplankton species in the Bay. The most abundant dinoflagellates include *Procentrum micans* and *Gonyaulax polyhedra*, both of which cause red tide.

The zooplankton community consists of more than 80 taxa, of which 36 are distinct species (MBC and SCCWRP 1980). Of these, 30 are copepods. Common zooplankers include *Acartia tonsa, A. californiensis, Pseudodiaptomus euryhalinus, Evadne nordmanii,* and *Podon polyphemoides* (Corps 1993).

Future Without-Project Conditions (50 years)

With the predicted loss of marine habitats and increased freshwater influence, planktonic assemblages would become increasingly dominated by freshwater and euryhaline (tolerating variable salinities) species.

3.4.2.3 Invertebrates

Historic and Existing Conditions

Prehistoric and recent historic conditions in Upper Newport Bay have been described by USACE (1993). The invertebrate fauna contained species typical of the sandy and muddy shores of California bays and estuaries fully open to tidal circulation (Ricketts and Calvin 1968; MacGinitie and MacGinitie 1968). Sandy epifauna included sand dollars (*Dendraster excentricus*), sea pansies (*Renilla kollikeri*), sea stars (*Astropecten armatus*), moon snails (*Polinices lewisii*), scallops (*Aequipecten circularis*), and fiddler crabs (*Uca crenulata*), on sandflats. Infaunal species included cockles (*Chione* sp.), mole crabs (*Lepidopa myops*), a variety of polychaete worms, and the lancelet (*Amphioxus*). Eelgrass beds were common and undoubtedly supported abundant invertebrates.

Some of the earliest records of benthic invertebrates from the Upper Bay (and Lower Newport Bay) were from samples collected in 1951 and 1954 by Barnard and Reish (1959). While these samples are post-development and do not represent original Newport Bay fauna, samples were thought to be representative of a nearly unpolluted system of "ultrahaline water" (high salinity). They recorded 61 species of polychaetes and 34 species of amphipods.

In 1957, the Allan Hancock Foundation, while conducting regional wide marine investigations (California State Water Control Board 1965), sampled the middle, unaltered portions of Upper Newport Bay and described an "*Ostrea-Melampus-Cerithidea* community." Conspicuous and dominant were clumps of oysters (*Ostrea lurida*) which attached to partially buried rocks, mostly along the channel margins. Eelgrass was common in the low intertidal, and the mudflats were covered with the algae *Enteromorpha.*

Under present conditions, a wide assortment of benthic invertebrates are associated with Newport Bay's soft-bottom substrate (Haaker 1975; MBC and SCCWRP 1980; Quammen 1980). The distribution and abundance of benthic invertebrates in Newport Bay as elsewhere is a function of their tolerance and adaptability to variations in major physical factors (temperature, dissolved oxygen, salinity, and depth), sediment type, and biological interactions (competition and predation). Shallow water embayments, such as Upper Newport Bay, with seasonal or year-round freshwater inputs are generally stressful to strictly marine invertebrates because of seasonally variable conditions. Invertebrate communities have been altered during the past 35 years. Sediment quality, as governed by past and current dredging disturbance, and an accumulation of toxic organics, fish cannery wastes, trace metals, pesticides, polychlorinated biphenyls, and petroleum hydrocarbons, have in the last 35 years altered the types, distribution, and abundance of benthic organisms in Newport Bay (CDFG 1953; Barnard and Reish 1959; Daugherty 1978; MBC and SCCWRP 1980; Seapy 1981).

Over 300 species of benthic invertebrates have been identified from Newport Bay mudflats and subtidal channel sediments (Barnard and Reish 1959; Daugherty 1978; Dawson 1963, MBC and SCCWRP 1980; Seapy 1981; Ware 1985). At least 255 of these live in the sediments between the Pacific Coast Highway Bridge and San Diego Creek (CDFG 1989). The numerically dominant types of benthic invertebrates are annelid worms (polychaetes and oligochaetes), crustaceans (gammarid and caprellid amphipods, isopods, ostracods, and cumaceans), and mollusks (gastropods and pelecypods). Most forms are widely distributed and highly adaptable (they survive well under stress conditions which occur naturally in many California coastal bays and estuaries).

The number of benthic infaunal species decreases between the entrance to Newport Harbor and Upper Newport Bay (MBC and SCCWRP 1980, Daugherty 1978). These community changes occur because of increasing environmental stresses due to extremes in salinity, temperature, and dissolved oxygen, as well as decreasing grain sizes within the sediments they inhabit.

Marine plants and invertebrates adapted to relatively stable ocean temperatures and salinities, high dissolved oxygen, continuous tidal exchange, and coarser sandy sediments are found near the entrance to Newport Bay. The upper end of the Bay is shallower, salinities are lower and more variable, and summer temperatures are higher. Correspondingly, the community is dominated by brackish and freshwater benthic plants and invertebrates. These conditions typically occur above the Main Dike, extending to Jamboree Road. Between these two environmental extremes, benthic plant and invertebrate communities consist of species that tolerate a wide range of environmental conditions; these make up the majority of the Upper Newport Bay benthic flora and fauna. Common invertebrates include polychaete worms (*Capitella capitata, Pseudopolydora paucibranchiata, Streblospio benedicti, Haploscoloplos elongatus, Tharix* sp., *Neanthes arenaceodentata, Polydora socialis, P. ligni, P. nuchalis, Prionospio heterobranchia newportensis*), oligochaete worms, amphipods (*Grandidierella japonica, Corophium acherusicum, C. insidiosum, Amphithoe* spp.), caprellid amphipods (*Mayerella banksia*), snails (*Tryonia imitator* and *Assiminea californica*), and clams (*Theora lubrica, Chione fluctifraga,, Macoma* spp., *Tagelus subteres,* and *T. californianus*).

In Newport Bay, recruitment and subsequent high densities and numbers of species occur between summer and early fall (Daugherty 1978; MBC and SCCWRP 1980; Seapy 1981). Lower densities and numbers of species occur during the winter and spring as a result of a reduction in salinity induced by greater freshwater inflows and intense shorebird feeding activity (Quammen 1980; Seapy 1981; MBC and SCCWRP 1980).

Species composition and distribution also change on a seasonal basis. Brackish and aquatic species (insect larvae, freshwater oligochaetes, freshwater clams, and freshwater ostracods) are often found in Upper Newport Bay during the winter and early spring because of lowered salinity in the estuarine waters and sediments. However, localized assemblages dominated by freshwater species can also be found in sediments near perennial freshwater drainages such as the Santa Ana-Delhi Channel, San Diego Creek, and Big Canyon Creek.

The most abundant surface-dwelling invertebrates of the mudflats, saltmarsh, and tidal creeks are horn snails (*Cerithidea californica*), saltmarsh snails (*Melampus olivaeceous*), yellow shore crabs (*Hemigrapsus oregonensis*), and lined shore crabs (*Pachygrapsus crassipes*). Horse mussels (*Geukensia demissa*) attach to the roots of cordgrass and other solid substrates in Upper Newport Bay, while isopods burrow into marsh banks such as those an the Bayside marsh peninsula. Fiddler crabs (*Uca crenulata*), once abundant throughout the Upper Bay, prefer the sandy sediments of higher mudflats and low- and mid-saltmarsh zones near the Main Dike and on the Bayside peninsula. The decline in *Uca* abundances is likely the result of increased sedimentation and a decrease in the sediment regime from sandy to silty mud sediments.

The California brackish water snail (*Tryonia imitator*) is a federal species of concern. It is an extremely small snail which is considered sensitive because of the loss of its brackish water habitat typically at the mouths of creeks, streams, and rivers of southern California. It prefers coarse sediments in brackish areas at the mouth of the Santa Ana-Delhi channel and San Diego Creek. In 1980, it was found in densities an high as 51,620 per square meter near the Santa Ana Delhi Channel (MBC and SCCWRP 1980). *Tryonia* also inhabits sediments in the downstream tidal channels, but in significantly lower densities primarily during winter and spring when stormwater runoff reduces the water and sediment salinities (MBC and SCCWRP 1980). Recent sampling (September 1996) confirms the abundance of *Tryonia* at the mouth of San Diego Creek, and it's occurrence in lesser numbers throughout the Upper Bay.

Subtidally, the most common large invertebrates include burrowing anemones (*Pachycerianthus fimbriatum* and *Edwardsiella* spp.), predatory sea slugs (*Chelidonura inermis*), hydroids (*Corymorpha palma*), and herbivorous bubble snails (*Bulla gouldiana*).

Hard surfaces such as pilings, docks, floats, riprap, cement bulkheads, and vessel bottoms in both Upper and Lower Bay marinas provide attachment surfaces for intertidal and subtidal algae and sessile marine invertebrates, and offer protective cover and foraging habitat for motile marine invertebrates and fishes. Collectively, the various invertebrates and algae that make up this community in bays and harbors are referred to as the "fouling community" because of their ability to form thick, encrusting layers of marine growth. Invertebrates that colonize the hardscape include sponges, bay mussels (*Mytilus edulis*), sea squirts (*Ciona intestinalis, Styela plicata*, and *S. montereyensis*), slipper limpets (*Crepidula onyx* and *C. dorsata*), barnacles (*Balanus* spp. and *Chthamalus fissus*), lined shorecrabs, limpets (Acmaeidae), polychaete worms, and ectoprocts.

Riprap is used to stabilize the shoreline near the Pacific Coast Highway Bridge and Big Canyon. It provides shelter and foraging area for rocky intertidal invertebrates such as rock lice (*Ligia occidentalis*), barnacles, lined shore crabs, and yellow shore crabs. Fishes, such as long-jaw mudsucker (*Gillichthys mirabilis*) and rock blenny (*Hysoblennius gilberti*) also occur in this habitat.

Future Without-Project Conditions (50 Years)

With diminished tidal influence, lowered salinities, and reduced acreage of marine subtidal and mudflat habitats, the invertebrate fauna of Upper Newport Bay would become impoverished relative to present conditions. Strictly marine species would probably be restricted to the lower part of the study area, whereas the uppermost part of the Bay would be dominated by freshwater and euryhaline species.

3.4.2.4 Fishes

Historic and Existing Conditions

Historical data on fishes are not available for detailed comparison, but long-term habitat changes have undoubtedly changed the character of fish communities in the Bay. MEC (1997) used percent of total catch by species to compare the major fisheries studies conducted in Upper Newport Bay since 1980 (Table 3.4-13). This historical comparison indicates that over 40 fish species have been collected and utilize some part of UNB (Allen 1988, Horn and Allen 1981). In general, two species (deepbody anchovy and topsmelt) were numerically dominant among all surveys. Deepbody anchovy and topsmelt accounted for over 86% of the catch in April and September 1997. Topsmelt was the overwhelming dominant in the 1978 through 1980 surveys and in the 1986-87 surveys, and other species including deepbody anchovy, California killifish, and gobies were moderately abundant. One notable difference in the fish assemblage of earlier years was the occurrence of freshwater species such as mosquitofish, striped bass, bluegill, black bullhead, and threadfin shad. At least some of the freshwater species; e.g., striped bass, were released in the Bay (Allen 1988). Marine subtidal habitats have diminished in acreage and have been increasingly subjected to freshwater influence, sedimentation, and disturbance associated with dredging and filling of the Bay. As a result of harbor development and other disturbances, subtidal habitats have lost productive eelgrass beds.

At present, Newport Bay (including Upper Newport Bay) supports a diverse assemblage of pelagic and demersal (bottom-orientated) fishes that occupy several different habitat types, including marsh channels and pools, mudflats, shallow subtidal channels and slopes, deeper channels, and marinas. Although species composition in these habitats can be significantly different, a general description of fishes of the Bay is provided below, with habitat notes where appropriate.

Fish abundance, number of species, and biomass in Upper Newport Bay are highly variable due to changes in temperature, salinity, and productivity (Horn and Allen 1981, Allen 1988, CDFG 1989). In general, the lowest abundances occur in late fall and winter when transient species such as California halibut leave the Bay for more coastal and offshore locations (Corps 1993). In contrast, the greatest number of species and abundances usually occur in spring and summer when these same transient species re-enter the Bay, adding to the resident species of the fish community. Thus, although general species composition patterns are generally predictable, abundance and biomass patterns are less consistent and more difficult to accurately predict.

At least 78 fish species have been identified from previous studies of UNB (Hardy 1970; Allen 1976; MBC and SCCWRP 1980; Horn and Allen 1981; Allen 1988). More recent studies (MBC 1997; MEC 1997) collected a total of 20 and 14 fish species, respectively at sites throughout the Bay using beach and purse seines, otter trawls, and beam trawls, with beach and purse seines collecting the greatest number of individuals and species (MEC 1997). The Bay also is important habitat not only for its resident species, but as a spawning ground for at least 10 species, including California halibut (*Paralichthys californicus*), yellowfin croaker (*Umbrina roncador*), white seabass (*Atractoscion nobilis*), and barred sand bass (*Paralabrax nebulifer*), and a nursery ground for the juveniles of 33 fish species (White 1977).

Table 3.4-13
Comparison of the Percent of Total Catch (and Rank) of the Ten Most Abundant Species of Fish Collected During Different Surveys at Upper Newport Bay

Common Name	Species	MEC 1997	MBC 1997	Allen 1988	MBC & SCCWRP 1980	Horn & Allen 1981
anchovy (<50 mm)	*Engraulidae* (<50 mm)	41.2 (1)		<0.1		
deepbody anchovy	*Anchoa compressa*	20.0 (1)	52.1 (1)	2.4 (4)	1.9 (6)	2.8 (4)
topsmelt	*Atherinops affinis*	25.1 (2)	35.1 (2)	56.3 (1)	73.3 (1)	76.2 (1)
California killifish	*Fundulus parvipinnis*	6.5 (3)	0.1	3.6 (3)	<0.1	8.7 (2)
yellowfin goby	*Acanthogobius flavimanus*	1.5 (4)		1.8 (6)	1.3 (9)	<0.1
longjaw mudsucker	*Gillichthys mirabilis*	1.4 (5)	0.6 (9)	1.1 (8)		0.3 (9)
pipefish	*Syngnathus* sp.	1.3 (6)	<0.1	0.8	<0.1	<0.1
arrow goby	*Clevelandia ios*	0.8 (7)	3.5 (3)	12.1 (2)	2.2 (4)	2.1 (6)
goby (<25 mm)	Gobiidae (<25 mm)	0.5		13.6 (2)		
diamond turbot	*Hypsopsetta guttulata*	0.4 (8)	0.2	0.4	2.1 (5)	0.2 (10)
California halibut	*Paralichthys californicus*		0.7 (8)	0.3	2.4 (3)	0.1
cheekspot goby	*Ilypnus gilberti*	0.2 (10)		0.2	1.4 (8)	0.2
specklefin midshipman	*Porichthys myriaster*	0.2 (10)		<0.1	<0.1	<0.1
yellowfin croaker	*Umbrina roncador*	<0.1	0.1	0.4	0.1	0.3 (9)
bay goby	*Lepidogobius lepidus*		2.4 (4)			
spotted turbot	*Pleuronichthys ritteri*		1.8 (5)		0.1	<0.1
slough anchovy	*Anchoa delicatissima*		1.5 (6)	1.0 (9)	0.9	2.4 (5)
pacific staghorn sculpin	*Leptocottus armatus*		1.0 (7)	0.7	1.1	<0.1
shiner surfperch	*Cymatogaster aggregata*		0.5 (10)	<0.1	4.8 (2)	1.8 (7)
striped mullet	*Mugil cephalis*		<0.1	1.9 (5)	1.2 (10)	0.3 (9)
mosquitofish	*Gambusia affinis*			0.9 (10)		3.6 (3)
northern anchovy	*Engraulis mordax*			1.4 (7)	<0.1	0.5 (8)
queenfish	*Seriphus politus*			<0.1	1.8 (7)	<0.1
threadfin shad	*Dorosoma petenense*				2.2 (4)	
Sampling Months Year		Sep 1997	Apr 1997	Jan,Mar, May,Jul, Sep,Nov 1986-1987	Jan, Mar, Nov, Dec 1979-1980	Jan, Mar, May, Jul, Sep, Nov 1978-1979
Sampling Gear: BS-beach seine, BT=beam trawl, DN=drop net, E=enclosure, GN=gill net, OT=otter trawl, PS=purse seine		BS, BT, PS	BS	BS, OT, E, GN	BS, OT	BS,OT, E, GN, DN
Total Number of Species		15	20	39	34	46
Mean Number of Species Per Survey (range)				19 (14-23)	19 (15-26)	25 (18-31)
Source: MEC 1997						

Pelagic assemblages have consistently been dominated by a few species, including topsmelt (*Antherinops affinis*), slough anchovy (*Anchoa compressa*), and deepbody anchovy (*A. delicatissima*). Topsmelt have been the most abundant fish collected by seines in 1974-75 (Allen 1976), in 1978 (Horn and Allen 1981), and in 1986-87 (Allen 1988). Recent studies by MBC (1997) and MEC (1997) using beach and purse seines indicated deepbody anchovy and topsmelt were the dominant pelagic fishes in several areas of Upper Newport Bay. Moreover, topsmelt are one of the most commonly collected pelagic fishes in bays and harbors in southern California (MBC 1997).

Common bottom-dwelling or demersal fishes in Upper Newport Bay include California halibut, diamond turbot (*Hypsopsetta guttulata*), yellowfin goby (*Acanthogobius flavimanus*), and California killifish (*Fundulus parvipinnis*). Pipefishes (*Sygnathus* spp.) also are commonly collected in many areas of UNB, especially at vegetated sites. Recent beam trawl and beach seine surveys by MBC (1997) and MEC (1997) collected 16 and 11 demersal fish species, respectively. California killifish and yellowfin goby were the most abundant species collected in all samples. Other commonly collected demersal fish species included arrow goby (*Clevlandia ios*), bay goby (*Lepidogobius lepidus*), spotted turbot (*Pleuronichthys ritteri*), staghorn sculpin (*Leptocottus armatus*), California halibut (*Paralichthys californicus*), and longjaw mudsucker (*Gillichthys mirabilis*) (MBC 1997; MEC 1997).

A high diversity of fish species are found in marina and boat dock areas of Newport Bay (USACE 1993), where fishes utilize hard substrates (i.e., pilings) for cover. Common marina fishes include pile perch (*Damalichthys vacca*), pipefishes (Syngnathidae), kelpfishes (*Heterostichus* spp.), opaleye (*Girella nigricans*), halfmoon (*Medialuna californiensis*), and kelp bass (*Paralabrax clathratus*).

Future Without-Project Conditions (50 Years)

Under the future without-project conditions the quantity and quality of habitats for most fish species in Upper Newport Bay will decline. According to the sediment model, within 20 years, approximately 81.2 acres of subtidal habitat in the Upper Bay will be converted to mudflat. By Year 50, approximately 173.9 acres of subtidal habitat will be lost. Thus, 81 percent of the open water habitat in the Upper Bay will be lost within the next 50 years. The increased sediment and freshwater influence would result in a degradation of the quality of the Upper Bay subtidal habitat for marine fishes. The increased freshwater influence predicted by the salinity model (Corps 1998) would be expected to reduce the populations of many fish species in the Upper Bay. Allen (1982, 1988) found that the distribution of most marine and estuarine fish species in Upper Newport Bay was positively correlated with salinity. The increased freshwater influence under the without-project future conditions also suggests that contaminants and sediments in San Diego Creek waters will degrade water quality for fishes. The smaller body of open water and reduced tidal influence under future without-project conditions would also lead to more extreme fluctuations in temperatures which would reduce the populations of sensitive fish species.

Under the future without-project conditions, the modified HEP analysis (see Appendix A for details) predicted substantial losses in HUs for California halibut, the indicator species for benthic fishes, and deepbody anchovy, the indicator species for water column fishes. Within 20 years, the HEP model predicted that halibut would suffer a 23 percent loss of HUs and deepbody anchovy a 25 percent loss. By Year 50, the percent loss of HUs was 52 percent for halibut and 51 percent for anchovy.

3.4.2.5 Marine Mammals

There are no resident marine mammals in Upper (or Lower) Newport Bay (CDFG 1985; Marsh 1990; USACE 1993). The types of marine mammals that occasionally may be sighted are limited to a few California sea lions (*Zalophus californianus*) that occasionally congregate near Lower Bay sportfishing facilities and the harbor entrance, but are sometimes sighted north of the PCH Bridge. There have also been rare occurrences of California gray whales (*Eschrictius robustus*) in the Lower Newport Bay entrance channel (USACE 1993). Historically and prehistorically, marine mammal occurrences would likely have been more frequent based on the study area's having been an open coastal embayment with productive fringing mudflats and marshes.

3.4.3 Threatened and Endangered Species

Recent input received from the USFWS (1997, 1999) has been incorporated as applicable in the following sections.

3.4.3.1 Listed Species

State- and federal-listed rare, threatened, and endangered species that occur in Upper Newport Bay are listed below. Historical information is included where available.

Saltmarsh Bird's Beak (*Cordylanthus maritimus* spp. *maritimus*). This state- and federal-listed endangered plant species occurs at several sites in high marsh habitats within the lower reaches of Upper Newport Bay (CDFG 1997). It is the only listed plant species confirmed to occur in the study area (USFWS 1997). A portion of one population located at the west end of Shellmaker Island was observed during the September 1997 botanical field work. The plants had already flowered and fruited.

Saltmarsh bird's beak is an annual herb that is hemiparasitic and in the Scrophulariaceae family. It occurs in the high marsh zone of coastal saltmarshes from San Luis Obispo County south to Baja California. It is listed as endangered at both the federal and state levels and is a California Native Plant Society (CNPS) List 1B species.

Arroyo Southwestern Toad (*Bufo microscaphus californicus*). There are no records of this species' occurrence in the study area. USFWS (1997) notes the existence of potential habitat in San Diego Creek. This species could only occur in freshwater upstream of tidal flows.

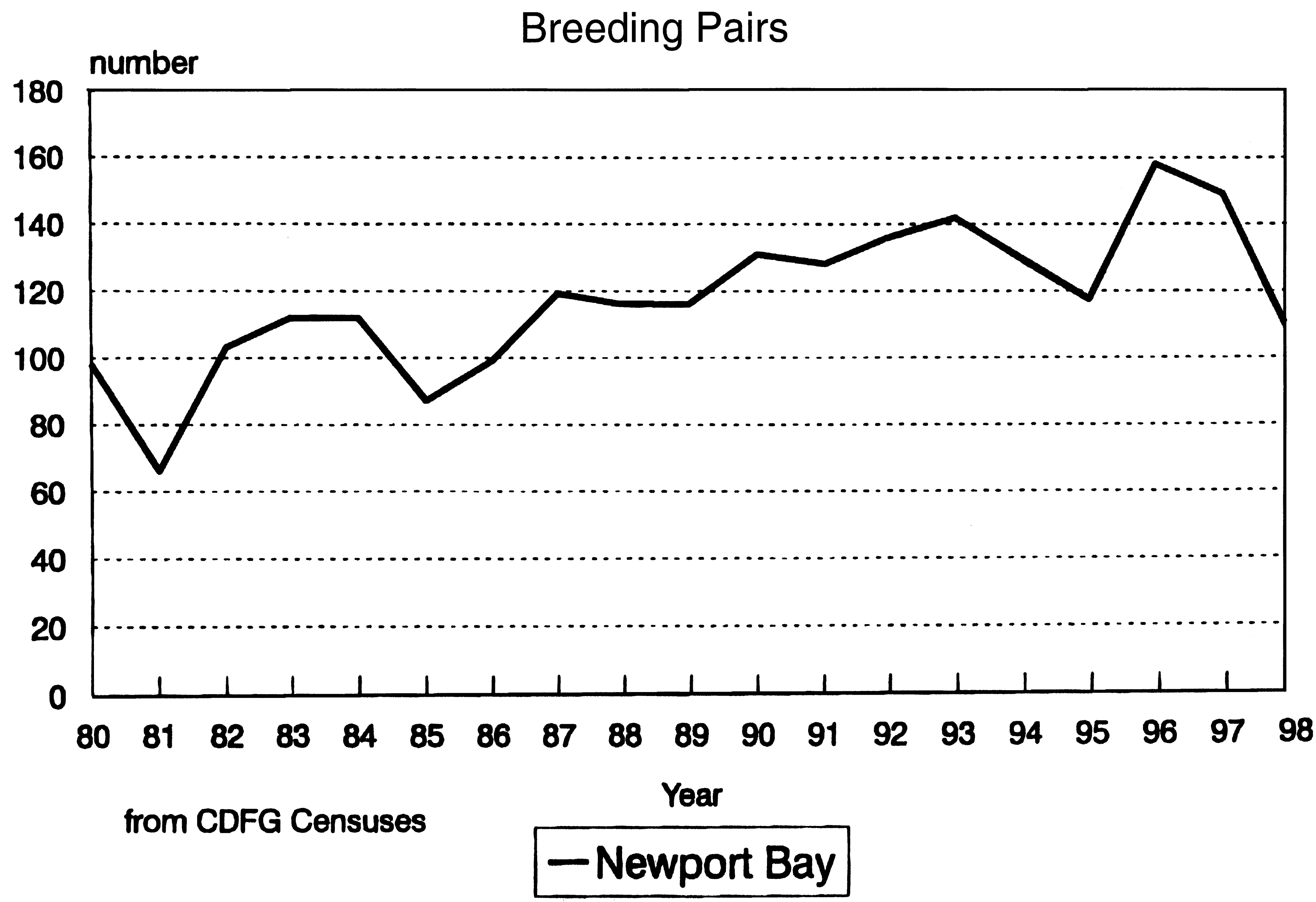
California Brown Pelican (*Pelecanus occidentalis californica*). The California brown pelican, a state- and federal-listed endangered species, occurs year-round in Upper Newport Bay. Numbers tend to be lower in late spring-early summer when the birds are nesting on offshore islands, and higher in late summer and fall, when flocks are augmented by young birds. The species can be observed in the area year round as a non-breeder. Numbers have ranged from 0 to 44 birds during census counts by Sea and Sage Audubon (Kust, unpublished data).

This species nests on the Channel Islands off the coast of southern California and Baja California during late winter through spring. As young fledge, the adults and young disperse along the California coast. The birds seen during the summer are for the most part non-breeding immatures. Habitats used by this species include open water, where it feeds on fish, and mudflat and salt panne for loafing. At least eight individuals were observed during the 1997 field survey (MEC 1997), and they were found in Areas 1, 3, and 4 (Appendix D).

American Peregrine Falcon (*Falco peregrinus anatum*). The peregrine falcon is state-listed as endangered. One or two individuals have typically been sighted in Upper Newport Bay during spring and/or fall in surveys by Sea and Sage Audubon (Kust, unpublished data). The American peregrine falcon is uncommon in abundance but regular in its occurrence to Newport Bay. No breeding occurs within the Bay itself but falcons have nested on high-rise buildings adjacent to the Bay (Gallagher 1997). This species feeds on other birds, particularly migrant and/or wintering shorebirds and waterfowl. One was observed in Area 4 during the September survey (Appendix D). The peregrine falcon was removed from the federal list of endangered species in 1999 (Mesta 1999).

Light-Footed Clapper Rail (*Rallus longirostris levipes*). The resident population represents about 65 percent of California's population of this state- and federally-listed endangered species. Extensive studies within the Bay over the past 15 years indicates that the population is increasing. Clapper rails are found throughout the Upper Bay, heavily utilizing cordgrass marsh for nesting at several locations, including Shellmaker Island, Middle Island, Upper Island, and in saltmarsh habitat above the Main Dike.

The clapper rail's nesting season is from March to July. Upper Newport Bay has consistently supported the highest numbers of rails of any southern California wetland, and is believed to be the only viable subpopulation remaining in the United States. Clapper rails' home ranges have been estimated from 0.9 to 4.2 acres. The subspecies inhabits saltmarsh and freshwater marsh where it feeds on small fish and aquatic invertebrates. Low elevation saltmarsh dominated by California cordgrass (*Spartina foliosa*) is the species' preferred nesting habitat, but it has been known to breed in brackish and even freshwater marsh (Gallagher 1997). The 1998 light-footed clapper rail census recorded 105 pairs in Upper Newport Bay (Zembal 1998) and the 1999 census recorded 104 pairs (USFWS 1999). This number is down from the 1990s high of 158 pairs in 1996 (Figure 3.4-3). During the 1997 field studies at least seven individuals were heard and/or observed. They were full-sized birds foraging at the interface between mudflat and low marsh.



Chambers Group

LIGHT-FOOTED CLAPPER RAIL POPULATIONS
IN UPPER NEWPORT BAY
Figure 3.4-3

California Black Rail (*Laterallus jamaicensis* ssp. *coturniculus*). The black rail is a state-listed threatened species which has been reported in Upper Newport Bay (CDFG 1985), but whose recent occurrence is unconfirmed and doubtful (USFWS 1997). Like the clapper rail, black rails are secretive birds of low marsh habitats.

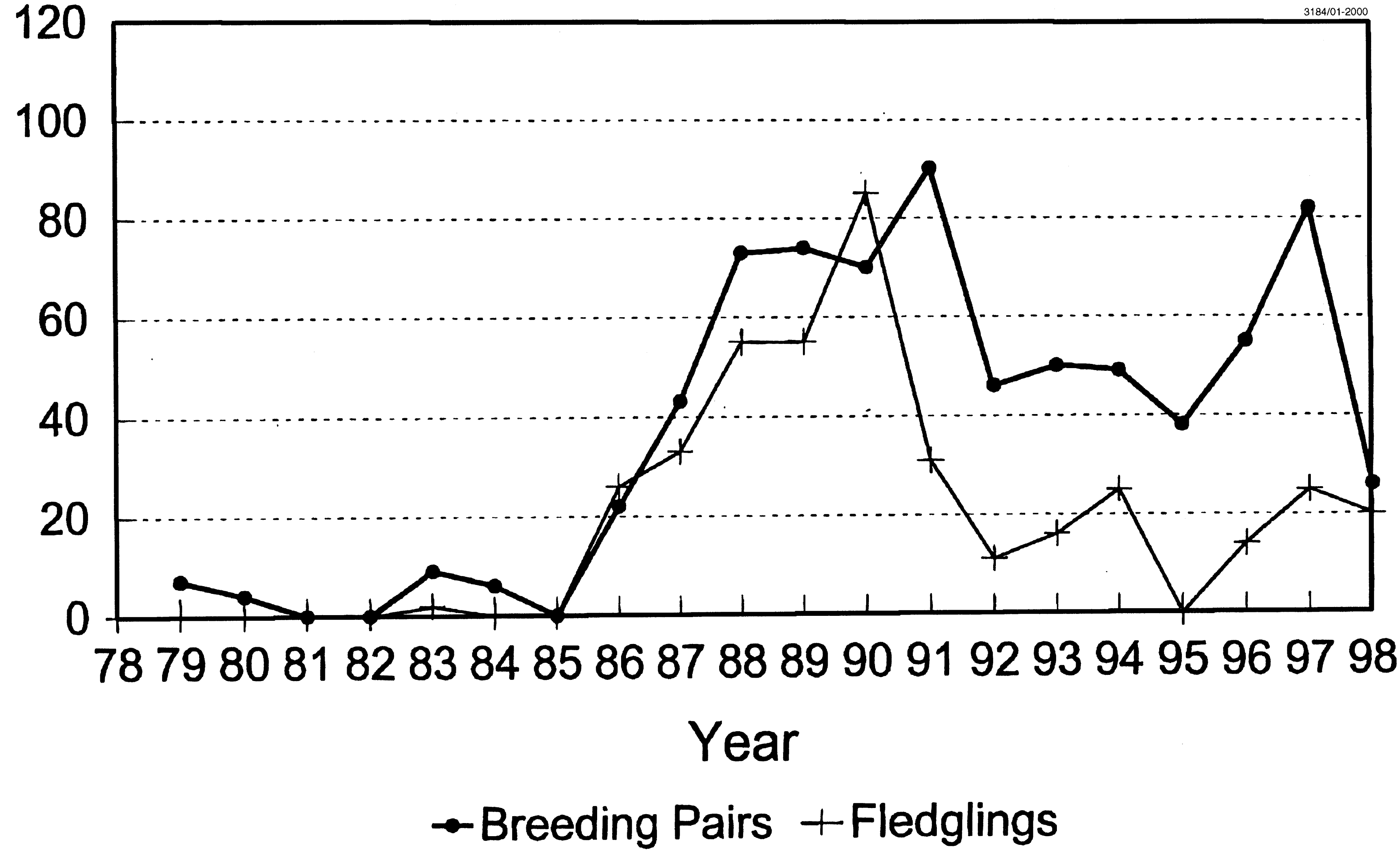
Western Snowy Plover (*Charadrius alexandrinus nivosus*). This subspecies of plover is federally threatened and a California species of special concern. Its present status in the Bay is as an uncommon fall/spring and winter migrant. The breeding status of Snowy Plover in Newport Bay is precarious with no current nesting records (Hamilton and Willick 1996; Gallagher 1997). The species has in the past bred in the Bay as well as numerous other places along the coast of Orange County. However, currently the only known breeding locations in the county are Bolsa Chica and the Santa Ana River mouth (Hamilton and Willick 1996; Gallagher 1997). The species requires open, undisturbed salt panne for nesting and surface-feeds on mudflats for aquatic invertebrates and very small fish (Tricia A. Campbell, personal observation). The reason for the decline of this species in the Bay is not entirely known but disturbance and predation may play a role. No snowy plovers were seen during recent surveys.

California Least Tern (*Sterna antiserum brownie*). The state- and federal-listed endangered California least tern is a seasonal resident from April through early September. Historical conditions were undoubtedly favorable to nesting by least terns, but subsequent residential development has eliminated potential nesting sites. Least terns typically forage on juvenile baitfish in the open waters within proximity of their nesting sites.

Two man-made islands were constructed within the Unit I sedimentation basin during wetland restoration in 1982 and 1985 to provide habitat for the least tern. The two islands encompass about 7 acres of breeding habitat above the influence of the tides. Nesting populations have been noted on one of the islands (the southerly, "hot dog" shaped island). As sedimentation has occurred within the Unit I basin; however, the channels that were originally formed to separate these islands from the mainland have become so shallow that the channels dry during low tide conditions. At these times, predators have ready access to the islands thereby decreasing protection for the least terns. Maintenance dredging efforts to reestablish the islands during all stages of the tide is necessary to support the safety of the least tern populations on these islands. Attempts to develop nesting habitat on Shellmaker Island have been unsuccessful. In 1990, the estimated population included 70 pairs and 85 fledglings (Figure 3.4-4). In 1995, approximately 38 pairs nested with no productivity (Caffrey 1997). For the 1995 productivity loss, reduced food supply was speculated, although not easily confirmable (Caffrey 1997). Least terns rebounded in 1997 with 82 pairs and 24 fledgings, but in 1998 nesting was down again with only about 24 pairs. In 1999, 40 pairs of least terns nested on the southerly island (USFWS 1999).

Coastal California Gnatcatcher (*Polioptila californica californica*). This subspecies of California gnatcatcher is federally threatened and is a California species of special concern. It is a common breeding resident of coastal sage scrub where it feeds on arthropods. Although sage scrub is the preferred habitat for this species, particularly during the breeding season, post-breeding individuals can also be found foraging in ruderal and riparian areas. There are at least ten pairs breeding in the study area (Gallagher 1997). Nine individuals were observed in Areas 3 and 4 during the 1997 survey (Appendix D).

Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*). This subspecies of Savannah sparrow is state-listed as endangered. It is a year-round resident with nesting activity occurring between mid-March through mid-August in high marsh habitat around the edges of the Bay and on the islands. It is distributed throughout Upper Newport Bay. Expansion of high marsh vegetation has contributed to an increased population since 1977. The 1986 census of this species population in Upper Newport Bay identified a total of 245 breading pairs (Corps 1993). In 1991, 199 pairs were recorded (James and Stadtlander 1991). In 1996 the population in Upper Newport Bay was 252 pairs (Zembal, personal communication 1997). This sparrow feeds on arthropods and vegetative parts and is an obligate breeder in middle elevation saltmarsh. Although the majority of its subsistence stems from the saltmarsh and closely adjacent mudflat, individuals, particularly post-breeding birds, can be found foraging in a wide variety of habitats including ruderal, beach, and dirt parking lots. At least 17 individuals of this subspecies were noted during the recent field surveys in all areas of the Upper Bay (Appendix D).



Chambers Group

CALIFORNIA LEAST TERN POPULATIONS
IN UPPER NEWPORT BAY
Figure 3.4-4

Pacific Pocket Mouse (*Perognathus longimembris* ssp. *pacificus*). The Pacific pocket mouse is a Federal-listed endangered species that has only recently been rediscovered in coastal southern California. It occurs in coastal sage scrub and grassland habitats on fine sandy soils (USFWS 1994). It is not expected to occur in areas that could be affected by the project, but areas of native grassland-scrub adjacent to the Upper Bay provide possible habitat for this species.

3.4.3.2 Sensitive Plant Species

Two sensitive plant species that are not state- or federal-listed but occur in the project area and are on the CNPS list of plants that are endangered in California and elsewhere (list 1B) are the southern tarplant (*Hemizonia parryi australis*) and Davidson's saltscale (*Atriplex serenana* var. *davidsonii*) (De Ruff 1995).

3.4.3.3 Sensitive Insect Species

Two endangered butterflies occupy coastal dune habitat in southern California, the Palos Verdes blue butterfly (*Glaucopsyche lygdamus palosverdesensis*) and El Segundo blue butterfly (*Euphilotes battoides allyni*) (Scott 1986). Coastal dune habitat is lacking within the Upper Bay; therefore, these species are not expected.

Several saltmarsh insect species are of concern because of loss or alteration of wetland habitat. These include the globose dune beetle (*Coelus globosus*), Belkin's dune fly (*Brennania belkini*), and the saltmarsh wandering skipper (*Panoquina errans*). The globose dune beetle and Belkin's dune fly are potential but unlikely residents of Upper Newport Bay because their normal habitat is in coastal foredune vegetation.

The saltmarsh wandering skipper is a possible resident. This butterfly has a range from Santa Barbara County south to the southern tip of Baja California, Mexico (MacNiell 1962; Donahue 1975). Adults may be collected from about March through October. The larval host plant is saltgrass (*Distichlis spicata*) (Emmel and Emmel 1973; Brown 1981), which is common in Upper Newport Bay. The adults feed on the nectar of heliotrope (*Heliotropium curvassavicum*), Fleshy jaumea (*Jaumea carnosa*), sea rocket (*Cakile maritima*), deerweed (*Lotus scoparius*), and alkali heath (*Frankenia salina*) (Brown 1981; Busnardo 1989). No wandering skippers were observed during the brief September 1997 survey.

Some species of tiger beetle (family Cicindelidae) are likely residents of Upper Newport Bay. Populations of these predaceous beetles have been greatly reduced due to habitat loss or alteration. Gabbs tiger beetle (*Cicindela gabbi*) inhabits dark colored mudflats in the lower zone of estuaries, and Nagano (1982) recommends that this beetle be listed as a threatened species.

3.4.3.4 Bird Species of Special Concern

American White Pelican (*Pelecanus erythrorhynchus*). This species is an uncommon winter migrant to the study area (Hays et al. 1990). These birds forage for fish in the open water as well as loaf on mudflats and salt panne. None were observed during the 1997 field study.

Common Loon (*Gavia immer*). This species of loon is a California species of special concern and is an uncommon inhabitant of the Bay during winter. It forages in open water for fish and invertebrates (Ehrlich et al.1988). None were observed during the 1997 survey.

Double-crested Cormorant (*Phalacrocorax auritus*). This species of seabird is a California species of special concern and is an uncommon to common species of open water, mudflat, and salt panne. They forage on fish and invertebrates from open water (Ehrlich et al. 1988). Both mudflat, salt panne, and various perches are used by this species for loafing. At least 11 individuals were noted in Areas 1, 3, and 4 during the 1997 survey (Appendix C).

Osprey (*Pandion haliaetus*). The osprey is a California species of special concern and is an uncommon fall/spring and winter migrant. In earlier times this bird nested along the coast of southern California but has not been observed recently (Gallagher 1997). In 1980, a single bird was noted building a nest on the mast of a boat at lower Newport Bay and over the last decade or so individual birds and/or pairs have exhibited preliminary nesting behavior in the area (Hamilton and Willick 1996). This species is an unusual raptor (bird of prey) in that it forages over open water for fish. Although the water is its source for food, the species relies on undisturbed perches, mudflats, and salt panne for consumption of prey and loafing. At least two individuals were observed during the 1997 survey in Areas 1 and 4 (Appendix C).

White-tailed Kite (*Elanus leucurus*). This species is a state fully protected species and is regularly observed in the Bay throughout the year. The species has not been a confirmed breeder for a number of years, but nesting habitat is certainly available. Human disturbance is likely playing a role in the lack of nesting of this species. At least three individuals were observed in Areas 1 and 4 during the 1997 field study (Appendix C).

Northern Harrier (*Circus cyaneus*). The northern harrier is a California species of special concern that is an uncommon inhabitant of Newport Bay. Although individuals and pairs can be observed at any season of the year, breeding apparently does not occur in the study area (Gallagher 1997). Because it is a ground nester, it is especially sensitive to disturbance from humans and mammalian predators. Harriers forage over a wide variety of habitats including mudflat, saltmarsh, freshwater marsh, and ruderal, feeding on small mammals, reptiles, and when available young of nesting waterbeds. Two individuals were observed during the September 1997 survey in Areas 1 and 3 (Appendix C).

Sharp-shinned Hawk (*Accipiter striatus*). This accipiter is a California species of special concern and is an uncommon migrant and winter visitor to the study area. The habitats utilized by this species encompass any place other bird species occur, though it is most frequent in vegetated uplands. The sharp-shinned hawk preys on birds that are the same size or smaller than itself and does so by catching its prey "on the wing." Shorebirds and passerines are all potential prey for this bird. At least 1 and possibly 2 individuals were noted during the current field study in Areas 1 and 3 (Appendix C).

Cooper's Hawk (*Accipiter cooperii*). This species is a California species of special concern and is an uncommon bird at Newport Bay. Like the sharp-shinned hawk, this accipiter feeds on birds which it catches "on the wing" and does so in any habitat where birds occur, including neighborhoods. Some individuals of this species are resident and breed in Orange County, however, none appear to be breeding in Newport Bay (Gallagher 1997). One was observed in Area 4 during the 1997 survey.

Merlin (*Falco columbarius*). This bird is a California species of special concern and is an uncommon fall/spring migrant and winter visitor to the Bay. Merlins feed on other birds, with migrating and over-wintering waterfowl and shorebirds being a favorite. None were observed during the 1997 field study.

Long-billed Curlew (*Numenius americanus*). This species of curlew, a California species of special concern, is an uncommon to common non-breeding migrant in the Bay. It feeds on aquatic invertebrates in the intertidal zone by probing its long down-curved bill into the substrate. At least 12 individuals were noted in all areas of the Upper Bay during the 1997 field survey (Appendix C).

California Gull (*Larus californicus*). This species is a California species of special concern and is an uncommon to common fall/spring migrant and winter visitor. Like most gulls, California gulls are opportunists and feed on a variety of sources such as fish, carrion, garbage, and aquatic invertebrates. Typical habitats used for foraging and/or loafing include open water, mudflat, and salt panne. None were observed during the September 1997 survey.

Elegant Tern (*Sterna elegans*). The elegant tern is a California species of special concern and is a common to abundant fall/spring and summer migrant. This species does not breed in the Bay but can be found loafing on mudflat and salt panne and to some degree foraging over the Bay's open water. It feeds entirely on fish that it catches by plunge diving. A single individual was recorded during the 1997 survey in Area 4 (Appendix C).

Black Skimmer (*Rhynchops niger*). This species is a California species of special concern and is a common to abundant visitor at all seasons. This species requires open, undisturbed salt panne for nesting with large numbers regularly breeding on the man-made dredge fill islands in Area 4 (Hamilton and Willick 1996; Gallagher 1997). This species is unique in its foraging strategy in that it literally skims the surface of estuarine and oceanic waters feeling for fish. In 1998, 200 pairs of black skimmer nested on the northerly island (USFWS 1999). In 1999, 1975 pairs nested there. During the 1997 field study, at least 136 individuals were observed in Areas 1, 3, and 4 (Appendix C).

Vaux's Swift (*Chaetura vauxi*). This species is a California species of special concern and is an uncommon fall and spring migrant. Vaux's swift are aerialists and are typically seen foraging for arthropods high overhead. No individuals of this species were observed during the 1997 survey.

California Horned Lark (*Eremophila alpestris actia*). This subspecies of horned lark is a California species of special concern and is an uncommon, sporadic fall/spring and winter migrant to the study area (Hays et al. 1990). When this species is present it is typically present in large flocks. Horned larks forage for arthropods and vegetative parts on the ground in a variety of habitats including salt panne and ruderal. None were observed during the September survey.

San Diego Cactus Wren (*Campylorhynchus brunneicapillus couesi*). This California species of special concern has apparently been extirpated at Newport Bay (Hays et al. 1990). It was formerly an uncommon resident of upland cactus patches. No individuals of this species were recorded during the 1997 field survey.

Loggerhead Shrike (*Lanius ludovicianus*). This shrike is a California species of special concern and is an uncommon resident of Newport Bay. This species is a unique passerine in that it feeds on small birds, reptiles, mammals, and arthropods. Although the bird is not characteristic of any one type of habitat, it is typically associated with ruderal and other terrestrial habitats in the Bay. A small number of pairs breed in the study area with native and non-native shrubs used for nest placement (Gallagher 1997). No individuals of this species were recorded during the 1997 field survey.

Western Yellow Warbler (*Dendroica petechia brewsteri*). This warbler is a California species of special concern and its status in Newport Bay is as a common fall and spring migrant. Habitats expected to be used include ruderal, riparian, and other terrestrial habitats. This species was not recorded during the 1997 field survey.

Yellow-breasted Chat (*Icteria virens*). This warbler is a California species of special concern that occurs uncommonly during the spring, summer, and fall in riparian habitats. This insectivore is not a confirmed breeder in Newport Bay (Gallagher 1991) and was not observed during the 1997 field survey.

Large-billed Savannah Sparrow (*Passerculus sandwichensis rostratus*). This is an uncommon subspecies of savannah sparrow that is found in a variety of habitats including mudflat, saltmarsh, and ruderal. Individuals in California are dispersants or migrants in fall and winter, from nesting areas in northwest Mexico. It is a California species of special concern and like other Savannah sparrows feeds on arthropods and vegetative parts. Two individuals of this subspecies were found in Area 3 during the September 1997 field survey (Appendix C).

Future Without-Project Conditions (50 Years)

Continuing sedimentation appears unlikely to affect saltmarsh bird's beak in high saltmarsh or endangered species that occur in coastal sage scrub.

The modified HEP analysis (Appendix A) predicted that Belding's savannah sparrow would benefit by a 29 percent gain in HUs by Year 20 and an 17 percent gain by Year 50. The gain in habitat units was a direct result of the gain in acres in low saltmarsh, mid saltmarsh and high saltmarsh habitat, because Belding's savannah sparrow uses all of these habitats.

The California least tern and California brown pelican would lose habitat during the next 50 years as open water areas become filled with sediment. These species as well as species of concern such as American white pelican, common loon, double-crested cormorant, California gull, elegant tern, black skimmer and osprey, would not only suffer from a decrease in the amount of open water habitat, the quality of that habitat will decline. The modified HEP model predicted that the California least tern would suffer a 49 percent loss of HUs by Year 50. Piscivorous species, including the terns, black skimmer, cormorant, gull and osprey, will have a lowered prey base because the increased freshwater influence is expected to decrease forage fish populations in the Upper Bay.

The current breeding area for least terns is within the recently restored Unit I/III basin, which lost considerable depth over the years between the 1986 dredging project and the 1998/1999 Unit III dredging (Coastal Frontiers 1992). Reduction in depth will degrade the openwater character of the habitat and result in adult terns having to forage farther from their nests. The potential for the least terns to abandon their nesting site would increase with a decrease in tidal influence in the Unit I/III Basin. Similarly, the incidence of predation on least terns by mammalian predators would probably increase as nest sites become increasingly accessible due to the increased elevation of surrounding marsh by sedimentation.

The modified HEP model predicted that the light-footed clapper rail would benefit from a 2 percent gain in HUs by Year 20 and a 19 percent gain by Year 50. The HEP model, however, does not quantify potential habitat degradation for clapper rails if small channels within the low marsh become filled by sediment.

Endangered light-footed clapper rail cordgrass nesting habitat and tidal channel foraging habitat would slowly be degraded beginning north of the Main Dike and extending into the area between the Narrows and Shellmaker Island. The reduction in value could result in emigration of individuals to cordgrass habitat lower in the Bay, as the degradation continues along a gradient between the Main Dike and the PCH Bridge. If channels within the low marsh become isolated from tidal action, cordgrass habitat may actually be lost because cordgrass vigor is strongly related to tidal influence.

Clapper rails prefer to nest in the low saltmarsh, but also nest in (in order of decreasing preference) stands of high marsh plants on hummocks isolated from upland access by creeks, mudflats, or low marsh; tumbleweeds or wrack mostly in low saltmarsh (cordgrass); and stands of freshwater reeds (Jorgensen 1984). As freshwater habitat is increased in the Bay, clapper rails will adapt to using this habitat. However, the maintenance of light-footed clapper rail populations will depend, in large part, an maintaining and expanding cordgrass habitat (MacDonald and Williams 1985).

3.4.4 Regulatory Setting

- The **Endangered Species Act of 1973** (16 U.S.C. 1531 et seq.) protects threatened and endangered species, as listed by the USFWS, from unauthorized take, and directs Federal agencies to ensure that their actions do not jeopardize the continued existence of such species. Section 7 of the Act defines federal agency responsibilities for consultation with the USFWS. The Act requires preparation of a Biological Assessment to address the effects on listed and proposed species of a project requiring an Environmental Impact Statement.

- The **Fish and Wildlife Coordination Act** (16 U.S.C. 661 et seq.) seeks to recognize the contribution of wildlife resources and their increasing significance due the expansion of the national economy and other factors. The Act requires that wildlife conservation receives equal consideration and be coordinated with other features of water resources development programs. Whenever the waters of any stream or other body of water are proposed to be impounded, diverted, the channel deepened or otherwise controlled or modified, the Corps shall consult with the USFWS, the National Marine Fisheries Service as appropriate, and the agency administering the wildlife resources of the state (i.e., CDFG). The consultation shall consider conservation of wildlife resources with the view of preventing loss of and damages to such resources as well as providing for development and improvement in connection with such water resources development.

- **Executive Orders 11988 and 11990**, Floodplain Management and Protection of Wetlands require federal agencies to provide leadership to protect the natural and beneficial values served by floodplains and wetlands. Federal agencies are directed to avoid development in floodplains where possible, and to minimize the destruction or degradation of wetlands.

- The **California Endangered Species Act of 1984** (Fish and Game Code Section 2050 et seq.) provides for the protection of rare, threatened, and endangered plants and animals, as recognized by the CDFG, and prohibits the unauthorized taking of such species. Agencies are required to consult with the CDFG on actions that may affect listed or candidate species. With regard to plants, the Endangered Species Act greatly expands upon protection afforded to rare, threatened, and endangered plants under the earlier California Native Plant Protection Act of 1977.

3.5 AIR QUALITY

3.5.1 Meteorology and Climate

The South Coast Air Basin (SCAB) has a Mediterranean climate characterized by mild winters, when most rainfall occurs, and warm, dry summers. The most important climatic and meteorological characteristics influencing air quality in the study area are the persistent temperature inversions, predominance of onshore winds in Orange County, mountain ridge and valley topography, and prevalent sunlight. As described in Table 3.5-1, average summer high and low temperatures (July) in the Newport Beach area are 74°F (23°C) and 61°F (16°C), respectively. Average winter high and low temperatures (January) are 63°F (17°C) and 45°F (7°C), respectively. Rainfall averages approximately 12 inches (0.30 meters) per year. Most of the annual rainfall occurs between November and April, with minor precipitation during summer months.

Table 3.5-1
Monthly Temperatures and Precipitation in Newport Beach

Month	Temperature (°F)		Precipitation (Inches)
	Maximum	Minimum	
January	63	45	2.27
February	63	47	2.53
March	65	49	1.71
April	66	52	1.19
May	68	55	0.20
June	70	58	0.08
July	74	61	0.01
August	74	62	0.07
September	74	60	0.19
October	71	56	0.45
November	68	50	1.01
December	65	46	2.17
Source: SCAQMD 1981			

In Newport Beach, daytime winds normally occur from the west or southwest due to onshore flow from the Pacific Ocean. Average daytime maximum speeds are approximately 4 miles per hour (mph) (1.8 meters per second [m/s]) in the summer decreasing to 2 mph (.9 m/s) during the winter. Nighttime predominant wind patterns generally find an easterly to northeasterly flow set up from the general offshore flow enhanced by the local thermal drainage. Average nighttime maximum speeds in the winter reach 2 mph (.9 m/s) and fall to a gentle 1.5 mph (.7 m/s) in the summer.

3.5.2 Air Quality

The quality of surface air (air quality) is evaluated by measuring ambient concentrations of pollutants that are known to have deleterious effects. The degree of air quality degradation is then compared to ambient air quality standards (AAQS). The current California and National Ambient Air Quality Standards (CAAQS and NAAQS, respectively) are listed in Table 3.5-2. The air pollutants that are regulated by these standards are called criteria pollutants. The CAAQS are generally more stringent than the corresponding NAAQS. A summary of the air quality status in the study area relative to the AAQS, is provided in Table 3.5-3. Air quality in the SCAB regularly exceeds NAAQS for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2) and inhalable particulates (PM_{10}).

Table 3.5-2
National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
			Primary[c,d]	Secondary[c,e]
Ozone (O_3)	8-hour[f] 1-hour	NS 0.09 ppm (180 $\mu g/m^3$)	0.08 (160 $\mu g/m^3$) 0.12ppm (235 $\mu g/m^3$)	NS 0.12 ppm (235 $\mu g/m^3$)
Carbon Monoxide (CO)	8-hour 1-hour	9.0 ppm (10 mg/m^3) 20.0 ppm (23 mg/m)	9.0 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	NS NS
Nitrogen Dioxide (NO_2)	Annual Avg. 1-hour	NS 0.25 ppm (470 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$) NS	0.053 ppm (100 $\mu g/m^3$) NS
Sulfur Dioxide (SO_2)	Annual Avg. 24-hour 3-hour 1-hour	NS 0.05 ppm[g] (131 $\mu g/m^3$) NS 0.25 ppm (655 $\mu g/m^3$)	80 $\mu g/m^3$ (0.03 ppm) 365 $\mu g/m^3$ (0.14 ppm) NS NS	NS NS 1300 $\mu g/m^3$ (0.5 ppm) NS
Suspended Particulate Matter (PM_{10})	Ann.Geo.Mean Ann.Arith.Mean 24-hour	30 $\mu g/m^3$ NS 50 $\mu g/m^3$	NS 50 $\mu g/m^3$ 150 $\mu g/m^3$	NS 50 $\mu g/m^3$ 150 $\mu g/m^3$
Suspended Particulate Matter ($PM_{2.5}$)[h]	24-hour Annual	NS NS	65 $\mu g/m^3$ 15 $\mu g/m^3$	NS NS
Sulfates (SO_4)	24-hour	25 $\mu g/m^3$	NS	NS
Lead (Pb)	30-day Avg. Calendar Qtr.	1.5 $\mu g/m^3$ NS	NS 1.5 $\mu g/m^3$	NS 1.5 $\mu g/m^3$
Hydrogen Sulfide (H_2S)	1-hour	0.03 ppm (42 $\mu g/m^3$)	NS	NS
Vinyl Chloride	24-hour	0.010 ppm (26 $\mu g/m^3$)	NS	NS
Visibility Reducing Particles	1 Observation	Insufficient amount to reduce the prevailing visibility[i] to less than 10 miles when the relative humidity is less than 70% (CA only)	NS	NS

Table 3.5-2, Page 2 of 2

Notes: NS = no standard; ppm = parts per million; $\mu g/m^3$ = microgram per cubic meter; Mg/m^3 = milligrams per cubic meter

a. California standards for O_3, CO, SO_2 (l-hour), NO_2, and PM_{10} are values that are not to be exceeded. SO_4, Pb, H_2S, Vinyl Chloride, and visibility-reducing particles standards are not to be equaled or exceeded.
b. National Standards, other than ozone and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The O_3 Standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
c. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.
d. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain primary standards no later than 3 years after that state's implementation plan is approved by the EPA.
e. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.
f. The Interim Implementation Policy will define how and when states must achieve the new standards will be proposed by the end of 1997 and finalized by the end of 1998.
g. At locations where the state standards for ozone and/or PM_{10} are violated. National standards apply elsewhere.
h. The Interim Implementation Policy will define how and when states must achieve the new standards will be proposed by the end of 1997 and finalized by the end of 1998. USEPA extended the implementation timelines for the $PM_{2.5}$ standards. The agency committed to complete another full review of the health science, and allow 5 years to build a monitoring network, before any areas are designated nonattainment for $PM_{2.5}$. Following designations (in 2002-2005), areas would have another three years to develop attainment plans (by 2005-2008), with attainment by 2014-2017.
i. Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

Table 3.5-3
Attainment Status of South Coast Air Basin

O_3		CO		NO_2		SO_2		PM_{10}	
State	Federal	State	Federal	State	Federal	State	Federal	State	Federal
N	Extreme Non-Attainment	N	N	T	T	A	A	N	Serious Non-Attainment

Notes: A = Attainment of Standards; N = Non-Attainment; T = Non-Attainment (Transitional)
Source: SCAQMD 1997.

Annual ambient air quality monitoring has been conducted at two locations (El Toro and Costa Mesa) in the vicinity of the Upper Newport Bay between 1992 and 1997. The El Toro monitoring stations recorded concentrations of O_3, CO, and PM_{10}, while the Costa Mesa station monitored O_3, CO, and NO_2. Table 3.5-4 presents the results from these monitoring stations for the years 1993 through 1997.

As presented in Table 3.5-4, maximum ozone concentrations and number of violations recorded in both the Costa Mesa and El Toro monitoring stations have decreased between 1993 and 1997. The NO_2 concentrations at Costa Mesa did not exceed the CAAQS during the 1993 to 1997 time frame. Exceedances of the CAAQS for PM_{10} concentrations at El Toro have fluctuated over the subject time period, but more current levels show a marked decrease. With regard to CO concentrations, the maximum CO concentrations recorded in Costa Mesa and El Toro have declined over the last 5 years. It should be noted that during the subject time period, the Costa Mesa monitoring station did not record PM_{10} concentrations, and the El Toro monitoring station did not record concentrations for oxides of nitrogen (NO_X). The high frequency of southwest to northwest sea breezes usually occurs during the daytime for most of the year and transports air pollutants away from the coast toward the interior regions in the afternoon hours. As a result, air quality conditions along the coast, such as Newport Bay, are typically better than the conditions presented for the interior Costa Mesa and El Toro Monitoring Stations (Table 3.5-4).

Table 3.5-4
Air Quality Summary[a]

Standards	Monitoring Stations									
	Costa Mesa					El Toro				
	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
OZONE (1-Hour) STANDARD										
Maximum Concentration (ppm)	0.12	0.12	0.11	0.10	0.10	0.16	0.18	0.15	0.14	0.13
Days > CAAQS (0.9 ppm)	10	3	3	1	1	22	16	18	20	8
Days > NAAQS (0.12 ppm)	1	0	0	0	0	7	5	1	2	2
NO_2 (1-Hour) STANDARD										
Maximum Concentration (ppm)	0.13	0.16	0.18	0.14	0.12	NM	NM	NM	NM	NM
Days > CAAQS (0.25 ppm)	0	0	0	0	0	NM	NM	NM	NM	NM
PM_{10} (24-Hour) STANDARD										
Maximum Concentration ($\mu g/m^3$)	NM	NM	NM	NM	NM	115	91	122	79	86
Days > CAAQS (50 $\mu g/m^3$)[b]	NM	NM	NM	NM	NM	7/61	7/59	11/60	4/61	4/56[c]
Days > NAAQS (150 $\mu g/m^3$)	NM	NM	NM			0/61	0/59	0/60		
CO (8-Hour) STANDARD										
Maximum Concentration (ppm)	7.3	7.9	6.7	7.3	5.8	4.1	5.5	4.1	4.0	3.6
Days ^{3} CAAQS (9.0 ppm)	0	0	0	0	0	0	0	0	0	0
Days ^{3} NAAQS (9.5 ppm)	0	0	0	0	0	0	0	0	0	0

Notes: ppm=parts per million; $\mu g/m^3$=micrograms per cubic meter; NM = Not Monitored
[a] Source: California Air Resources Board (CARB), 1994.
[b] "Days" for PM_{10} are given as exceedances/number of annual measurements.
[c] Less than 12 full months of data and may not be representative.

In addition to criteria pollutants, other regulated pollutants include toxic air contaminants (TACs), which are suspected or known to cause cancer, genetic mutations, birth defects, or other serious illnesses in exposed people. (The TACs are not regulated by the NAAQS or CAAQS, but are addressed by the National Emission Standards for Hazardous Air Pollutants [NESHAPs] and Title III of the 1990 Clean Air Act Amendments.) Generally, TACs behave in the atmosphere in the same way as inert pollutants. The concentrations of both inert and toxic pollutants are therefore determined by the level of emissions at the source and the meteorological conditions encountered as these pollutants are transported away from the source. Thus, impacts from toxic pollutant emissions tend to be site specific and their intensity is subject to constantly changing meteorological conditions. The worst meteorological conditions that affect short-term impacts (low wind speed, highly stable air mass, and constant wind direction) occur relatively infrequently.

Regulatory Setting. Federal, state, and regional agencies have established standards and regulations that affect proposed projects. The following federal and state regulatory considerations apply to the project and to all alternatives.

- The Federal Clean Air Act of 1970 directs the attainment and maintenance of NAAQS. The 1990 Amendments to this Act determine attainment and maintenance of NAAQS (Title I), motor vehicles and reformulation (Title II), hazardous air pollutant (Title III), acid deposition (Title IV), operating permits (Titles V), stratospheric ozone protection (Title VI), and enforcement (Title VII).
- The EPA implements New Source Review and Prevention of Significant Deterioration.
- The CARB has established the CAAQS and determines attainment status for criteria air pollutants.
- The California Clean Air Act (CCAA, AB 2595) went into effect on January 1, 1991. The CCAA mandates achieving the health-based CAAQS at the earliest practicable date.
- The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) requires an inventory of air toxics emissions from individual existing facilities, an assessment of health risk, and notification of potential significant health risk when found to be present.
- The Calderon Bill (SB 1731) amends the 1987 "Hot Spots" Act (AB 2588). The bill sets forth changes in the following four areas: provides guidelines to identify a more realistic health risk,

requires high risk facilities to submit an air toxic emission reduction plan, holds air districts accountable for ensuring that the plans will achieve their objectives, and high risk facilities will be required to achieve their planned emission reduction.

- The Tanner Bill (AB 2728). This bill amends the existing Tanner Bill (AB 1807) by setting forth provisions to implement the federal program for hazardous air pollutants.
- Toxic Emissions Near Schools (AB 3205). This bill requires new or modified sources of air contaminants located within 1,000 ft. from the outer boundary of a school to give public notice to the parents of school children before an air pollution permit is granted.
- Section 21151.4 of the CEQA discusses Hazardous Air Pollutant releases within 0.25 mile of a school.

The SCAQMD has jurisdiction in the counties of Los Angeles, Orange, Riverside, and the western nondesert portion of the San Bernardino County. Rules and regulations of this agency are designed to achieve defined air quality standards that are protective of public health. To that purpose they limit the emissions and the permissible impacts of emissions from projects, and specify emission controls and control technologies for each type of emitting source in order to ultimately achieve the air quality standards.

Nonattainment areas are required to prepare a schedule including applicable measures to bring the area into attainment of all federal and state ambient air quality standards. This is demonstrated through the State Implementation Plan (SIP). The Air Quality Management Plan (AQMP) serves as the applicable document to demonstrate consistency with the SIP for the South Coast Air Basis. The SCAQMD and the Southern California Association of Governments (SCAG) are the agencies responsible for preparing the AQMP for the SCAB. Since 1979 a number of AQMPs have been prepared. The most recent comprehensive plan fully approved by the USEPA is the 1994 AQMP (1994 AQMP), which includes a variety of strategies and control measures. The 1994 AQMP was based on the 1991 AQMP and was designed to comply with state and federal requirements. The goal of the 1994 AQMP was to reduce the high level of pollutant emissions in the SCAB, and ensure clean air for the region. Projected attainment dates for criteria pollutants are presented in Table 3.5-5. To accomplish its task, the AQMP relied on a multilevel partnership of governmental agencies at the federal, State, regional, and local level. These agencies (i.e., the USEPA, ARB, local governments, SCAG, and SCAQMD) are the cornerstones that implement the 1994 AQMP and previous AQMP programs.

Table 3.5-5
Projected Attainment Dates for Federal and State Air Quality Standards for the South Coast Air Basin

Air Pollutant	State	Federal
Nitrogen dioxide (NO_2)	December 31, 1999	December 31, 1999
Carbon monoxide (CO)	2000 - 2010	December 31, 1999
Ozone (O_3)	Beyond 2010	December 31, 2009
Particulate matter (PM_{10})	Beyond 2010	December 31, 2005
Source: SCAQMD 1997		

The AQMP is a dynamic document that is updated every 3 years. The 1997 AQMP is based on the 1994 AQMP and carries forward most of the strategies included therein. However, with recent findings by nationally recognized health experts, the new Plan puts greater emphasis on PM_{10} particulate matter. In fact, the 1997 AQMP is the first plan required by federal law to demonstrate attainment of the federal PM_{10} ambient air quality standards. The 1997 Plan also updates the demonstration of attainment of ozone and carbon monoxide. Additionally, because the Basin came into attainment of the federal nitrogen dioxide standard since the prior AQMP was prepared, the new AQMP includes a maintenance plan to assure continued compliance.

The 1997 AQMP also addresses several state and federal planning requirements and incorporates new scientific data, primarily in the form of updated emissions inventories, ambient measurements, and new air quality models. Expanding on the control strategies included in the 1994 AQMP, the 1997 AQMP projects sufficient emissions reductions to meet all federal criteria pollutant standards within the time frames allowed under the federal Clean Air Act.

The 1997 AQMP also addresses notable regulatory rules promulgated since the preparation of the 1994 Plan. These include the implementation of Phase II reformulated fuels in 1996, the replacement of Regulation XV rideshare program with an equivalent emission reduction program, and new incentive programs for generating emission credits. Other highlights of the 1997 AQMP are noted below.

- use of the most current air quality information (1995), including special particulate matter data from the PM_{10} Technical Enhancement Program;
- improved emissions inventories; especially for motor vehicles, fugitive dust, and ammonia sources;
- a similar, but fine tuned overall control strategy with continuing emphasis on flexible, alternative approaches including intercredit trading;
- a determination that certain control measures contained in the 1994 AQMP, are infeasible, most notably the future indirect source measures;
- enhanced modeling for particulates;
- separate analyses for the desert portions within the District's jurisdiction: the Coachella Valley within the newly designated Salton Sea Air Basin; and the Antelope Valley within the Mojave Desert Air Basin;
- attainment to the federal Post-1996 Rate-of-Progress Plan and the Federal Attainment Plans for ozone and carbon monoxide;
- a Maintenance Plan for nitrogen dioxide; and
- an attainment demonstration and State Implementation Plan Revision for PM_{10}.

3.6 NOISE

3.6.1 Noise Measurement

A noise environment consists of a base of steady "background" noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These sources can vary from an occasional aircraft overflight to virtually continuous noise from traffic on an adjacent street.

To describe noise environments and to assess impact on noise sensitive areas, a frequency weighting measure which approximates human perception is customarily used. It has been found that A-weighting of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is the one used in most noise criteria. Table 3.6-1 lists typical sound levels measured in the environment and characterizes the subjective human response to various intensities of noise.

Several standards or "metrics" are used in the assessment of noise impacts. These include the median level, the day-night average, and the Community Noise Equivalent Level (CNEL). The median is the decibel level that is exceeded 50 percent of the time (and commonly designated by "L_{50}"). The interval can be the day, night, or 24-hour period. The day-night average (L_{dn}) is a 24-hour weighted average, wherein 10 dBA is added to noise measured from 10 p.m. to 7 a.m. The CNEL is also a weighted average, wherein 5 dBA is added to measured noise between 7 p.m. and 10 p.m., and 10 dBA to sound levels in the night before 7 a.m. and after 10 p.m. The "peak" noise level is often computed by L_{10}, the noise level exceeded 10 percent of the time. The background level is often computed in terms of L_{90} (i.e., noise level exceeded 90 percent of the time).

3.6.2 Upper Newport Bay Setting

Upper Newport Bay is located within the city of Newport Beach, California. The Bay is approximately 1,000 acres in size and is bounded by Upper Newport Bay Regional Park to the North, Pacific Coast Highway to the south, Galaxy Drive and Irvine Avenue to the west, and Backbay Drive to the east. The principal sources of noise in the general vicinity of Upper Newport Bay include: motor vehicle traffic along roadways and highways, as well as departures and arrivals of aircraft at neighboring airports.

The roadways (e.g., Backbay Drive) adjacent to the project site are mainly two-lane residential streets with minimal traffic volumes. However, there are several major roadways and highways (e.g., Pacific Coast Highway, Jamboree Road, Route 73) in the vicinity of the subject area that do experience heavy traffic volumes. Pacific Coast Highway crosses the southern boundary of the study area and Jamboree Road crosses the northeastern boundary. Noise levels adjacent to major roadways like Pacific Coast Highway and Jamboree Road often exceed 65 to 70 dBA[3], which is usually characterized as a moderately loud noise level (Table 3.6-1).

Table 3.6-1
Typical Sound Levels Measured in the Environment

Common Sounds	A-Weighted Sound Level in Decibels	Subjective Impression
Oxygen Torch	120	
Rock Band	110	
707 Landing at 370 ft. 707 Takeoff at 1,000 ft.	100	Very Loud
Diesel at 50 ft.	90	
Garbage Disposal	80	
Vacuum Cleaner at 10 ft.	70	Moderately Loud
Air Conditioner at 100 ft.	60	
Quiet Urban Daytime	50	
Quiet Urban Nighttime	40	Quiet
Bedroom at Night Recording Studio	30	
	20	Just Audible
Threshold of Hearing	10 0	
Source: Aviation Planning Associates. 1978 and 1979.		

3 The A-weighted scale (dBA) are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. In this system of measurements, the range of human hearing is varied between 0 dBA (slightly below the threshold of hearing) to about 140 dBA which is the threshold of pain.

Until 1999, three airfields were located in the vicinity of Upper Newport Bay. John Wayne Airport is the closest and is located approximately 1 mile north of Upper Newport Bay. Aircraft arrivals and departures to and from John Wayne Airport extend above the Upper Newport Bay. Further, as identified in the John Wayne Airport EIR, the 60 CNEL (in dBA) noise contour resulting from aircraft operations cover a majority of Upper Newport Bay (City of Newport Beach 1994). The two marine air bases in the project vicinity included the El Toro U.S. Marine Air Station and the U.S. Marine Corps Air Station in Tustin. The El Toro Air Station was located approximately 7.5 miles east of Upper Newport Bay, while the Tustin Air Station was approximately 3.5 miles to the northeast. Both airfields closed in 1999 in accordance with the Federal Base Realignment and Closure Act. However, it should be noted that the El Toro U.S. Marine Air Station may become an international airport in the near future. General flight patterns from military aircraft rarely affected the existing noise environment of Upper Newport Bay.

Ambient Noise Levels. In 1991, the City of Newport Beach measured noise levels at 38 locations throughout the city. The measurement locations were selected on the basis of proximity to major noise sources and noise sensitivity of the land use areas. Five of the 38 locations were located adjacent to the Upper Newport Bay; Figure 3.6-1 identifies the five monitoring locations. Table 3.6-2 provides the results (in L_{eq} and L_{max}) of the noise survey and identifies the source of the noise. Based on the noise levels presented in Table 3.6-2, the noise environment around Upper Newport Bay can be characterized as quiet to moderately loud (Table 3.6-1).

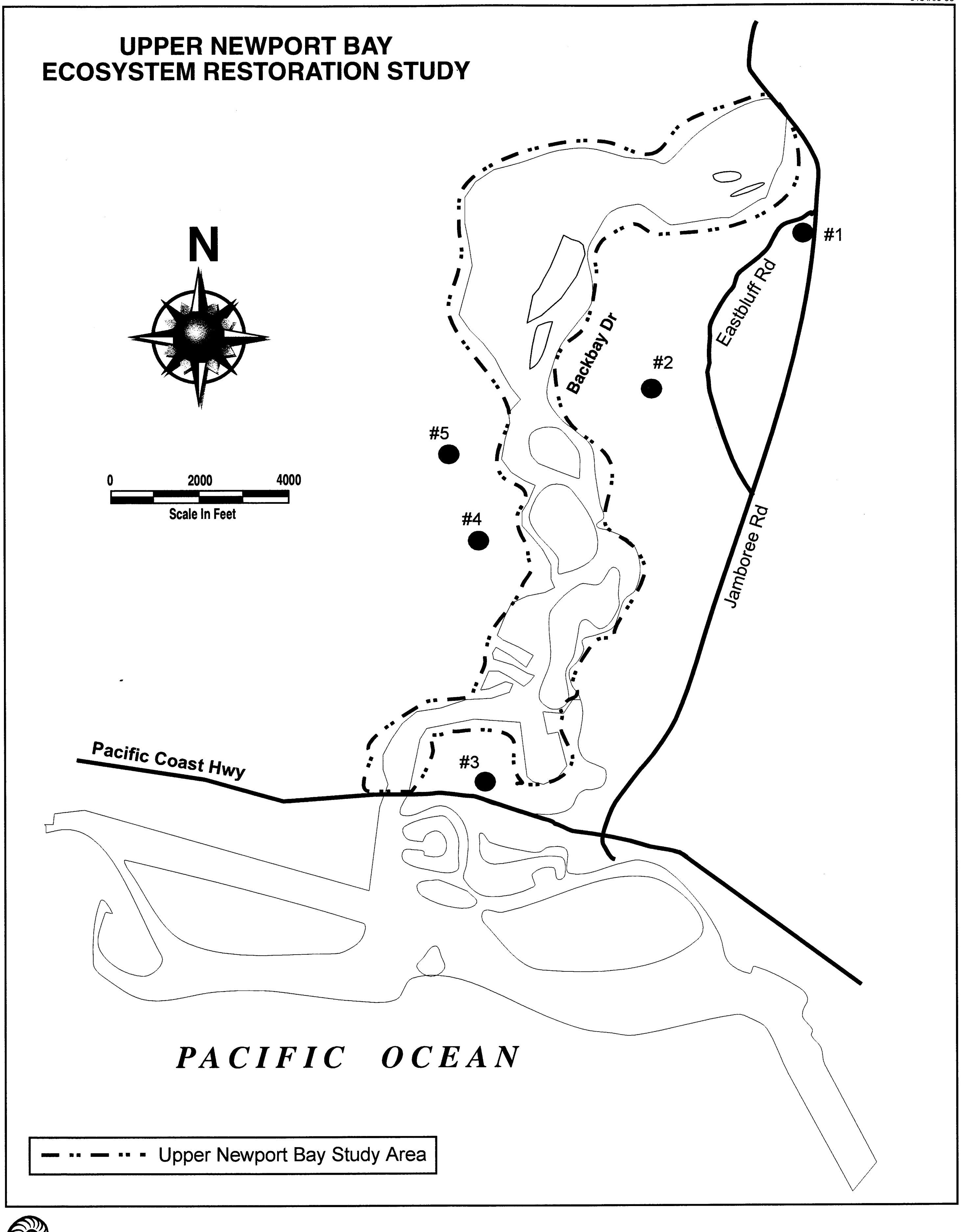
More recent noise measurements were made in 1995 (Giroux and Associates 1996). Noise measurements were made over a 24-hour period in two locations (Figure 3.6-2). Average noise during the quietest hour (between 3 and 4 a.m.) was between 37.1 dB at one location and 38.2 dB at the other. Average noise during the loudest hour was 80.4 dB in both locations (Table 3.6-3). Measurements at 14 locations (Figure 3.6-2) between noon and 4:30 p.m. showed that during the afternoon hours, the noise levels around the Bay could be characterized as moderately loud (Table 3.6-4).

Table 3.6-2
Ambient Noise Measurement Results

#	Location	Sound Level (dBA)		Noise Source(s)
		L_{eq}	L_{max}	
1	End of Carob Street	58	77	Traffic on Jamboree, Jets from John Wayne Airport
2	Eastbluff Drive, N.E. of Vista Deloro	62	75	Traffic on Eastbluff Dr., Jets from John Wayne Airport, Firecracker
3	Deanza Trailer Park	51	58	Traffic on Pacific Coast Highway
4	1501 Mariner	61	78	Traffic, Crows, UPS Truck
5	1742 Irvine Avenue	71	80	Traffic, Jets, Trash Truck

Source: City of Newport Beach 1994
Note: L_{eq} = The energy average noise level during the sample period.
L_{max} = The maximum noise level during the sample period.

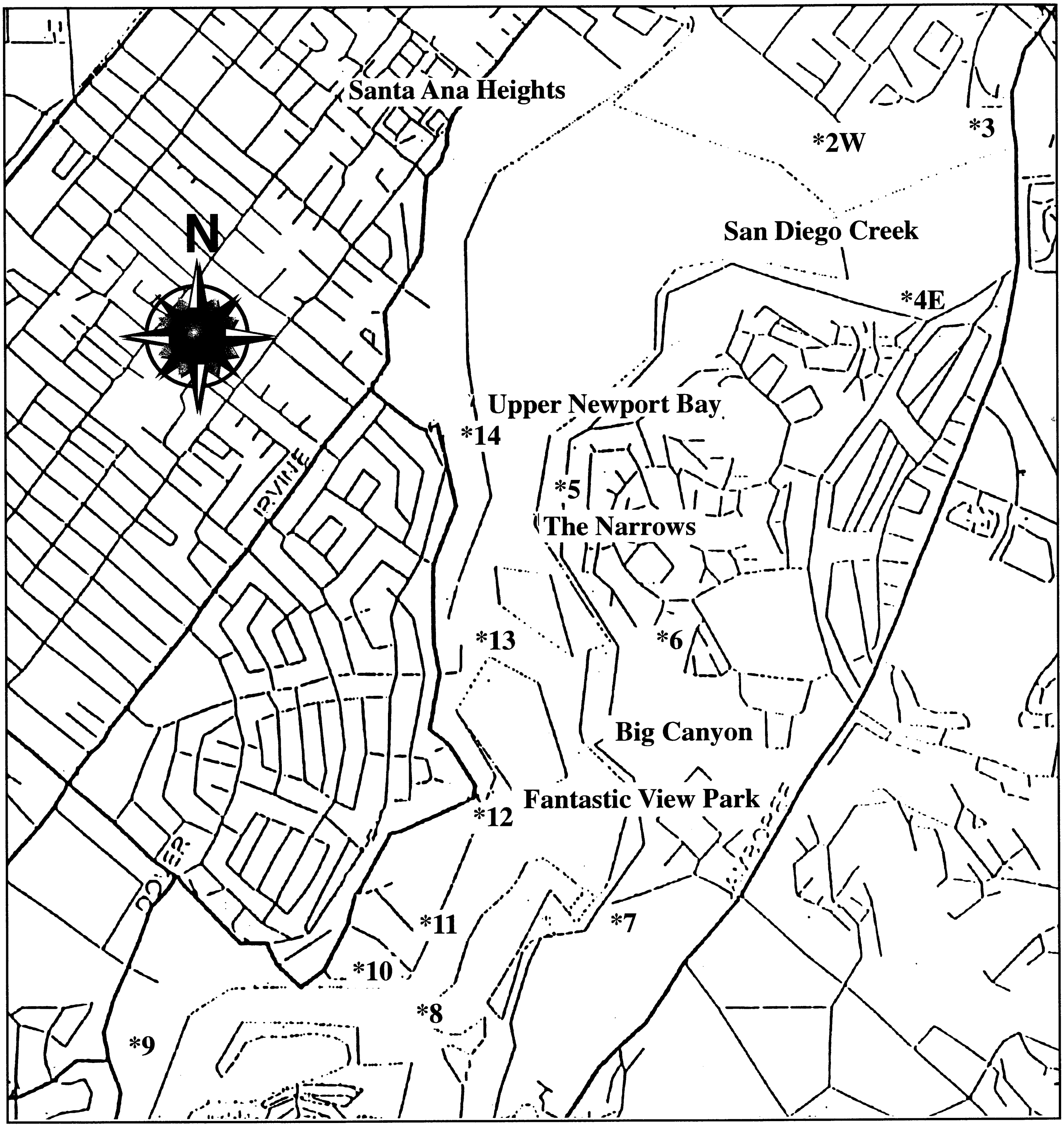
3184/09-99



Chambers Group

NOISE MONITORING LOCATIONS
Figure 3.6-1

3184/09-99



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Source: Giroux and Assoc. 1996

SHORT-TERM NOISE MONITORING
Figure 3.6-2

Table 3.6-3
Upper Bay 24-Hour Noise Monitoring Results
(Locations on Figure 3.6-2)

Parameter	West Side (2W)	East Side (4E)
Peak Hour Leq = When =	 60.2 dB 15-16 PDT	 60.3 16-17 PDT
MAX 1-SEC Leq = When =	 80.4dB 12-13 PDT	 80.4 dB 16-17 PDT
Quietest Hour Leq = When =	 37.1 dB 04-05 PDT	 38.2 dB 03-04 PDT
MIN 1–SEC Leq = When =	 36.3 dB 01-02* PDT	 37.2 dB 02-03* PDT
24-HOUR CNEL	56.0 dB	57.4 dB
*- and other hours Source: Giroux and Associates 1996		

Table 3.6-4
Noise Monitoring Results
(Locations on Figure 3.6-2)

Site	L_{eq}	L_{max}	L_{min}	L_{10}	L_{33}	L_{50}	L_{90}
1	67.3	83.0	50.0	71.0	65.5	61.5	52.5
2	66.3	81.5	46.0	70.0	63.0	59.5	51.5
3	61.3	76.0	50.5	65.0	60.0	58.0	*53.5
4	57.8	72.0	47.0	62.0	54.0	51.0	48.5
5	61.8	76.5	46.5	65.0	60.5	57.0	49.5
6	59.4	75.5	39.0	58.0	44.0	42.0	40.0
7	64.2	80.5	47.5	67.5	61.5	59.0	52.0
8	73.1	82.5	51.0	76.5	73.0	71.0	61.5
9	62.6	73.0	53.0	64.0	62.5	62.0	59.0
10	59.8	75.0	41.5	63.5	55.0	50.0	43.0
11	63.6	80.5	43.5	66.5	59.0	56.0	48.5
12	65.8	81.5	43.5	68.0	56.0	51.5	45.5
13	63.1	78.5	43.5	66.0	58.5	54.5	47.0
14	66.1	81.0	45.5	70.0	61.0	57.0	49.5
Source: Giroux and Associates 1996							

Sensitive Receptors. Sensitive noise receptors such as single-family residential units, parks, and schools are located adjacent to the subject study area. Open space and residential areas line the eastern and western shores of the Upper Newport Bay. The Upper Newport Bay Regional Park is in the northern portion of the study area, while the Newport Dunes Resort is in the southeast portion of the study area.

3.6.3 Regulatory Setting

There are no federal noise standards that directly regulate environmental noise from construction or project operation. Federal regulations safeguard the hearing of workers exposed to occupational noise, enforced by the Office of Safety and Health Administration (OSHA). Further, the EPA has developed guidelines on recommended maximum noise levels to protect public health and welfare (USEPA 1974). Table 3.6-5 provides examples of these protective noise levels.

Table 3.6-5
Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety

Effect	Level	Area
Hearing Loss	$L_{eq}(24)<70$ dB	All areas
Outdoor Activity Interference and Annoyance	$L_{dn}<55$ dB	Outdoors in residential areas and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq}(24)<55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor Activity Interference and Annoyance	$L_{dn}<45$ dB	Indoor residential areas.
	Leq(24)<45 dB	Other indoor areas with human activities such as schools, etc.
Source: USEPA March 1974. Note: $L_{eq}(24)$ = Represents sound energy averaged over a 24-hour period. L_{dn} = Represents the L_{eq} with a 10 dB nightime weighting.		

California encourages each local government entity to perform noise studies and implement a noise element as part of their general plan. Standards and implementation are administered by the California Office of Noise Control. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The state land use compatibility information is the basis for the development of the City of Newport Beach's land use noise compatibility information, which is presented in Table 3.6-6 at end of Section 3.6.

The City of Newport Beach Building Code (Title 10.28) provides policies to guide the noise abatement of future developments, including procedures to minimize noise impacts from the construction and operation of proposed projects. As listed in Table 3.6-7, the Code provides specific times and days when construction is permitted.

Table 3.6-7
Specific Times and Days Construction Activities are Permitted

Day	Time Period
Weekdays	7 a.m. to 6:30 p.m.
Saturdays	8 a.m. to 6:00 p.m.
Sundays/Holidays	Not Permitted
Source: City of Newport Beach 1995	

The City of Newport Beach General Plan (City of Newport Beach 1994) includes a Noise Element that describes the acceptable community noise standards or levels for various types of land uses and sensitive noise receptors within city territory. In addition, the General Plan provides direction on mitigating noise levels that are not compatible with the acceptable community noise standards. The land use/noise compatibility matrix for the City of Newport Beach is listed in Table 3.6-6. The City's indoor and outdoor noise standards for various land uses are presented in Table 3.6-8.

Noise levels within the study area could increase as a result of the projected influx of people into the southern California area. Noise levels would be associated with the increase in the number of vehicle miles traveled along local roadways, as well as the number of aircraft arriving and departing from regional airports. It should be noted that the El Toro U.S. Marine Air Station may become an international airport in the near future. This would substantially increase the noise levels adjacent to the airport, and may affect the noise levels near the Upper Newport Bay study area.

Table 3.6-8
City of Newport Beach Interior and Exterior Noise Standards

Categories	Uses	Interior Noise Level (CNEL)[1]	Exterior Noise Level (CNEL)[2]
Residential	Single Family, Two Family, Multiple Family	45[3] 55[4]	65
	Mobile Homes	---	65[5]
Commercial, Industrial Institutional	Hotel, Motel, Transient Lodging	45	65[6]
	Commercial Retail, Bank Restaurant	55	
	Office Building, Research and Development, Professional Offices, City Office Building	50	
	Amphitheatre, Concert Hall, Auditorium, Meeting Hall	45	
	Gymnasium (Multipurpose)	50	
	Sports Club	55	
	Manufacturing, Warehousing, Wholesale, Utilities	65	
	Movie Theater	45	
Institutional	Hospitals, School Classrooms	45	65
	Church, Library	45	---
Open Space	Parks	---	65

Source: City of Newport Beach 1994.

Notes:
1. Indoor environment excluding: Bathrooms, toilets, closets, corridors.
2. Outdoor environment limited to:
   a. Private yard of single family
   b. Multi-family private patio or balcony which is served by a means of exit from inside.
   c. Mobile home park
   d. Hospital Patio
   e. Park's Picnic Area
   f. School's Playground
   g. Hotel and Motel recreation area
3. Noise level requirement with closed windows. Mechanical ventilating system or other means of natural ventilation shall be provided as of Chapter 12, Section 1205 of UBC.
4. Noise level requirement with open windows, if they are used to meet natural ventilation requirement.
5. Exterior noise level should be such that interior noise level will not exceed 45 CNEL
6. Except those areas around the airport within the 65 CNEL contour.

Table 3.6-6
Land Use Compatibility for Community Noise Environment

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE - L_{dn} or CNEL (db)						
	50	55	60	65	70	75	80
Residential -Single Family, Two Family, Multiple Family							
Residential -Mobile Home							
Commercial - Motel, Hotel, Transient Lodging							
Institutional (General) Schools, Libraries, Churches, Hospitals, Nursing Homes							
Commercial (Recreation) and Institutional (Civic Center) Auditorium, Concert Hall, Amphitheaters, Meeting Hall							
Commercial (Recreation) - Children Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club							
Open Space - Playgrounds, Neighborhood Parks							
Open Space - Golf Courses, Nature Centers, Wildlife Reserves, Wildlife Habitat, Cemeteries							
Commercial, Industrial, Institutional - Office Buildings, Business Commercial and Professional							
Commercial (Regional, Village District, Special) Commercial Retail, Bank, Restaurant, Movie Theater							
Commercial (General, Special) Industrial, Institutional - Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities							
Agriculture							

	Table 3.6-6 Land Use Compatibility for Community Noise Environment (Page 2 of 2)	
	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.
Source: The City of Newport Beach 1994		

3.7 HAZARDOUS AND TOXIC MATERIALS

Hazardous materials and wastes include substances that pose a potential hazard to human health or the environment. A number of properties may cause a substance to be considered hazardous, including toxicity, ignitability, corrosivity, or reactivity. A material is considered hazardous if it appears on a list of hazardous materials prepared by a federal or state regulatory agency, or if it has characteristics defined as hazardous by such an agency. The California Department of Toxic Substances Control (DTSC), formerly the Department of Health Services, defines hazardous materials as follows:

> A hazardous material is a substance or combination of substances which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either: (1) cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating irreversible illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

Hazardous materials can be released into the environment by either point or non-point sources. An example of a point source release would be when contaminants are released from a specific site, such as a pipe or tanker. A non-point source of contamination is when contaminants enter the environment in a diffused fashion. Examples of non-point source releases include urban or agricultural runoff into a river.

3.7.1 Regulatory Setting

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) provides the EPA the authority to identify and clean up contaminated hazardous waste sites. The CERCLA also contains enforcement provisions for the identification of liable parties, it details the legal claims which arise under the statute, and provides guidance on settlements with the EPA (Arbuckle et al. 1993). Section 120 of this Act addresses hazardous waste cleanups at Federal facilities and requires the creation of a Federal Agency Hazardous Waste Compliance Docket, which lists facilities that have the potential for hazardous waste problems. In addition, a Hazardous Substance Superfund was established to pay the EPA's cleanup and enforcement costs and certain natural resource damages, but also to pay for private party claims.

With EPA approval, individual states may implement hazardous waste programs under the Resource Conservation and Recovery Act (RCRA). The approved California Hazardous Waste Control Law (HWCL), which is generally more stringent than the RCRA, is administered by the California Environmental Protection Agency (CalEPA). The HWCL lists chemicals and common materials that may be hazardous; establishes criteria for identifying, packaging and labeling hazardous wastes; prescribes the management controls; establishes permit requirements for treatment, storage, disposal and transportation; and identifies some wastes that cannot be disposed of in landfills.

3.7.2 Existing Baseline

This section describes the baseline conditions of point source contamination as regulated by federal, state, and local agencies within the Upper Newport Bay watershed. A comprehensive database search of all existing sites within 4 to 5 miles of Jamboree Boulevard and Interstate 405 overcrossing (about 2.5 miles northeast of Upper Newport Bay) was conducted by VISTA Information Solutions. The area searched includes all of Upper Newport Bay, as well as the primary watershed for Newport Bay (Figure 3.7-1).

The American Society of Testing and Materials (ASTM) provides a listing of databases that are suggested to be searched when conducting a Phase I Site Assessment. These databases include the EPA National Priority List (NPL), the Comprehensive Environmental Responsibility, Compensation, and Liability Information System (CERCLIS), CalSites, Leaking Tanks (LST), and local programs (e.g., Orange County Groundwater Cleanup Program, Industrial Cleanups, and Landfills). All databases suggested by the ASTM were included in the search. Below is a brief summary of results of the NPL, CERCLIS, Calsite, LST, and local database search.

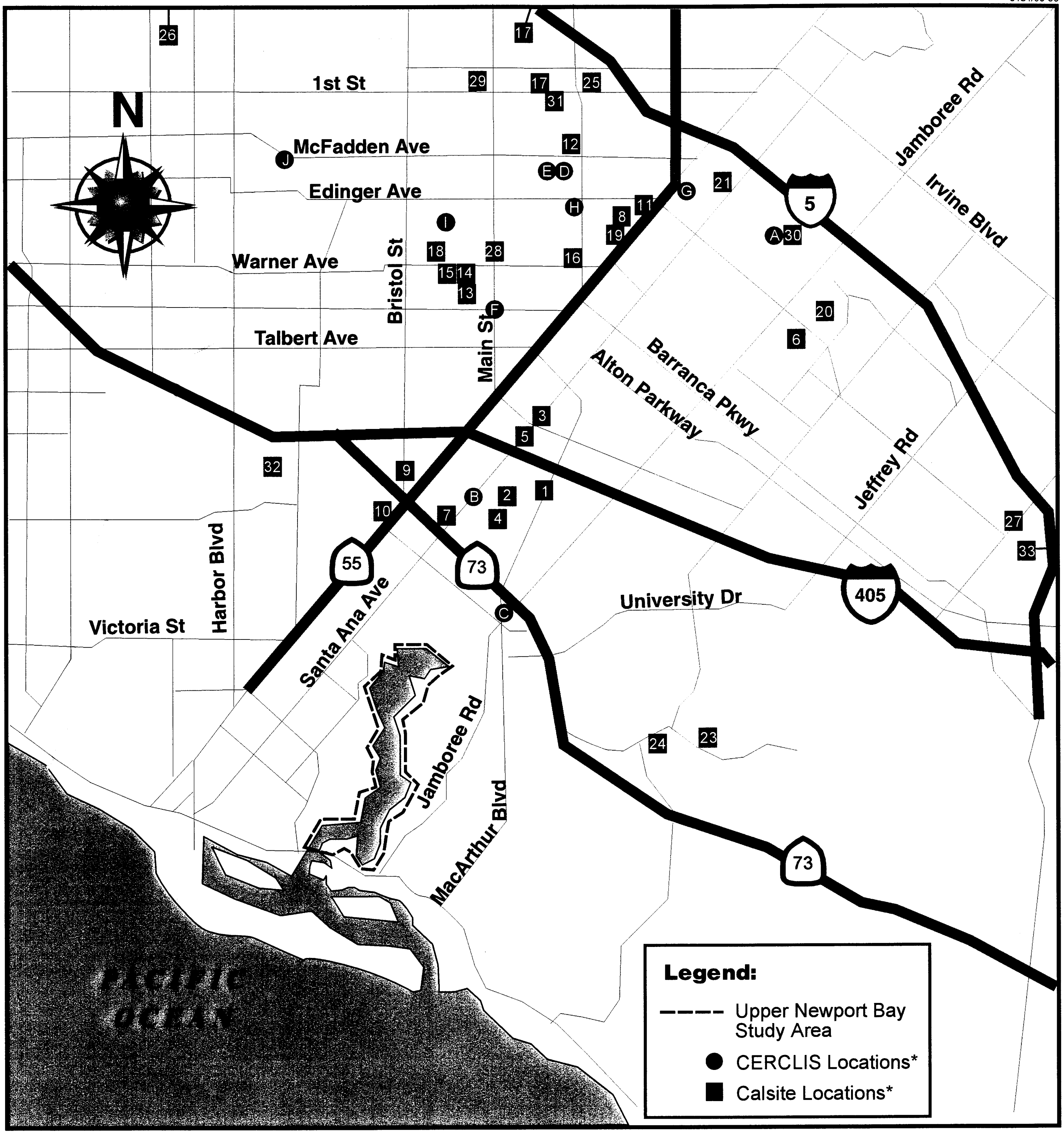
National Priorities List. NPL Sites are authorized under Section 105(a)(8)(b) of the CERCLA, also known as the Superfund law; therefore, NPL sites are listed as Superfund sites. This list is updated annually by the EPA based on various releases or threatened releases throughout the nation. The list criteria is based on risk to public health, welfare, and environment, taking into account a variety of factors including the extent of population at risk, hazard potential, the potential for contamination of drinking water supplies, and threats to ambient air quality. There are no NPL sites (Superfund sites) within the data search study area.

CERCLIS. The CERCLIS List contains sites that are either proposed to or on the NPL, and sites which are in the screening and assessment phase for possible inclusion on the NPL. The information on each site includes a history of all pre-remedial, remedial, removal, community relation activities or events at the site, financial funding information for the events, and unrestricted enforcement activities. As shown on Figure 3.7-1, there are 10 CERCLIS sites within the data search study area. None of these sites is within the immediate vicinity of the Bay.

CalSites. The CalEPA, DTSC maintains an automated database (CalSites) which contains information on properties or "sites" where an unauthorized release of hazardous substance(s) has occurred and that site investigation and cleanup are necessary. As shown on Figure 3.7-1, there are 32 Calsites within the data search study area, but none is within the immediate vicinity of the Bay.

Leaking Storage Tanks. The LST data base is provided by the RWQCB (Regions #8 [Santa Ana] and #9 [San Diego]), and the CalEPA. There are 454 LST sites within the data search study area. Due to the volume of LST sites within the data search study area, LST sites are not included on Figure 3.7-1. With regard to cleanup status, most LST sites are either listed as closed/cleanup completed, remedial action started, remedial action plan development, or information not available.

Local Sites. The local databases consist of the Orange County Groundwater Cleanup Program, Orange County Industrial Cleanups, and Orange County Landfills. There are 511 local sites within the data search study area, most of which are contaminated with petroleum products (e.g., gasoline, oil, and/or diesel fuel). Due to the volume of local sites within the data search study area, local sites are not included on Figure 3.7-1. With regard to cleanup status, most local sites are either listed as closed, under investigation, conducting remedial action, conducting post remedial monitoring, or unknown.



*Approximate Locations

Chambers Group

0 1 2
Scale In Miles

CALSITE AND CERCLIS FACILITY LOCATIONS
Figure 3.7-1

3.8 CULTURAL RESOURCES

3.8.1 Archaeological Sites

Upper Newport Bay has been an important focus of settlement throughout prehistory because of the abundance of resources that were available from the bay-estuary habitats. During prehistoric times these resources were always available because Newport Bay was never completely closed by siltation. Most other southern California coastal bays and lagoons, such as Bolsa Chica Bay and the San Diego County lagoons, did silt in by about 3,000 before present (B.P.), depriving the local populations of marine resources, such as bay/estuary fish and shellfish. Archaeological investigation of sites in the Upper Newport Bay area has shown that the most important resources obtained from the Bay were certain easily caught members of shark-ray family and three kinds of shellfish (Mason, Koerper, and Langenwalter 1997). Two members of the shark-ray family, *Myliobatis californica* (bat ray) and *Rhinobatos productus* (shovelnose guitarfish), are found in almost all archaeological sites around Newport Bay. Tons of shellfish were collected from the Bay and taken to surrounding sites for processing and consumption. During the Late Prehistoric Period, shellfish still in the shell was carried over 8 km into the San Joaquin Hills to provide a protein source for people engaged in seed collecting (Mason and Peterson 1994). The most important shellfish were *Chione* spp. (venus clam), *Argopecten* sp. (scallop), and *Ostrea lurida* (oyster). Migratory waterfowl were also important resources.

Upper Newport Bay and San Joaquin Marsh were originally surrounded by an almost continuous band of archaeological sites. Almost all of these sites, with the exception of those in Upper Newport Bay Regional Park and Upper Newport Bay Ecological Reserve, have now been destroyed by development. This county park and preserve includes most of the shoreline of Upper Newport Bay. The archaeological sites in the county park and preserve are divided into three geographical groupings. Most sites are on the western and northern shore of the Bay between Santiago Drive and Jamboree Road (Table 3.8-1). A smaller group of sites is located along Eastbluff Drive between Jamboree Road and Backbay Drive at the northeast end of the Bay (Table 3.8-2). The third group of sites is on the east side of the Bay between Newport Dunes Resort and the mouth of Big Canyon (Table 3.8-3). Many of the sites in the latter two groups were originally recorded in 1949 and updated site record forms reflecting their current status are not available. Many of these sites have probably been accepted by road construction and residential and resort development prior to the establishment of the preserve. The sites in the first group on the western and northern sides of the Bay are largely intact, however. The 22 sites in Tables 3.8-1, 3.8-2, and 3.8-3 are the sites within the Area of Potential Effect (APE) for the project because they are on the shoeline of Upper Newport Bay.

Table 3.8-1
Archaeological Sites in the Upper Newport Bay Regional Park and Ecological Preserve Between Santiago Drive and Jamboree Road

Site Number	Description	Recorded By	Year
ORA-44	Shell Midden	Briggs Bissell	1949 1991
ORA-45	Shell Midden	Briggs Brown	1949 1991
ORA-164	Shell Midden	Payne & Frame Bissell	1960 1991
ORA-166	Shell Midden	Hafner Brown	1962 1991
ORA-168	Shell Midden	Hafner, et al. Perry & Le Fontain Brown	1965 1977 1991
ORA-170	Shell Midden	Hafner, et al. Bissel	1965 1991
ORA-172	Shell Midden	Hafner, et al. Brown	1965 1991

Table 3.8-1, Page 2 of 2

Site Number	Description	Recorded By	Year
ORA-191	Shell Midden	Chace & Hafner O'Neil & Evans Brown	1966 1980 1991
ORA-192	Shell Midden	Chace & Hafner Brown	1966 1991
ORA-193	Shell Midden	Chace & Hafner Bissel	1966 1991
ORA-347	Shell Midden	Sperry & McKinney Douglas & Nelson	1972 1979
ORA-348	Shell Midden	Boehmler Brown	1972 1991
ORA-351	Shell Midden	Sperry & McKinney Brown	1972 1991

Table 3.8-2
Archaeological Sites in the Upper Newport Bay Regional Park and Ecological Preserve Between Jamboree Road and Backbay Drive

Site Number	Description	Recorded By	Year
ORA-54	Shell Midden	Briggs	1949
ORA-55	Shell Midden	Briggs	1949
ORA-56	Shell Midden	Briggs Brown	1949 1991

Table 3.8-3
Archaeological Sites in the Upper Newport Bay Regional Park and Ecological Preserve Between Newport Dunes Resort and Big Canyon

Site Number	Description	Recorded By	Year
ORA-50	Shell Midden	Briggs Chace	1949 1965
ORA-51	Shell Midden	Briggs Chace	1949 1965
ORA-52	Shell Midden	Briggs Chace	1949 1965
ORA-53	Shell Midden	Briggs McKinney Chace	1949 1964 1965
ORA-98	Shell Midden	Chace	1965
ORA-1098	Shell Midden	Breece & Harrison	1985

3.8.2 Prehistoric and Historic Background

The prehistory of the Orange County area is traditionally divided into three time periods known as the Milling Stone Period, the Intermediate Period, and the Late Prehistoric Period (Wallace 1955; Koerper and Drover 1983). The Milling Stone Period may begin as early as 9,500 B.P. as indicated by radiocarbon dates from CA-ORA-64, a site on the bluffs in the Newporter North area on the east side of upper Newport Bay. The Intermediate Period extends from about 3,000 B.P. to 650 B.P. when the Late

Prehistoric Period began (Mason and Peterson 1994). The Late Prehistoric Period ended with the arrival of the Spanish Portolá expedition in A.D. 1769.

The Milling Stone Period represents a long period of time characterized by smaller, more mobile groups compared to later time periods. These groups probably had a seasonal round of settlement which included both inland and coastal residential bases (Mason, Koerper, and Langenwalter 1997). They relied on grass and sage seeds to provide calories and carbohydrates. Although fewer projectile points occur, compared to later periods, faunal data indicate the same animals were hunted (Koerper 1981). Inland Milling Stone Period sites have numerous manos, metates, and hammerstones, while shell middens are common along the coast. Quartz and rhyolite are more common than chert as the preferred materials for making chipped stone tools (Mason and Peterson 1994).

The period from 1,000 B.C. to A.D. 750 is known archaeologically as the Intermediate Period. During this period, mortars and pestles appear, indicating the beginning of acorn exploitation (Koerper and Drover 1983). Use of the acorn, a storable high calorie food source, probably allowed greater sedentism, especially in inland areas. Large projectile points indicate that the bow and arrow, characteristic of the Late Prehistoric Period, had not yet been introduced. Hunting was probably conducted using a spear thrower. Settlement patterns during this period are not well known. The semi-sedentary settlement pattern characteristic of the Late Prehistoric Period may have begun during the later part of the Intermediate Period, although lower population densities may have meant less territoriality.

The Newport Bay area was part of territory occupied by the Gabrielino and Juaneño Native American groups when the Spanish arrived in A.D. 1769. Newport Bay, originally known as the *Bolsa de Gengar*, was in the territory of the rancheria of Genga, a village listed in the mission records that has been identified with archaeological site ORA-58 in Fairview Park in Costa Mesa (Koerper et al. 1996). People from this village were taken to both San Gabriel and San Juan Capistrano Missions, suggesting that the lower Santa Ana River and Newport Bay region may have been multi-ethnic (Earle and O'Neil 1994).

Gabrielino and Juaneño settlement and subsistence systems may extend back in time to the beginning of the Late Prehistoric Period about A.D. 750. The Gabrielino and Juaneño were semi-sedentary hunters and gatherers. Seeds from sage and grasses, goosefoot, and California buckwheat were collected and ground using manos and metates. Protein was supplied by hunting deer, rabbits, and other animals using a bow and arrow as well as various traps and snares. Coastal dwellers collected shellfish and engaged in fishing for bay/estuary, nearshore, and kelp bed species. Dried shellfish and fish were probably exchanged for inland products such as acorns.

The Gabrielino and Juaneño lived in villages of up to 250 people located near permanent water sources and a variety of food resources (Earle and O'Neil 1994). The village was the center of a territory from which resources were gathered. Work parties left the village for short periods of time to hunt, fish, and gather plant foods. While away from the village they established temporary camps and resource processing locations. Archaeologically, such locations are indicated by manos and metates for seed processing, bedrock mortars for acorn processing, and lithic scatters indicating manufacturing or maintenance of stone tools (usually made of chert) used in hunting or butchering. Overnight stays in field camps and minor residential bases are indicated by fire-affected rock resulting from campfire hearths.

After A.D. 1769 California became a Spanish colony. Missions were established by Franciscan friars to convert the native population to Christianity. Mission San Gabriel was established north of the project area in 1771 and Mission San Juan Capistrano was established south of the project area in 1776 (McKenna and de Barros 1993). As previously noted, people from the Newport Bay area were taken to both missions. Most native villages were abandoned and the native population was concentrated at the missions. Here, the native populations were exposed to Old World diseases to which they had no immunity, resulting in drastic population loss. After Mexico became independent from Spain in 1821, California became part of Mexico. The missions were secularized in 1834 and their lands were granted to former soldiers and other Mexican citizens for use as cattle ranches. The Newport Bay area was granted to Jose Sepulveda in 1842 as part of the Rancho Bolsa de San Joaquin (McKenna and de Barros 1993). This rancho was combined with an earlier land grant to the north to form Rancho San Joaquin.

After a brief war with Mexico, upper California became part of the United States in 1848 upon ratification of the Treaty of Guadalupe Hidalgo. The population of southern California remained low in the 1860s and 1870s with cattle ranching continuing as the principal economic activity. However, a combination of drought and the expense of defending their land titles in U.S. courts resulted in sales of many of the cattle ranches to Anglo-Americans. The Rancho San Joaquin was sold to Irvine, Flint, and Bixby in 1864 and became part of the Irvine Ranch (McKenna and de Barros 1993).

Immigration to southern California increased substantially with the arrival of the first transcontinental railroad in southern California, the Southern Pacific Railroad, completed in 1876. During the "Boom of the Eighties" (Dumke 1944) towns were formed and land was sold to new arrivals from the East by real estate developers and speculators. Increased land speculation and town formation resulted from completion of the second transcontinental railroad, the Atchison, Topeka, and Santa Fe, which reached Los Angeles in 1887. The two competing railroads vied for customers by reducing fares to extremely low levels. This fare war lasted for about six months.

The Irvine Ranch remained a large agribusiness until the 1960s when large scale residential and commercial development began. Upper Newport Bay is now surrounded by the City of Newport Beach.

Records Search

A records search was requested from the South Central Coastal Information Center (SCCIC) of the California Historic Resources Information System on July 13, 1999. The request included information on all sites within a one half-mile radius of Newport Bay.

The records check indicates that sixty-two prehistoric sites have been identified within one half mile of the project area. Twenty-two of the recorded sites are within the project APE. No historic archaeological sites have been recorded within a one half -mile radius of the project area. No National Register of Historic Properties, California State Historic Resources or California Points of Historical Interest are located within a half-mile radius. One property listed on the California Historical Landmarks (1990) does occur within a one half-mile radius. This property is SHL 198 – the Old Landing.

Fifty-nine previous surveys and/or excavations have taken place within a one half-mile radius of the project area. Thirty-five of these were performed within the project area. Six additional investigations are located within the Newport and Tustin quadrangles but have not been mapped due to insufficient locational information.

Twenty-two of the recorded sites lie within Upper Newport Bay Regional Park and Upper Newport Bay Ecological Preserve and are within the project APE (see Tables 3.8-1, 3.8-2, and 3.8-3). All are described as shell midden sites. Only six of these sites (ORA-48, ORA-170, ORA-192, ORA-193, ORA-347, and ORA-348) have been excavated. If any of the other sites have been tested, there are no copies of reports at the SCCIC.

Little is known of most of the other sites beyond the project APE. Most were impacted by development before the implementation of environmental laws such as CEQA which took effect in 1971. A few sites to the northeast of Upper Newport Bay along San Diego and Bonita Creeks have been investigated recently. These include ORA-57 and ORA-206. ORA-57 is located on San Diego Creek at the southern end of the San Joaquin Marsh. The northern part of the site was investigated by the WPA in 1938 and was subsequently destroyed. The southern part of the site was investigated during the test program for the San Joaquin Hills Transportation Corridor and was found to be greatly disturbed. The site appears to have been a residential base occupied during the end of the Intermediate Period and during the Late Prehistoric Period (de Barros and Koerper 1990). A previously unknown portion of ORA-206 was discovered during grading for the San Joaquin Hills Transportation Corridor and was buried under fill adjacent to MacArthur Boulevard along the lower reaches of Bonita Creek. ORA-206 was a seasonally occupied minor residential base where the principal activity was shellfish processing (Mason 1997).

Due to the limited extent of field work in this portion of Newport Bay, little can be said about the chronology of the sites. Information on chronology is available only for four of the six sites that have been tested. ORA-170 dates to the Intermediate Period (Macko 1997). ORA-192 dates to the Late Prehistoric Period, as does ORA-193 (Lyneis 1981). ORA-348 has two distinctive cultural levels. The lower component has been dated by artifact typology to the Encinitas II Period (Intermediate Period), while the upper component has been dated by artifact chronology to the Shoshonean Period (Late Prehistoric Period) (Drover 1972).

ORA-48

ORA-48 was reported as almost destroyed in 1965. Subsequent investigations were conducted in 1972 (ARI), 1975 (WESTEC), 1981 (APC), and RMW (Bissell 1990). No artifacts were recovered (Rosenthal 1990).

ARI excavated 14 backhoe trenches in the site. The investigators concluded that the site was highly disturbed. A person familiar with the property history, Pacifico Montavo, was interviewed and commented that "ten years earlier dredging residue resulting from the channel-deepening operations of Dover Shores was dumped on the area tested" (Rosenthal 1990).

Westec (1975) recommended further evaluation. This was carried out by personnel from APC in 1981 who found ORA-48 to be disturbed, but recommended that a qualified archaeologist should monitor any grading activities.

In 1990 RMW excavated a series of twenty-two 30 cm wide postholes and one 1 m by 1 m hand excavated unit at ORA-48. Shells were recovered to a depth of 35 cm, but no artifacts were noted (Bissell 1990).

ORA-170

The site was field checked in 1991 by RMW Paleo Associates. Their report described the site as "a dense scatter of various shell fish species." The site was said to be 3,000 square meters in size and over one meter in depth. The study suggested that the southwestern portion of the site was intact (Brown 1991).

Macko (1997) conducted Phase II testing at the site in 1995. The testing consisted of 49 post-holes and ten 1-meter-square hand excavated units. A low number of chipped stone artifacts were recovered, suggesting to the investigator that stone tool production was not a major activity at the site. One mano and a few fragments of other ground stone also were recovered. Shell beads were noted.

Macko (1997) believed the site dated to the Intermediate Period and recommended Phase III mitigation in which sampling on a larger scale was required. Results of the Phase III mitigation included a diversity of stone, bone, and shell artifacts dating to the Intermediate Period. A geomagnetic survey of the site suggested that as many as 50 possible subsurface features may exist. Five of these were hand excavated.

ORA-192

In 1972 ARI excavated five units of unknown size adjacent to and parallel with Jamboree Road. The investigations determined the site to be partially destroyed. Nevertheless, the data suggest that ORA-192 was a special activity area focused on shellfish processing.

Seven years later APC conducted a survey through ORA-192 for a proposed pipeline right-of-way. Two one meter square units were hand excavated. Unit 1 exposed intact midden soil with shell to a depth of 35 cm. No chipping waste was recovered, but a chalcedony projectile point base was noted. Unit 2 was completely sterile. The investigators concluded that the site served as a special function station tentatively dating to the Encinitas II Period (Intermediate Period), approximately 2,000 B.C.

A survey conducted at ORA-192 by LSA (Padon 1983) recorded Locus B for this site. It was described as consisting of midden soil with shellfish remains. No artifacts were recovered.

Two years later Breece (1985) recovered a granite mano at Locus B. His investigations included a surface collection and subsurface testing program. Four one meter square units were hand excavated. No artifacts were recovered from the subsurface testing.

ORA-193

ORA-193 was excavated by a field class from California State College, Long Beach, directed by Margaret Lyneis (1981). A total of 133 square meters of the 2,000-square-meter site area were excavated. The excavations revealed the site to be a shell midden with nine cultural strata separated by sand and silt. All occupations date to the Late Prehistoric Period after 1350 BP.

The site appears to have been a seasonal residential base for the purpose of processing marine resources, including large quantities of shellfish (*Argopecten* sp., *Ostrea lurida*, and *Chione* sp.), fish (mostly *Myliobatis californica* and *Rhinobatos productus*), and avifauna. Some terrestrial hunting may also have taken place, as indicated by the recovery of 22 arrow projectile points. The artifact assemblage is unusual because the most numerous tool type is blunt tipped bone tools. There were 103 of these tools, which may have been used to remove meat from shellfish or to process fish. Other artifacts included utilized flake scrapers, gravers, scraper planes, and hammerstones. The small amount of ground stone tools (three possible mano fragments, and a metate fragment) indicate that plant food processing was not an important activity. Lyneis (1981:75) concluded that ORA-193 was occupied "occasionally for brief periods" between A.D. 600 and the end of Late Prehistoric Period.

ORA-347

This site was tested by APC in 1979. They determined that the site consisted of midden soil measuring approximately 20 meters by 40 meters in area, with a thickness of about 90 cm. The deposit is buried under 40 cm of light sand. No artifacts were reported.

ORA-348

ORA-348 was excavated by classes from California State College Fullerton. Drover (1972) excavated at least seven one meter square units. Additional units may have been excavated, but were not plotted. The test was in anticipation of a proposed pipeline trench through the site. A number of artifacts were recovered including perforated shell ornaments, projectile points and knives, bone tools, a ground stone pendant, utilized flakes and scrapers, pestle fragments, hammerstones, and chipping waste. Faunal remains included shellfish and animal bone.

ARI surveyed the site again during the 1980s. LSA placed nine auger holes in the site in 1984. They recovered only two small chert flakes, but reported a distinct buried midden soil layer at a depth of between 40 cm and 60 cm.

In 1985 Breece conducted a surface collection and subsurface data recovery program at ORA-348. Nine one meter square units were hand excavated. Four artifacts were recovered from the surface. This included a bowl fragment, a metate piece, one hammerstone, and one chert core. Artifacts recovered from the units included projectile points, cores, one hammerstone, one metate fragment, a bowl fragment, one piece of worked bone, a perforated pecten shell and two dozen pieces of lithic debitage; primarily chert. Breece concluded that the site must represent a habitation site, but found it difficult to assign the site to a specific cultural period.

3.8.3 Regulatory Setting

Cultural resources that could be affected by the project are protected by federal law and regulations because the project is a federal undertaking. Most federal legislation concerning cultural resources is derived from two basic elements: environmental review based on NEPA and historic preservation legislation, the most important of which is the National Historic Preservation Act of 1966, as amended (NHPA).

NEPA provides for the consideration of historic resources in federal environmental documents in order to "preserve important historic, cultural, and natural aspects of our national heritage, and to maintain, wherever possible, an environment that supports diversity and a variety of individual choice" (42 U.S.C.A. Sec. 4331).

Section 106 of the NHPA protects cultural resources that could be affected by federal undertakings (projects with federal funding, on federal land, or requiring federal permits). Procedures implementing Section 106 are set forth in 36 CFR 800. These procedures include identification of resources, evaluation of their significance using National Register of Historic Places (NRHP) criteria, determination of the effects of the undertaking on eligible resources or properties, and implementation of mitigation measures.

Identification

Identification of cultural resources is completed by means of a records search and an archaeological and historic property survey. Archaeological sites are identified by systematically walking over the area that could be affected by the undertaking. The archaeologist looks for cultural material such as artifacts, features, and food waste (animal bone and shell). If cultural material is found, it is recorded as a site and a site record form is filed with the appropriate archaeological information center. A historic property survey is conducted by an architectural historian who makes an inventory of structures more than 50 years old based on stylistic characteristics.

Evaluation

The significance of cultural resources is evaluated using the criteria for eligibility for the NRHP. The criteria, defined in 36 CFR 60.4, are as follows:

- The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, association, and:

  (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
  (b) that are associated with the lives of persons significant in our past; or
  (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
  (d) that have yielded, or may be likely to yield, information important to prehistory or history.

Unless a resource is of exceptional importance or value, sites younger than 50 years are not considered eligible for the NRHP. However, it is recommended that sites 45 years old or older be considered during the evaluation process to allow for potential delays between evaluation and project construction periods. Because the process for actually listing a site on the NRHP can be a lengthy one, the State Historic Preservation Officer (SHPO) can determine a site eligible for listing on the NRHP. If the SHPO determines a site to be eligible, the Section 106 process (36 CFR 800), including determination of effects and implementation of mitigation measures, must be completed.

Survey data are often insufficient to determine the eligibility of cultural resources, particularly archaeological resources. A subsurface test program to provide additional data is often necessary to determine the age of a resource, its integrity, and/or its potential to yield information important in prehistory (NRHP Criterion D). Historical resources are evaluated by carrying out historical research to determine their historical associations (NRHP Criteria A and B) and by describing their architectural characteristics (NRHP Criterion C).

Effects

Implementing regulations of Section 106 of the National Historic Preservation Act (36 CFR 800.5) require that impacts to eligible resources or properties be assessed in terms of effect. Significant impacts are those that have an "adverse effect" on characteristics that make a resource eligible for the NRHP [36 CFR 800.9(a) and (b)]. In general, an impact is significant if it would result in damage to a resource's integrity, setting, or research potential. Effect determinations may lead to a "No Effect" (no impacts) determination or to a "Determination of Effect" (impacts will occur). In the latter case, the effect must be evaluated to determine whether or not the effect will be adverse. The determination of effect is made by the lead federal agency with concurrence by the SHPO.

Mitigation Measures

If the effect is determined to be adverse, mitigation measures are required. Avoidance and preservation through project redesign are always the preferred mitigation. However, if this is not feasible, data recovery for archaeological sites and documentation and recording for historic structures and facilities are the usual mitigation measures. Data recovery consists of using archaeological methods to obtain a representative sample of the material in the site that made the site eligible for the NRHP. Documentation and recording for structures and facilities consists of a historical summary and photography and/or architectural scale drawings following Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) guidelines.

3.9 SOCIOECONOMICS

3.9.1 Population Trends

The study area for population trends is the City of Newport Beach located in the County of Orange. Table 3.9-1 presents historic, current, and projected population data for the City of Newport Beach and the County of Orange.

As shown by population figures in Table 3.9-1, the City of Newport Beach and the County of Orange experienced a dramatic population boom between 1940 and 1970. From 1970 to 1990 the population growth rate became more stable, but continued to increase. It is estimated that the population of Newport Beach increases up to 50 percent during the summer months because it is a popular resort destination with harbor and beach activities being the primary attractions (Corps 1993a).

Upper Newport Bay is within an area that is planned for urban growth. Given that Orange County and Newport Beach are popular locations to live, and that the area supports a strong tourist industry, it is expected that both the permanent and temporary summer time populations of the area would continue to increase over the next 50 years, but at a slower pace as build-out occurs. The total population of Orange County is expected to increase to 3,244,607 by 2020 (CSUF 1997). Assuming an annual growth rate of 4.4 percent from 2010 to 2047, the County of Orange and City of Newport Beach populations are expected to grow to about 3.6 million and 100,000, respectively by the year 2047 (Table 3.9-1).

3.9.2 Housing

In 1980, the City of Newport Beach had 31,397 housing units (Newport Beach 1992). By 1990, the number of housing units had risen to 34,861, representing an 11 percent growth rate (Census 1994). Currently there are 35,565 housing units within the City (Marelli 1997). The ultimate residential capacity within the City has been projected to be 39,819 housing units within the present City limits by 2010 (Newport Beach 1992). This projection is based on the City's General Plan and the City's traffic model. The ultimate residential capacity provides the most accurate means by which to project population within the City. The City projects that household size will stabilize at 2.2 persons per household by 2000 (Newport Beach 1992). Further, housing vacancy rates are expected to decline as a result of the

Table 3.9-1
Historic, Current, and Projected Population Data

City of Newport Beach			County of Orange		
Year	Population	Growth Rate (%)	Year	Population	Growth Rate (%)
1910	445		1910	34,436	
1920	894	100.9	1920	61,375	78.2
1930	2,203	146.4	1930	118,674	93.4
1940	4,483	101.4	1940	130,760	10.2
1950	12,120	173.1	950	216,224	65.4
1960	26,565	119.2	1960	703,925	225.6
1970	49,442	86.1	1970	1,420,386	101.8
1980	62,556	26.5	1980	1,932,709	36.1
1990	66,641	6.5	1990	2,410,553	24.7
2000	78,327	17.5	2000	2,867,593	18.9
2010	84,385	7.7	2010	3,107,312	8.4
2020	88,098	8.4	2020	3,244,607	4.4[1]
2030	91,974	4.4[2]	2030	3,387,370	4.4[2]
2040	96,021	4.4[2]	2040	3,536,414	4.4[2]
2050	100,245	4.4[2]	2050	3,692,016	4.4[2]

Note: Population projections for decades subsequent to 2020 are not available through regional, county or city planning agencies, or through academic institutions.
Source: Newport Beach 1992 for 1910-1980 information SCAG, 1994 for 1990-2010 information

[1] 2020 projections for Orange County provided by CSUF 1997
[2] City and County population projections for decades subsequent to 2010 have been based on CSUF's projected Orange County growth rate between 2010 and 2020. Given the limited availability of developable land and the City's expected build-out by 2010, the City's population is not expected to increase dramatically after 2010. Similarly, projected County populations after 2010 are not expected to increase dramatically.

increased demand for housing and increased housing prices in Orange County. An overall housing vacancy rate of 10% has been projected through the City's build-out date in 2010 (Newport Beach 1992). In 1980, Orange County's comparable overall housing vacancy rate was 12.9 percent. These projections and the population figures in Table 3.9-1 indicate that the City of Newport Beach will grow at an average rate of 1.5 percent per year through 2010 as compared to a 2.2 percent annual growth rate which has been projected by the Southern California Association of Governments for Orange County (Newport Beach 1992). This variance in growth rates is related to the smaller portion of undeveloped residential acreage available in Newport Beach. Therefore, housing growth over the next 50 years beyond the 2010 build-out is expected to be limited.

3.9.3 Employment

In 1980, the City of Newport Beach Planning Department estimated the City's total non-construction employment to be 42,000 persons. In January 1988, employment was estimated to be 58,255, a 39 percent increase (Newport Beach 1992). Like population and subsequent housing growth, employment growth will be limited at some point in the future by the finite amount of land and building space available. The City of Newport Beach projects that the 1988 employment figure of 58,255 will increase to 85,354 employees at the City's build-out point in 2010 (Newport Beach 1992). The predominant types of employment within Newport Beach are jobs related to administrative, professional, retail, financial, and recreational marine commercial enterprises (Newport Beach 1990). Given that the City is expected to reach build-out by 2010 and that the amount of developable land is currently limited, the employment base of Newport Beach is not expected to change dramatically over the next 50 years beyond the 2010 build-out.

3.10 LAND AND WATER USES

Historically the City of Newport Beach has been a residential beach community, and a popular vacation and resort town. Throughout the first half of the twentieth century, the City of Newport Beach continued to grow as a beach town (Newport Beach 1990). By the mid 1960s, as major employment, commercial, and educational centers opened in Orange County, it was apparent that Newport Beach would be subjected to increased residential and commercial development and would continue to be a highly desirable vacation and visitor center. As described in Section 3.9.1 (Socioeconomics), the amount of land available for development is currently limited in Newport Beach and the City's expected build-out date is 2010. This section focuses on existing conditions of land uses in the vicinity of Upper Newport Bay, water uses of the Upper Bay, and summarizes applicable plans, policies, and regulations. The study area includes Upper Newport Bay and surrounding lands within the City of Newport Beach.

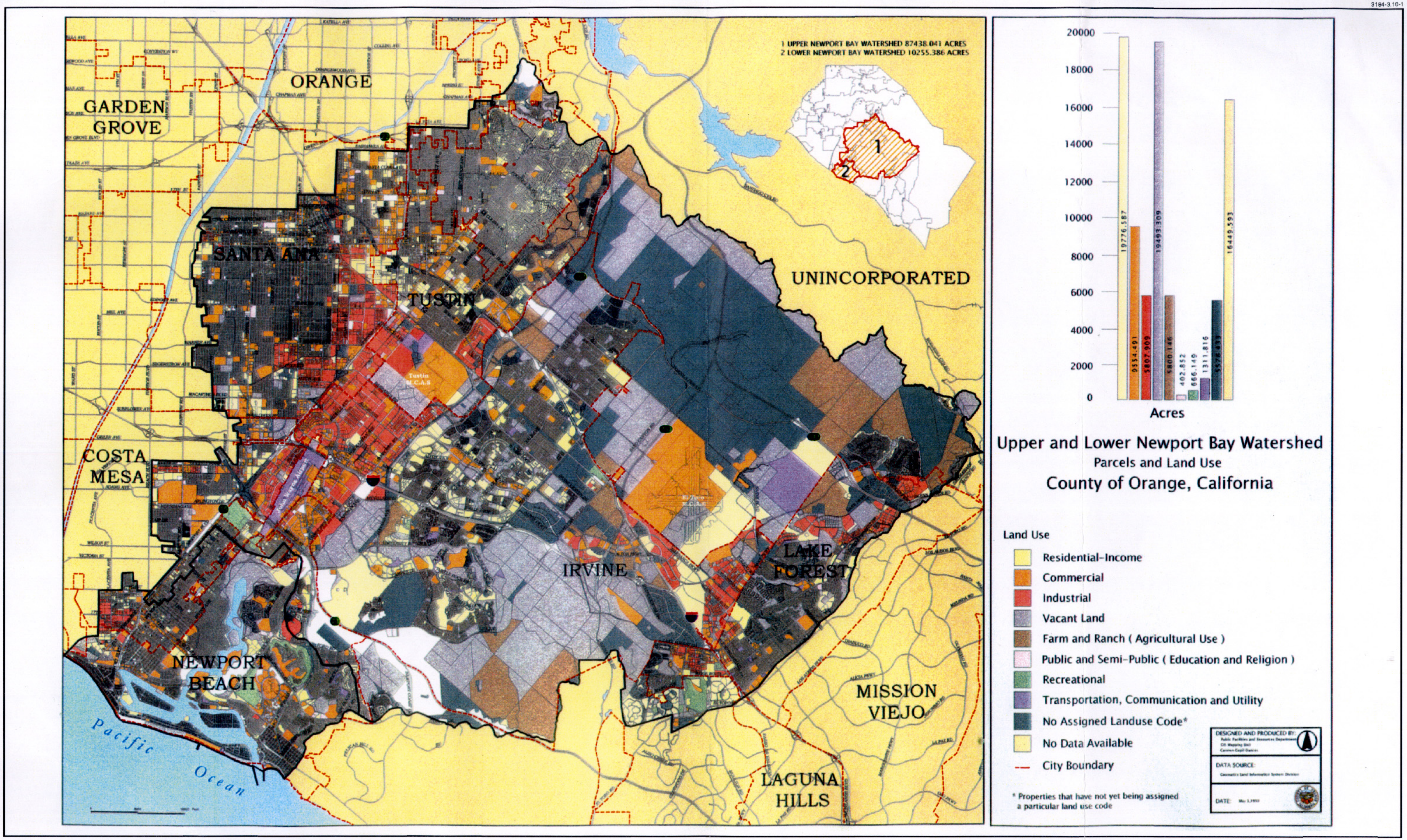
3.10.1 Land Use

The study area is generally characterized by a mixture of land uses including open space, recreational, residential, and commercial. In general, jurisdictions define their existing and desired future land uses through their general/comprehensive plan and zoning ordinances. Examples of common land uses categorized according to general land use classifications are presented in Table 3.10-1. Figure 3.10-1 shows land uses in the Newport Bay watershed.

Land Use Designations. The total area of Upper Newport Bay, between the bluffs, is 1,000 acres and is designated as "Open Space" by the City of Newport Beach General Plan (Newport Beach 1995). Under the open space designation, there are three categories: "Recreational and Environmental Open Space," "Water," and "Tidelands." The 1,000 acres (404.69 hectares) of Upper Newport Bay includes all three of these categories. Figure 3.10-2 illustrates that "Open Space" categories as they apply to the Bay and the City designated land uses surrounding the Bay. According to the City of Newport Beach Planning Department, all of the existing land uses surrounding Upper Newport Bay are compatible with the City's General Plan land use designations (Aslami 1997b).

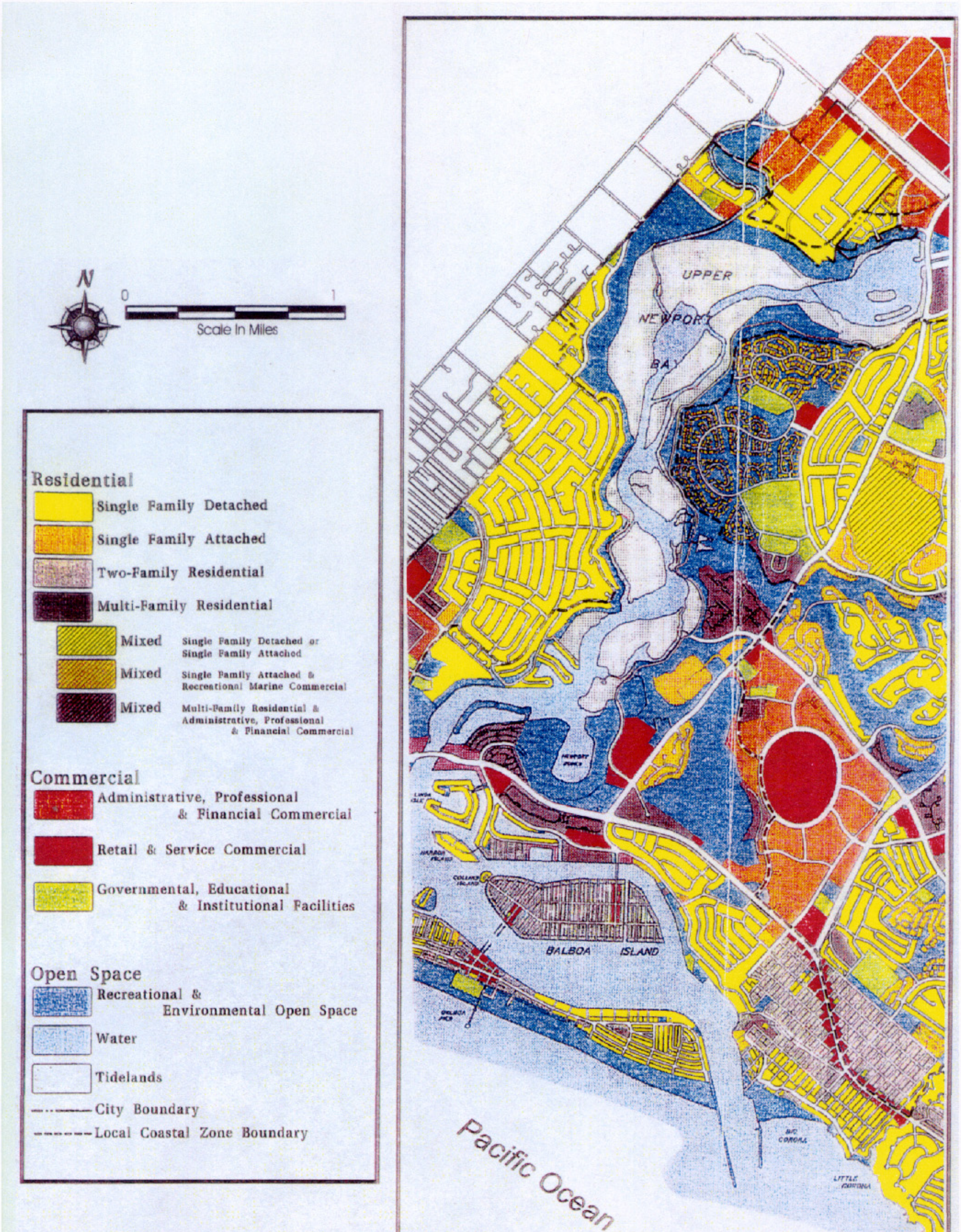
Table 3.10-1
Examples of Land Uses and their Classifications

Classification	Examples of Land Uses
Open Space	Significant Ecological Area; Environmentally Sensitive Habitat; Wildlife Refuge/Preserve; River, Stream or Floodplain; Coastal Bluffs or Non-Recreational Area; Vacant Urban Land
Recreational	State, County, City Park; State, County, City Beach or Vista Point; Recreation Facility; Cultural Center, Museum; Campground; Fairgrounds; RV Park Near Recreation Site; Zoo; Golf Course; Drive-In Theater/Nature Conservancy
Residential	Single or Multi-Family Residential; Condominium or Apartment; Townhouse; Mobile Home Park; Hillside Management Area
Commercial	Store; Business Park; Shopping Center; Retail Plant Nursery; Professional Office
Institutional	Governmental, public and quasi-public and community-owned facilities; Public and private schools from kindergarten to college/university levels and their support facilities; Post Offices; Libraries; Museums; Places of worship; Day care centers; Police Stations; Government Buildings; Non-profit Housing
Agricultural	Farm Field; Ranch; Orchard; Wholesale Nursery
Industrial	Oil Well; Oil Refinery; Tank Farm; Substation; Gravel Pit; Concrete Plant; Landfill; Sewer Plant; Transmission Line; Pipeline; Utilities



Chambers Group

LAND USES IN THE UPPER NEWPORT BAY WATERSHED
Figure 3.10-1



Source: City Of Newport Beach General Plan

Chambers Group

LAND USES IN THE VICINITY OF UPPER NEWPORT BAY
Figure 3.10-2

Zoning Designations. According to the City of Newport Beach Districting Map, the majority of Upper Newport Bay has no zoning designation or is zoned as "Open Space" (OS) (Aslami 1997a). Portions of Upper Newport Bay that consist of water and tidelands do not have a zoning designation. Whereas, portions of the uplands surrounding the water and tidelands are zoned as "Open Space." The surrounding lands that contain residential developments have a zoning designation of "Planned Community" (PC). Figure 3.10-3 illustrates the zoning designations in the immediate vicinity of Upper Newport Bay.

Existing Land Uses. The land uses of Upper Newport Bay, between and in the vicinity of the bluffs, are described below (Newport Beach 1990 and 1995). For the general location of these land uses, see Figure 3.10-4.

- **Upper Newport Bay Ecological Reserve** (752 acres) generally includes all of Upper Newport Bay north of Coney Island and west of Jamboree Road and consists of tidelands and uplands. The Reserve is under the jurisdiction of the CDFG. Upland areas of the Reserve are designated for Recreational and Environmental Open Space. The Reserve has been identified by the CDFG, California Coastal Commission, USFWS, and SCAG as a unique and valuable state resource. The Upper Bay is an integral part of the Pacific Flyway, and the saltwater marsh, bay waters, and uplands provide habitat for 158 species of birds, 60 species of fish, and over 1,000 species of marine invertebrates.

- **Newporter North** (88 acres) is bounded by San Joaquin Hills Road, Jamboree Road, the John Wayne Tennis Club, Newporter Inn, and Back Bay Drive. Bluff areas and environmentally sensitive resource areas are designated for Recreational and Environmental Open Space with some northern portions of the site designated for a maximum of 212 single-family attached residential dwelling units.

- **Mouth of Big Canyon** (58 acres) is a canyon area located between Upper Newport Bay Ecological Reserve, Jamboree Road, East Bluff, and Park Newport and is owned partially by the City of Newport Beach and partially by the CDFG. The outstanding feature of this area is lush riparian growth which covers much of the canyon bottom. This area is designated for Recreational and Environmental Open Space, to be used for passive recreation and wildlife habitat restoration.

- **Park Newport** is bounded by Upper Newport Bay, the Mouth of Big Canyon, Jamboree Road and San Joaquin Hills Road. This area has 1,306 residential units and is designated for multi-family Residential land use.

- **Eastbluff Remnant** (8.8 acres) is located between Eastbluff Park and Upper Newport Bay and consists of steep bluffs and upland plateau with high quality riparian vegetation and open grassland areas. This area is designated for Recreational and Environmental Open Space to be used for passive open space uses.

- The **Domingo Drive** area is located on the west side of Eastbluff Road's southern terminus into Jamboree Road and is designated for multi-family residential land use and currently has 225 dwelling units.

- **Bayside Village** includes both a residential and commercial development located between Upper Newport Bay and the Newport Dunes. The area is designated for Multi-Family Residential and Recreational and Marine Commercial (between PCH and Bayside Drive) land use. There is an existing mobile home park (the De Anza Bayside Village Trailer Park) in this area which is allowed under this land use designation.

- **Newport Dunes** is a County Aquatic Park Facility in Upper Newport Bay located north of Jamboree Road and PCH and is designated for Recreational and Environmental Open Space. Types of development permitted in this area include hotel, boat storage and ramps, day use parking, restaurant, marine retail, and recreational vehicle park and support services. The Newport Dunes Marina is located at this facility.

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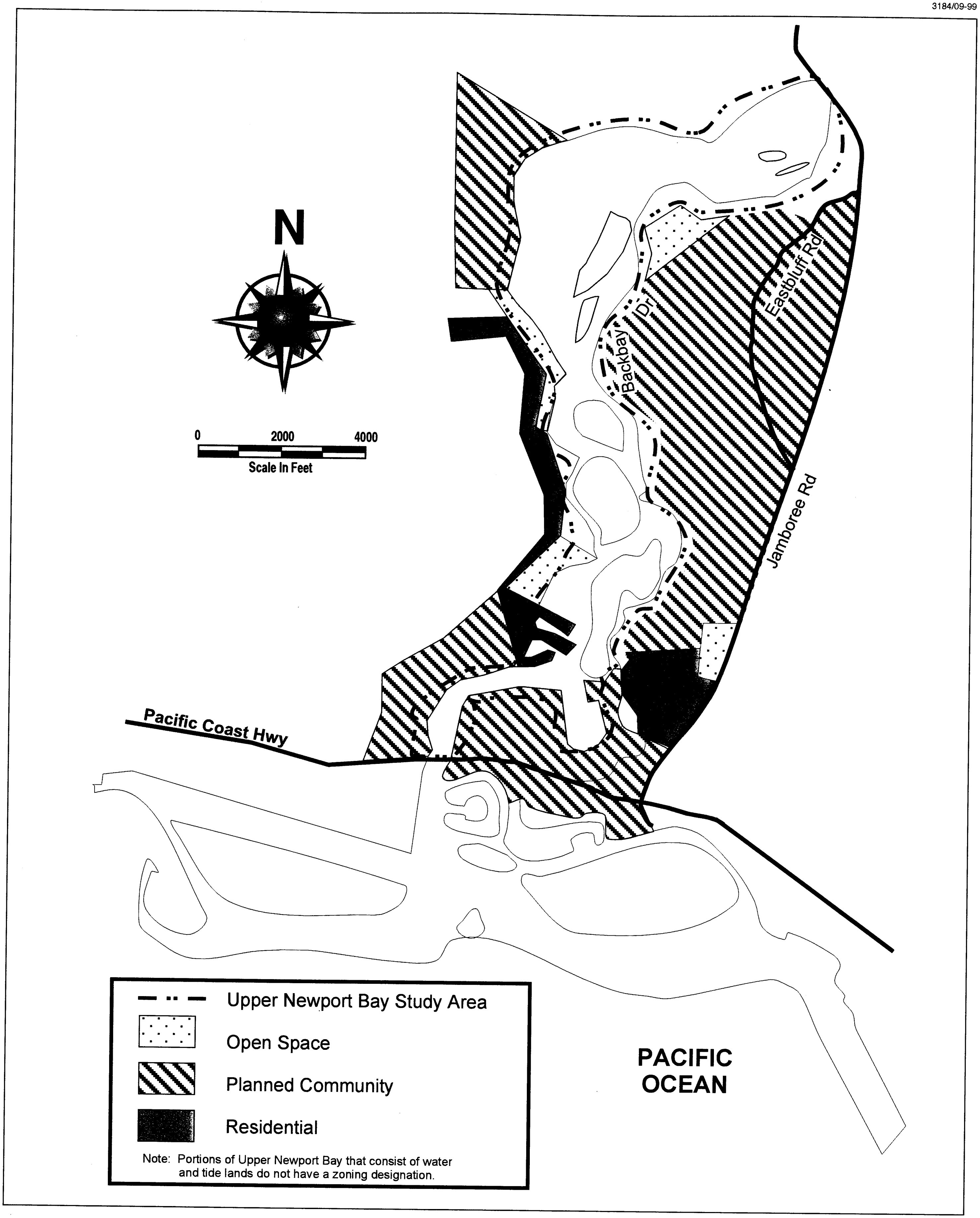

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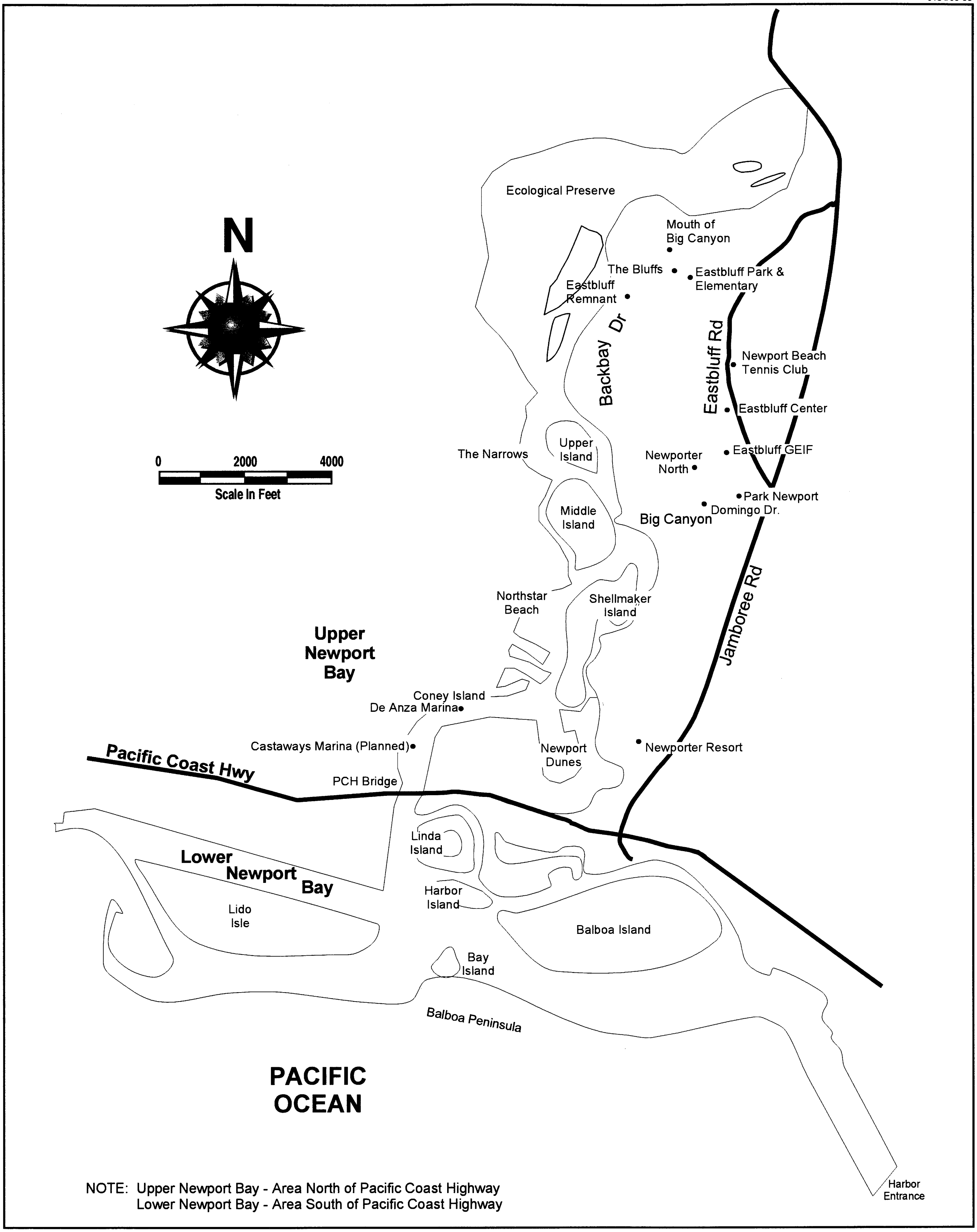
Source: City of Newport Beach District Map

ZONING DESIGNATIONS
Figure 3.10-3



Chambers Group

GENERAL LOCATION OF LAND USES
Figure 3.10-4

- **Newporter Resort** is located on the east side of Newport Dunes and includes the Hyatt Newporter Hotel and the Newporter Golf Course. This area is designated for Retail and Service Commercial land use. The maximum number of hotel rooms allowed are 479.

- **Shellmaker Island** is the southernmost of the three Upper Bay islands. It is designated for Recreational and Environmental Open Space. The southern tip of the island is part of the CDFG's Ecological Reserve property, but is currently leased to two uses that do not conform with the Reserve's objectives. These uses are the University of California, Irvine (UCI) Rowing Base which occupies 2.4 acres of fee lands and tidelands, and Shellmaker, Inc., which conducts dredging operations occupies 1.9 acres (CDFG 1985). These facilities were in existence before the Reserve was created and although their activities are allowed to continue they may not be expanded or intensified.

- **Eastbluff GEIF** includes educational and institutional uses along Eastbluff Drive, Mar Vista Drive, and Domingo Drive and consists of several churches, schools, and the Corona Del Mar High School. This area is designated for governmental, Educational and Institutional land uses.

- **The Bluffs** are located between Upper Newport Bay and Eastbluff Drive and currently consist of 1,374 single family homes. This area is designated for Single-Family Attached land use.

- **Eastbluff Center** is a neighborhood commercial shopping center located on Eastbluff Drive at Vista del Sol. Its land use designation is Retail and Service Commercial.

- **Eastbluff Park** is a community park owned by the City of Newport Beach located along Vista del Oro at Vista del Sol. Its land use designation is Recreational and Environmental Open Space with a maximum permitted development of 15,000 square feet (1,393 square meters).

- **Eastbluff Elementary** is located adjacent to Eastbluff Park, and is no longer used for school facilities. This site is used for civic, cultural, and community facilities and is designated for Governmental, Educational and Institutional Facilities.

- **Newport Beach Tennis Club** is located north of the Eastbluff Center and is designated for Recreational and Environmental Open Space with a maximum permitted development of 15,000 square feet (1,393 square meters).

Future Land Uses. Upper Newport Bay is within an area (i.e., Orange County and Newport Beach) planned for further urban growth. This is especially evident by the recent development and road improvement projects in the surrounding area. For example, existence of major arterial roads such as Jamboree Road, MacArthur Boulevard to the east which expanded as the extension of Highway 73, and the San Joaquin Hills Transportation Corridor, indicate the existing and anticipated growth in the area. According to the City's General Plan, ultimate residential build-out is also projected to occur by the year 2010 (Newport Beach 1992). Currently, the amount of land available for development within the City as a whole is limited. Specifically, there are no parcels of land available for development within the Upper Newport Bay area (Aslami 1997b). The majority of lands within Upper Newport Bay are either within the boundaries of the Ecological Reserve which can not be developed in the future due to its sensitivity as a wildlife habitat, or contain existing residential and planned community developments. Therefore, with regard to development, the overall land use characteristic of the Upper Bay is not expected to change dramatically over the next fifty years given the existing developed nature of the area and the projected build-out date of 2010.

3.10.2 Water Uses

Water uses of Upper Newport Bay have historically included water contact recreational activities such as water skiing, commercial fishing and sport fishing, wildlife habitat, preservation of rare species, marine habitat, and shellfish harvesting (Corps 1993a). However, the Upper Bay has been closed to body contact since 1974 and closed to shellfish consumption since 1978 (Corps 1993a). These restrictions are primarily due to poor water quality resulting from nutrient enrichment, trace metals, and organics (Section 3.3, Water Quality). While water contact activities are prohibited within the upper reaches of the Ecological Reserve for health reasons, swimming is allowed under the Reserve's regulations at Northstar Beach (CDFG 1985), unless posted otherwise.

Sport fishing uses are dependent upon the Upper Bay's capability to provide fish spawning, foraging, and nursery grounds. One species of particular importance in the Upper Bay is the California halibut which is an essential component of the sportfishing industry and critical to the overall ecological value of marine habitat (Corps 1993a). Upper Newport Bay offers the juvenile halibut population an increased growth potential as a result of high food production, warm temperatures, and decreased predation.

Water vessel usage of Upper Newport Bay includes commercial and recreational uses. For example, a boat launch ramp is provided at Newport Dunes Marina, and a boathouse in the lower reach of the Upper Bay, which is used to store kayaks and canoes for the Newport Aquatic Center and UCI's Rowing Base.

3.10.3 Recreational, Visual, and Educational Uses

The total ecological value and uniqueness of Upper Newport Bay produces opportunities for public recreation, visual enjoyment, education, and environmental awareness. It has been estimated that about 250,000 visitors use Upper Newport Bay each year (Corps 1993a). Recreational activities in Upper Newport Bay include birdwatching, hiking, bicycling, jogging, fishing, photography, viewing wildlife, and boating and fishing in the southern reaches of Upper Newport Bay not located within the Ecological Reserve.

Recreational use of Upper Newport Bay is mostly confined to the southern portion and perimeter of the Bay, since recreational activities (except passive recreation) are restricted within the Upper Newport Bay Ecological Reserve. The visual character of the Bay and its access for passive recreational activities such as birdwatching, viewing wildlife, walking, jogging, and photography is achieved via Back Bay Drive, which runs at the base of the bluff along the easterly side of the bay, and also at the Newport Dunes Aquatic Park (Newport Beach 1990). It should be noted that the Newport Dunes area of Upper Newport Bay is not within the Ecological Reserve and is a designated public beach area (Newport Beach 1985).

Other uses in Upper Newport Bay include educational activities and environmental observation. Public tours of the Upper Bay typically attract 1,000 to 2,000 people annually. Tours are also conducted to support the curriculum of the public schools of Orange County. In addition, local universities, colleges, and conservation groups use the Upper Bay for field trips and individual study. There are three interpretive displays along Back Bay Drive that provide onsite educational information. As one of the only remaining wetlands in California, Upper Newport Bay will be the subject of increased educational use.

3.10.4 Trail System

The most utilized access to Upper Newport Bay is Back Bay Drive. Back Bay Drive can be accessed at its southern terminus via Jamboree Road and via Eastbluff Drive, just west of Jamboree Road at its northern terminus (see Figure 3.10-4). From Jamboree Road just north of PCH to its intersection with Eastbluff Drive, Back Bay Drive is restricted to one-way northbound vehicular traffic. Back Bay Drive is part of the City and County bike trail system, and is a designated Scenic Drive and Pedestrian Trail (Newport Beach 1985). Scenic drives are local City designated roads that enable scenic vistas for bicyclist, pedestrians, and motorists. Pedestrian trails are improved walkways, sidewalks, or unimproved common walkways that are popular due to scenic features or neighborhood character. As a result, transport on Back Bay Drive is sometimes problematic due to the simultaneous foot, bicycle, and automobile traffic. In addition to Back Bay Drive, Upper Newport Bay can be reached by trails located along Irvine Avenue, 16th Street, Cliff Drive, and PCH (Newport Beach 1990).

3.10.5 Boating

Prior to attempts at harbor improvement, Newport Bay was plagued with dangerous entrance conditions and significant shoaling within the harbor area. Under large wave conditions, the entrance to the Bay was impassable. Numerous shipwrecks and loss of life have been documented in the late 1800s and early 1900s. Following many delays, the dredging activity that resulted in Newport Harbor as it exists today began in 1935. The completed harbor with its long jetties, deep channels, anchorages, and widened peninsula beaches (nourished from the dredge spoils of the harbor dredging) was dedicated in May 1936 (Corps 1993a).

Primary water-related uses of Upper Newport Bay have historically been boating, canoeing, kayaking, and power boats for fishing. Today, four marinas are located within the lower reach of Upper Newport Bay (Corps 1993a). These marinas serve vessels that use the navigational channels located south of the Pacific Coast Highway Bridge. Numerous vessels, primarily, recreational craft, are serviced at the four marinas. In addition, the marinas form substantial business enterprises based upon their draw as waterside facilities. Upper Newport Bay also serves the casual boat user, because it contains the only boat launch ramp between the harbors of Dana Point and Long Beach. The boat launch ramp, located within the Newport Dunes Marina facilities, and the boathouses used to store kayaks and canoes for the Newport Aquatic Center and UCI's Rowing Base are all located in the lower reach of the Upper Bay (see Figure 3.3-3). It should be noted that recreational vessel use within Upper Newport Bay is currently restricted by both shallow water depth and environmental contamination (Corps 1993a). Boating activities in the Ecological Reserve are restricted to non-motorized craft such as kayaks.

3.10.6 Regulations and Policies

Upper Newport Bay is within the City of Newport Beach. However, the majority of Upper Newport Bay which consists of the Ecological Reserve is owned by the CDFG. A summary of the applicable plans, regulations, and policies is provided below.

- The **Upper Newport Bay Ecological Reserve (UNBER) Management Plan** is designed to provide the basis for future management of the Ecological Reserve. It describes the ultimate physical configuration and uses of the Reserve. Formulation of the plan is guided by the "primary objective" of the UNBER: "Restoration and maintenance for the people of the State of California, now and in the future, of a saltwater marsh ecosystem" (pursuant to Senate Bill 368, 1975). Management goals include: improvement of fishery resources; protection and enhancement of wetland habitat; provision for unique scientific and educational opportunities; and provision of recreational opportunities compatible with the primary objective (CDFG 1985). The Management Plan is in the process of being revised. Current regulations regarding watercraft in the Reserve restrict boats to the main channel below the salt dike and prohibit speeds in excess of 5 miles per hour.

- California Coastal Commission (CCC), pursuant to the **California Coastal Act of 1976**, has responsibility for approving developments and issuing permits for projects in the coastal zone. In general, the coastal zone extends from the state's 3-mile seaward limit to an average of approximately 1,000 yards inland from the mean high tide of the sea. It should be noted that the CCC carries out the state's coastal zone management program within the coastal zone in accordance with the Federal Coastal Zone Management Act of 1972 (CCA 1976).

- According to the **County of Orange General Plan** the role of open space within Orange County is generally: to preserve natural resources, natural areas, their inhabitants, and their indigenous processes; to productively manage natural resources; to provide areas for outdoor recreation, such as parks, beaches, trails and areas of notable aesthetic, historic or cultural values (Orange County 1984).

- The **City of Newport Beach General Plan** consists of 13 elements including a Land Use Element, an Open Space and Recreation Element, a Conservation of Natural Resources Element, a Housing Element and a Local Coastal Program. This General Plan is a comprehensive, long-range statement of the City's development and preservation policies, and addresses all geographic areas of the City and the relationships between social, financial, environmental and physical characteristics. According to the General Plan, Upper Newport Bay is "environmentally sensitive." Although the Upper Bay is in the City of Newport Beach, the City considers it primarily a regional resource. Preservation or partial preservation of parcels in the Upper Bay would meet both regional open space, recreational and resource protection needs, as well as some citywide needs. The General Plan provides that the "City should actively cooperate with other regional agencies to preserve the sensitive ecological resources of the Upper Bay although the direct responsibility for these areas rests with County, regional and State agencies" (Newport Beach 1985).

3.11 CIRCULATION

Traveling from Balboa, Upper Newport Bay is accessed by heading eastward on Pacific Coast Highway and northward on Jamboree. Upon reaching Jamboree, a left turn onto Back Bay Drive leads to Upper Newport Bay. Coming from Newport Beach, visitors can head northward on San Joaquin Hills Road, which will eventually turn into Back Bay Drive.

Back Bay Drive is the primary route to the Upper Newport Bay. This is a one-way local scenic road that travels northward from south of Hyatt Newporter. Back Bay Drive encompasses the Newport Dunes Resort and Upper Newport Bay. This scenic road stops at the intersection of Back Bay Drive and Eastbluff Drive. The one-way section of the Back Bay Drive features a paved roadway divided by an off-center double yellow painted line. The off-center double line signifies that motor vehicles are to use the east portion of the road for North bound travel. Back Bay Drive vehicle volumes are relatively low in the winter. In the spring, when organized nature walks are conducted, volumes increase. Automobile activity along Back Bay Drive consists of vehicles driving northbound to observe the bay and wildlife and vehicles parked in designated areas as well as along the sides of Back Bay Drive to observe the bay and wildlife.

Parking primarily occurs in fours areas as described below, following from south to north: on San Joaquin Hills Road immediately east of Back Bay Drive; at the terminus of San Joaquin Hills Road and Back Bay Drive on the west side of Back Bay Drive; opposite the Big Canyon fresh water reservoir north of the intersection with Back Bay Drive; on Eastbluff Drive immediately north of the intersection with Back Bay Drive. During the December to March bird watch tours, particularly during the tours in December, tour participants also park on residential streets in the vicinity of Eastbluff Drive and Back Bay Drive, particularly on Vista del Oro.

Because of its constricted width and mixed traffic congestion that includes one-way vehicles as well as two-way leisure bicyclists, pedestrians and interpretive tour groups, Back Bay Drive poses special circulation problems. Discussions have been conducted between the City of Newport Beach and the Department of Fish and Game to resolve these potentially hazardous conditions. Some solutions being considered include speed bumps, parking pull-outs, special road stripping, restricted use hours and closure.

SECTION 4.0 - ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

4.1 INTRODUCTION

This section compares the environmental consequences of the project alternatives to the No Project Alternative. The consequences of the No Project Alternative is based on the 50 year without-project conditions as determined by several models introduced in Section 1.9. Numerical models were used to describe the changes in bay hydrodynamics, sediment transport and salinity that would occur because of projected future sediment loads. Changes in biological values under the No Project Alternative and the project alternatives are based on Habitat Evaluation Procedure (HEP) models described in detail in Appendix A. Mitigation measures are developed to reduce impacts identified as significant.

4.2 EARTH RESOURCES

4.2.1 Significance Criteria

An impact would be considered to have a significant adverse effect if:

- unique geologic features would be adversely affected,
- topography would be substantially altered in a way that would have negative effects on the environment,
- project activities would cause the area to become more susceptible to secondary seismic effects,
- the project would cause substantial erosion or scour, and/or
- the project would expose people or structures to seismic hazards likely to result in injury or property loss.

4.2.2 No Project Alternative

Under the No Project Alternative, no dredging would occur to remove sediment from the Upper Bay. Based on the numerical modeling of hydrological and sedimentation processes (RMA 1997), the projected bathymetry of Upper Newport Bay for the 50-year future without project condition is shown in Figure 3.2-5. During the next 50 years, the model predicts that the Unit III and Unit II basins would fill to equilibrium state while an increasing volume of sediment would deposit in the Lower Bay. All areas of the Upper Bay are expected to shoal relative to present conditions due to sediment accumulation. Within 10 years, open water areas in Upper Newport Bay would be filled to the pre-Unit III dredging levels and the Unit II basin open water areas would be mudflats. A narrow channel would be the only open water areas remaining in the Unit II and Unit III basins. Over the first 12 years, approximately one million cubic yards (cy) (765,000 [cu m]) are predicted to deposit in the Upper Bay and 750,000 cy (573,750 cu m) in the Lower Bay. Problems experienced prior to the Unit III dredging would be expected to occur. These problems include shoaling of the navigation channel above and below Pacific Coast Highway (PCH) Bridge and shoaling of the entrance to Balboa Marina. By Year 50 the model predicted sediment deposition of approximately 2,250,000 cy (1,721,250 cu m) in the Upper Bay and 4 million cy (3,060,000 cu m) in the Lower Bay. Over 12 feet (ft.) (3.6 m) of sediment was predicted to deposit near the entrance to the Upper Bay. By Year 50, the Upper Bay would consist of a single channel from just above the dike to the PCH Bridge, with large areas of intertidal mudflats within the Unit II and III basins. No subtidal open water habitat would remain in the Unit III basin area. Newport Dunes, Dover Shores, and De Anza Marina would become filled with sediment and would be exposed at low tides. Recreational boat use of these areas would be lost.

Based on the significance criteria, the No Project Alternative would have significant adverse impacts on earth resources. Upper Newport Bay is a unique geological feature that historically supported large areas of open water as shown by an 1875 topographic map (Corps 1993). The No Project Alternative would adversely affect this unique geological feature. Under the No Project Alternative, the topography of

Upper and Lower Newport Bay would be substantially altered in a way that would have negative effects on the environment. The No Project Alternative would not cause substantial erosion or scour, cause the area to become more susceptible to secondary seismic effects, or expose people or structures to seismic hazards likely to result in injury or property loss.

4.2.3 Sediment Control Alternatives

4.2.3.1 Alternative 1

Clamshell Dredge

Alternative 1 would maintain the Unit III basin at its current depth and configuration and would restore the Unit II basin to its original 1988 footprint. The channel between the Unit III and Unit II basins and the channel between the Unit II basin and PCH Bridge would be maintained. Channels would be restored between the tern islands and around New Island.

Implementation of Alternative 1 would substantially alter Upper Bay bathymetry compared to the 50-year without project conditions. The basin footprints in the Upper Bay is similar to that envisioned in the 208 plan. The maintenance of basins and channels in the Upper Bay would be a beneficial impact of the project. By maintaining open water embayments in Upper Newport Bay, Alternative 1 would maintain the Upper Bay closer to historic conditions. Wildlife and recreational uses within Newport Bay would be maintained.

Because there would be a larger tidal prism under Alternative 1 compared to existing conditions, tidal currents in narrow areas such as near the PCH Bridge would be increased. Greater tidal currents would not be expected to cause scour that would create problems in this area. The greatest currents in the Upper Bay are not tidal currents but flows during large storms. Therefore, maximum current velocities would not be increased. Furthermore, the area by PCH Bridge has presently been scoured to bedrock (T. Rossmiller, OCPFRD, pers. comm. 1999). No scour problems occurred within the Bay following the Unit I/II dredging project, which created basins with a similar footprint to Alternative 1.

Alternative 1 would not cause the area to become more susceptible to secondary seismic effects and would not expose people or structures to seismic hazards likely to result in injury or property loss.

Hydraulic Dredge

The impacts to earth resources of constructing the basins and channels with a hydraulic dredge would be similar to those described for a clamshell dredge with the exception that a dredge access channel between the Unit II basin and PCH Bridge would not need to be dredged. Maintenance of the upper basins at a frequency of approximately every 7 years would prevent shoaling problems in this channel and boats would be able to navigate the channel without problems. As described for construction with a clamshell dredge, no significant adverse impacts on earth resources would be expected.

4.2.3.2 Alternative 4

Of the sediment control alternatives, Alternative 4 has the largest basin footprint. The northerly tern island would be relocated from the uppermost basin to the Unit II basin, most of the mudflats in the Unit I/III basin would be converted to open water, the Unit III basin would be deepened to -20 ft. (-6 m) mean sea level (MSL), and the Unit II basin would be widened and lengthened. Historical topography (Corps 1993) shows the Unit II basin as mostly open water so the larger basin footprint of this alternative would not be inconsistent with historic conditions in the Bay. Like the other sediment control alternatives, Alternative 4 would prevent the negative impacts of sedimentation that would occur under the 50-year without-project conditions.

Relocation of the northerly tern island would involve obtaining approximately 23,000 cy (17.595 cu m) of additional sandy material from a source within Newport Bay. For the impacts analysis, it was assumed that the source would be a beach near the Entrance Channel to provide a reasonable worst case for air quality and land use impacts. If sand at the donor beach were excavated to a depth of 6 ft. (1.8 m) approximately 0.26 acres of beach would be taken. Excavation of this small an area of beach is not considered likely to constitute a significant adverse impact. Because several sources of sand are available within the bay, sand sources would be selected to avoid significant adverse impacts to any single beach.

Although the larger basin footprint of Alternative 4 would result in greater tidal currents than Alternative 1, Alternative 4 would not be expected to cause scouring problems. Current velocities under storm flows would still far exceed tidal currents. The PCH Bridge abutments are founded on bedrock and not vulnerable to scour. No seismic hazards are associated with implementation of Alternative 4.

As was true of Alternative 1, use of the hydraulic dredge would not require additional dredging of the channel between the PCH Bridge and the Unit II basin. The clamshell dredging alternative would require this channel to be deepened to provide access for the dredge. No significant adverse impacts to earth resources would occur if the channel were deepened or if it were not deepened.

4.2.3.3 Alternative 5

Alternative 5 would provide for a maximum expansion of the uppermost basin footprint similar to Alternative 4, but would not restore the Unit II basin. Alternative 5 provides a different basin configuration than that of historic conditions, which had a large open water area in the Unit II basin rather than the Unit III basin. However, Alternative 5 would still preserve the open water habitat values of the Upper Bay and would prevent the negative sedimentation effects that would occur in the 50-year without project baseline. Therefore, Alternative 5, like the other sediment control alternatives, is considered to have a beneficial impact on earth resources.

As discussed above, no significant adverse impacts related to tern island relocation, scour or seismic effects would occur. The only difference between the clamshell and hydraulic dredging methods on earth resources would be the requirement to deepen the access channel from the PCH Bridge for the clamshell dredge. No significant adverse impacts to earth resources would occur if the channel were deepened or if it were not deepened.

4.2.3.4 Alternative 6

Alternative 6 would create a larger basin than the Unit III configuration in the uppermost area but a smaller basin than Alternatives 4 and 5. As with Alternatives 4 and 5, the northerly tern island would be relocated near the dike. The Unit II basin footprint would be widened but not lengthened. As was true of the other sediment control alternatives, the restoration of basins in the Unit I/III and Unit II areas is considered a beneficial impact to earth resources. No significant adverse impacts to earth resources would occur.

4.2.3.5 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

No significant adverse impacts to earth resources were identified for any of the sediment control alternatives. No mitigation is required.

4.2.4 Habitat Restoration Alternative

4.2.4.1 Addition of Sand to Least Tern Islands

This alternative would add about 2 ft. (0.6 m) of sand to the least tern island(s) in the Unit III basin. Under Sediment Control Alternative 1, sand would be added to the two existing islands. About 23,000 cy (17,595 cu m) of sand would be excavated from a beach within Newport Bay and placed on the least tern islands. Under Sediment Control Alternatives 4, 5, and 6, the northerly least tern island would be relocated to the Unit II basin and sand would only be placed on the remaining southerly island. About 10,000 cy (7,650 cu m) would be needed to place 2 ft. of sand on the southerly island. Several sources of sand are available within Newport Bay. Sand sources would be selected to avoid significant adverse impacts to any single beach. No significant adverse impacts to earth resources would be expected to result from this habitat restoration alternative.

4.2.4.2 Construct Small Dendritic Channels through the Marsh

This habitat restoration alternative would construct a small channel through marsh habitat on Shellmaker Island as a pilot project. Approximately 9,650 cy (7,382 cu m) of material would be excavated and discharged at LA-3. The restoration of a small channel on Shellmaker Island would restore historic conditions and would not substantially alter topography. No significant adverse impacts to earth resources would be expected to result from this habitat restoration alternative.

4.2.4.3 Restoration of Wetlands in Filled Areas

This habitat restoration alternative would involve excavating filled areas within Upper Newport Bay to restore marsh habitat. Three different areas have been identified within the Upper Bay for marsh restoration (Figure 2.3-8): (1) Northstar Beach; (2) a section of land at the lower end of the northern side of the Unit I/III basin; and (3) dredge spoil areas on Shellmaker Island. If all three of these areas were excavated as much as 112,800 cy (86,242 cu m) of fill material would be removed. Restoration of historic marsh habitat by the excavation of fill is considered a beneficial impact because it would restore natural topography of the Bay. Some or all of this material may be appropriate for beneficial uses such as tern island construction or beach nourishment. Any material not suitable for beneficial uses would be discharged at the LA-3 disposal site. Marsh restoration would not be expected to cause substantial erosion or scour or to subject people or property to seismic hazards.

4.2.4.4 Restoration of Side Channels

This habitat restoration alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. If both side channels were restored 43,500 cy (33,278 cu m) would be excavated and discharged at the LA-3 disposal site. Restoration of side channels would restore the natural topography within the Bay and is considered a beneficial impact. No significant adverse impacts to earth resources would be expected to result from this habitat restoration alternative.

4.2.4.5 Restoration of Eelgrass Beds in Lower Portions of the Upper Bay

Restoration of eelgrass beds at Shellmaker Island would not involve any alteration of topography and, thus, would have no effect on earth resources. Because eelgrass beds stabilize the substrate, restoration of eelgrass would have a beneficial effect on sediments.

4.2.4.6 Removal of Segments of the Main Dike

Removal of segments of the main dike would remove artificial fill material, and would result in very minor alteration of topography. Approximately 500 cy (385.5 cu m) of material would be removed. This habitat restoration alternative would have virtually no effect on earth resources.

4.2.5 Cumulative Impacts

Maintenance of in-stream sediment basins in San Diego Creek and other upstream sediment controls that may be implemented in the future would reduce the frequency of maintenance dredging required to maintain the basins in the Upper Bay. The Upper Newport Bay Habitat Restoration Project is considered to have a cumulative beneficial impact on earth resources when considered with upstream sediment controls. Implementation of a sediment control alternative is also expected to reduce the need for dredging in the Lower Bay.

4.3 WATER RESOURCES

4.3.1 Significance Criteria

An impact to water quality would be considered significant if a project alternative results in:

- Violation of water quality objectives in the Water Quality Control Plan Santa Ana River Basin (RWQCB 1994) (Table 3.3-1) or exceedance of toxic materials concentrations specified by the National Toxics Rule (Table 4.3-1). An exceedance of a water quality standard would not be considered significant if it occurred for a period of a few hours or less within a distance of less than 300 ft. (90 m) of a project activity.
- Impairment of beneficial uses of Bay waters as defined in the Water Quality Control Plan Santa Ana River Basin (RWQCB 1994).
- Conflict with Total Maximum Daily Load (TMDL) objectives established by the Regional Water Quality Control Board (RWQCB), Santa Ana Region (RWQCB 1998 a and b, 1999).
- Water or sediment quality conditions that could be harmful to aquatic life or human health even if an accepted standard is not formally violated.

4.3.2 No Project Alternative

Under the No Project Alternative, basins in the Upper Bay would not be maintained and would fill with sediment. As described in Section 4.2.2, as the basins fill, increasing amounts of sediment would pass into the lower portions of the Upper Bay and into the Lower Bay. The No Project Alternative would be expected to have no impacts on ground water but substantial adverse impacts on surface water.

As sediment accumulates in the mudflats, tidal flow in the Upper Bay would become increasingly restricted to the main channel. The lower volume of water in the Upper Bay would result in a smaller tidal prism and decreased tidal flushing. Currents would be substantially depressed under dry weather conditions. For example the ebb tide current at the PCH Bridge would decrease from 1.4 ft./sec under the initial condition to 0.7 ft./sec by Year 50. Of particular concern is the reduction in current velocities in side channel areas, in the Upper Bay marinas, and in the back channels in the Lower Bay. Excessive algal growth usually occurs in areas with low current velocities. Although nutrient inputs to the Upper Bay are expected to decrease in the future if TMDL objectives for nutrients can be met, nuisance algal blooms in these areas are expected to occur under future without project conditions because of the reduced circulation. Excessive algal growth often results in lower dissolved oxygen levels at night when plants respire but do not photosynthesize. Decomposition of the plants when they die also increases oxygen

Table 4.3-1
National Toxics Rule Toxic Materials Concentrations

Constituent	FRESHWATER		SALTWATER	
	Criterion Maximum Concentration (µg/L)	Criterion Continuous Concentration (µg/L)	Criterion Maximum Concentration (µg/L)	Criterion Continuous Concentration (µg/L)
Arsenic	360	190	69	36
Cadmium	3.7	1	42	9.3
Chromium (III)	650	180		
Chromium (VI)	15	10	1100	50
Copper	17	11	2.4	2.4
Lead	65	2.5	210	8.1
Mercury	2.1	0.012	1.8	0.025
Nickel	1400	160	74	8.2
Selenium	20	5	290	71
Silver	3.4		1.9	
Zinc	110	100	90	81
Cyanide	22	5.2	1	1
Pentachlorophenol	20	13	13	7.9
Aldrin	3		1.3	
gamma-BHC	2	0.08	0.15	
Chlordane	2.4	0.00043	0.08	0.004
4,4'-DDT	1.1	0.001	0.13	0.001
Dieldrin	2.5	0.0019	0.71	0.0019
alpha-Endosulfan	0.22	0.056	0.034	0.0087
beta-Endosulfan	0.22	0.056	0.034	0.0087
Endrin	0.18	0.0023	0.037	0.0023
Heptachlor	0.52	0.0038	0.053	0.0036
Heptachlor Epoxide	0.52	0.0036	0.053	0.0036
PCB-1242		0.014		0.03
PCB-1254		0.014		0.03
PCB-1221		0.014		0.03
PCB-1232		0.014		0.03
PCB-1248		0.014		0.03
PCB-1260		0.014		0.03
PCB-1016		0.014		0.03
Toxaphene	0.73	0.0002	0.21	0.0002
Source: National Toxics Rule 1997 µg/L = micrograms per liter				

demand. Incidences of dissolved oxygen concentration below the standard of 5 milligrams per liter (mg/L) would be expected to occur more frequently under the No Project Alternative. Furthermore, reduced tidal flushing would reduce the dilution of pollutants that may be present in the water, and pollutant concentrations might increase in areas with reduced circulation.

Because of the sediment deposition and correspondingly higher elevations, some of the side channels and back areas may only experience tidal exchange during extreme tides. Water that enters these areas on the higher high tides may become isolated from tidal exchange until the next spring high tide series. Because of the long residence time, water in these back areas would stagnate. Dissolved oxygen concentrations would be expected to drop and temperature and salinity might reach extreme values at certain times of year. For example, during summer, water temperatures greater than 25° Celsius (C) may occur. Isolated water bodies might become hypersaline during summer and nearly fresh during wet winters.

As the volume of water in the Upper Bay decreases, the freshwater influence of San Diego Creek would become more pervasive. The largest differences in salinity would occur in the uppermost portions of the Bay because the sedimentation by Year 50 would have dramatically reduced the depth of the channel. As the tide ebbs, almost all the tidal water would retreat to lower portions of the Bay, but freshwater from San Diego Creek would continue to flow into the Unit III basin. Thus, on ebbing tides, the water in the upper portions of the Bay would be dominated by the San Diego Creek flows. In the Unit I/III basin, the model predicted that during low flow conditions, salinity would change from a range of about 28 parts per thousand (ppt) to 30 ppt in the existing post-Unit III dredging condition to 20 to 29 ppt by Year 50 (Corps 1998). In the Unit II basin, dry weather salinity would change from a range of 30 to 32 ppt to 27 to 32 ppt at Year 50. During storm events, the model predicted that salinities in the Unit I/III basin would drop more rapidly than under existing conditions and would undergo greater fluctuations during the post-storm recovery period. Salinity would also drop more rapidly during storm events in the Unit II basin but daily fluctuations would be expected to occur during storm flows under both Year 0 and Year 50 conditions.

The increased influence of San Diego Creek that would be expected under the No Project Alternative would result in increased influence not only of freshwater but also of sediments, nutrients, pathogens, and pollutants that may be in San Diego Creek flows. Best Management Practices and other measures that are expected to be implemented in the future to meet TMDL objectives would decrease the input of these substances. However, it is very difficult to control run-off that occurs during storm events and, with the reduced tidal influence in the Upper Bay under the No Project Alternative, objectives for pathogens, turbidity, contaminants, and, possibly, nutrients would be expected to be violated.

Under the No Action Alternative, sediment would continue to accumulate throughout Newport Bay. As basin, channel and marina areas shoal, fine sediments would readily become suspended by boat movements and even by wind waves. Turbidity throughout Newport Bay would, thus, be expected to increase under the No Action Alternative. Contaminants adhere most readily to fine grained sediments. Thus, when fine sediments become resuspended contaminant concentrations in the water column would be expected to increase. Although the inputs of metals and organic contaminants to the Bay are expected to decrease in the future because of improved upstream management, under the No Action Alternative, exceedances of National Toxics Rule objectives for copper, silver and zinc, which have been recorded at elevated levels within the Bay in recent years, would be expected.

In summary, under the No Project Alternative, significant adverse impacts to water quality would be expected to occur. Water quality objectives for dissolved oxygen, turbidity, fecal coliform and some metals would be expected to be violated. Beneficial uses of Bay waters including navigation, recreational use, wildlife use, commercial uses, rare and endangered species use, nursery habitat and shellfish would be impaired. The TMDL objectives for sediment, which include maintaining the Unit III and Unit II basins to a minimum depth of -7 ft. (-2.1 m) MSL and ensuring that sedimentation does not cause more than a 1 percent change from the existing acres, would not be met.

4.3.3 <u>Sediment Control Alternatives</u>

4.3.3.1 Ground Water

None of the sediment control alternatives would involve any withdrawal of ground water or addition to ground water. Dredging of basins and channels in Upper Newport Bay would not intersect any ground water aquifers. Therefore, none of the sediment control alternatives would be expected to have any impact on ground water.

4.3.3.2 Surface Water and Sediment Quality

<u>Alternative 1</u>

Construction

<u>Clamshell Dredge</u>

Dredging in the Unit III and Unit II basins and the Upper Bay main channels would affect water quality by resuspending sediments causing an increase in turbidity and nutrients and, possibly, a decrease in dissolved oxygen. Decreases in dissolved oxygen concentration are usually measured during dredging projects (Corps and LAHD 1992). A study of dredging in New York Harbor (Lawler, Matusky and Skelly 1983 in Corps and LAHD 1992) indicated that dredging reduced dissolved oxygen concentrations by 1 to 2 mg/L near the dredge but showed no decrease 200 to 300 ft. (60 to 90 m) away. Resuspension of sediments by the clamshell dredge would occur from the disturbance of bottom sediments during excavation and by leakage from the bucket as the sediments are lifted from the bottom and into the disposal scow. In general, the extent of measurable turbidity from a clamshell dredge would be expected to be less than 1,000 ft. (300 m). The RWQCB sets standards for dredging projects and generally requires that turbidity at 100 ft. (33 m) from a dredging project be limited to an elevation of not greater than 20 percent over ambient conditions. Turbidity curtains would be placed around the dredge and disposal scow to comply with this condition. Turbidity curtains were employed during the recent Unit III dredging project, and, while occasional brief incidences occurred in which the turbidity controls failed, overall compliance with RWQCB conditions was excellent (T. Rossmiller, OCPFRD, personal communication 1999).

The resuspension of sediments could cause the release of metals and organic chemicals associated with the sediments into the water column. Most of the contaminants have a low solubility in water, are adsorbed to the sediments and would not be released to the water. Monitoring of water column chemicals during dredging projects in San Francisco Bay indicated that contaminant concentrations did not exceed water quality objectives (Corps and Contra Costa County 1997). Suspended sediments from dredging would be contained by the turbidity curtain. Because of the use of the turbidity curtain, dredging would not be expected to have a significant adverse impact on water quality in Upper Newport Bay.

Fueling of the dredge, tugs and other waterborne equipment would occur every 2 to 3 days from a fuel barge located at Shellmaker Island. There is a slight risk that an accidental spill of fuel could occur. Because the dredge operation would be required to prepare a spill prevention and containment plan, impacts of a fuel spill would be adverse but insignificant.

<u>Hydraulic Dredge</u>

The hydraulic dredge would be expected to create less turbidity at the dredging site than the clamshell dredge. Because the dredged material would be sucked into a pipe rather than lifted to the surface, little surface turbidity would be expected. Dislodging of the sediments by the cutterhead would create a plume near the sea bottom. Turbidity would be expected to be limited to a localized area of between 200 and 500 ft. (60 and 150 m) near the bottom. Because the dredging must comply with RWQCB requirement that turbidity not be significantly elevated more than 100 ft. (33 m) from the dredge, turbidity curtains would be used around the dredge to contain the plume.

Turbidity during hydraulic dredging usually results when turbid water overflows from the disposal scow. An EPA-approved flocculating agent would be used to ensure that decant water contains minimal sediment. The flocculating agent would be added at 10 parts per million (ppm) to the 3,000 gallons per minute (gpm) flow into the scows. Based on tests performed with Upper Bay sediments and seawater, this flocculating agent would cause rapid clarifying of the scow water. In the tests the initial turbidity was approximately 400 nephelometric turbidity units (NTU). After addition of the flocculation agent, the turbidity was 5 to 7 NTU. Drinking water is 2 to 4 NTU. Because of the use of turbidity curtains at the dredge site and a flocculation agent to settle sediments during the decanting of water in the scows, no significant adverse impacts would be created during dredging with the hydraulic dredge. An access channel between PCH Bridge and the Unit II basin would not need to be dredged if a small hydraulic dredge were used. Therefore, use of a hydraulic dredge avoids the localized water quality impacts that would occur from deepening this channel.

Fueling of the hydraulic dredge would be done by truck at Jamboree Road. Because the handling of fuel on water would be reduced for this alternative compared to the clamshell dredge alternative, the chances of a fuel spill would be reduced.

Post Construction

Dredging of the Unit II and Unit III basins would improve tidal flushing and circulation compared to the 50-year without-project condition. The larger the tidal prism the more water would exchange every tidal cycle resulting in higher current velocities and more stable physical conditions such as temperature and salinity. Alternative 1 would maintain the Unit III basin in its current configuration and restore the original Unit II basin footprint. Approximately 156 acre-feet would be added to the tidal prism compared to the Year 0 condition (Culberstson, Adams and Assoc. 1986). The tidal prism in the Unit II and Unit III basins under Alternative 1 would be about 1,559 acre-feet.

Alternative 3 would maintain ebb tide currents at the PCH Bridge at about 1.4 ft./sec or slightly greater rather than the 0.7 ft./sec that is predicted under the No Project Alternative. Restoration of the side channel on the eastern side of New Island would enhance circulation there and eliminate stagnation. Higher current velocities would be expected to inhibit the growth of algae and would help to maintain dissolved oxygen levels at the standard of greater than 5 mg/L. The restoration of basins and side channels would also help to reduce extreme temperatures that might occur in shallow areas under the No Project Alternative. Temperature measurements in the Unit III basin during the summer following the Unit III dredging were lower than had been recorded in several years although the mild 1999 summer may also have been a factor.

Maintenance of the Alternative 1 basin configuration would offset the increased freshwater influence that would occur under the 50-year without-project conditions. Salinity in the Unit III and Unit II basins under dry weather conditions would be expected to be similar to the 1999 initial condition following the Unit III dredging project. Salinity in the Unit III basin would be between 28 and 30 ppt. Salinity in the Unit II basin would be between 30 and 32 ppt. The large daily fluctuations that would occur by Year 50 under the No Project Alternative would be avoided by maintenance of the basins. Even with the maintenance of the Alternative 1 basins, under storm flows, the Unit II and Unit III basins would be expected to become nearly fresh for about a day (Corps 1998). The salinity would drop less rapidly than under the No Project Alternative. The biggest difference expected under Alternative 1 compared to the No Project Alternative, is that the salinity in the Unit II basin would not be expected to fluctuate tidally during recovery from storms. Under the No Project Alternative, salinity in the Unit II basin would undergo a daily tidal fluctuation of 5 to 7 ppt during the approximately 3 day recovery period under both Year 0 and Year 50 conditions (Corps 1998). The fluctuations in salinity in the Unit II basin are related to the small volume of water in that basin. The Unit III dredging project did not dredge the Unit II basin. Alternative 1 would restore the original Unit II basin configuration. Because of the greater volume of water, there would be less influence of freshwater from San Diego Creek during low tide following storms. Because there would be less freshwater influence under Alternative 1, the Upper Bay would experience less degradation from nutrients, pathogens and contaminants that may be present in San Diego Creek.

Under Alternative 1, the Unit III and Unit II basins would trap most of the sediment that enters the Bay from San Diego Creek. The reduction in these easily suspended fine sediments in the lower portions of the Upper Bay and in Lower Newport Harbor would reduce turbidity in the lower portions of the Bay. Anecdotal reports from kayakers suggest that water clarity near the PCH Bridge improved markedly following the Unit III dredging project. Maintenance of the Unit III and Unit II basins under Alternative 1 would be consistent with the RWQCB TMDL objectives for sediment that require that the basins be maintained to a minimum depth of -7 ft. (-2.1 m) MSL.

Contaminants associated with sediments in San Diego Creek flows would accumulate primarily in the Unit III and Unit II basins. Contaminant emissions to the lower portions of the Upper Bay and to Lower Newport Harbor would thus be reduced and sediment quality would be expected to increase. Metal concentrations in the Unit III and Unit II basins under Alternative 1 would be expected to be similar to or lower than concentrations measured in the Unit I and Unit II basins prior to the Unit III dredging project (see Section 3.3.3). The contaminant of greatest concern in Newport Bay sediments is DDT. DDT concentrations in sediments under Alternative 1 would be expected to decrease because agricultural land in the San Diego Creek watershed is being converted to urban uses.

Under Alternative 1, maintenance dredging of the Unit III and Unit II basins and the main channel would be required approximately every 7 years. The RWQCB TMDL objectives for sediment include the implementation of sediment control measures in Upper Newport Bay such that the basins need not be dredged more frequently than about once every 10 years. Therefore, Alternative 1 would not meet this objective. Failure to comply with TMDL objectives would be an unavoidable significant adverse impact of

Alternative 1. Impacts to water quality during maintenance dredging would be similar to those described for the initial construction. These impacts would be adverse but insignificant.

<u>Alternative 4</u>

Construction

The impacts of Alternative 4 project construction on water quality would be similar to those of Alternative 1. Alternative 4 would involve much more dredging than Alternative 1. For the clamshell dredge alternative, 2,618,000 cy (2,002,770 cu m) of sediment would be dredged compared to 828,000 cy (633,420 cu m) for Alternative 1. For the hydraulic dredge, Alternative 4 would involve dredging of 2,543,000 cy (1,945,395 cu m) of sediment compared to 728,000 cy (556,920 cu m). Because turbidity curtains, flocculation agents and other methods would be used to reduce turbidity, turbidity during the dredging of Alternative 4 would be contained to meet the requirements of the RWQCB that turbidity not be elevated more than 20 percent at 100 ft. (30 m) from the dredge. Therefore turbidity would remain localized to the immediate vicinity of the dredge. However, these localized elevations of turbidity would occur over an approximately 3 year period for Alternative 4 compared to about 1 year for Alternative 1.

In addition to the impacts to water quality from deepening the channels and deepening and enlarging the basins, Alternative 4 would impact water quality by relocating the northerly tern island from the Unit III basin to the Unit II basin. Some sand would be expected to spill into the water column during excavation of the top of the old island and placement on the new island. Additional sand would be moved from a beach near the Entrance Channel to the new island in the Unit II basin. Because sand sized particles fall rapidly to the bottom, creation of the new tern island would not be expected to generate high levels of turbidity. As was true of dredging, RWQCB requirements to restrict elevated turbidity to a distance of 100 ft. (30 m) or less of construction activities would be met. If necessary, silt curtains would be used to comply with this requirement.

Post Construction

Alternative 4 would create the largest and deepest basins of any of the sediment control alternatives. Alternative 4 would, thus, have the largest tidal prism. For example the tidal prism in the Unit III and Unit II basins under Alternative 4 would be about 4,873 acre-feet compared to approximately 1,559 acre-feet under Alternative 1. Because of the much larger tidal prism, Alternative 4 would have the greatest amount of tidal flushing of any of the alternatives. The enhanced tidal flushing would increase the marine influence, reduce fluctuations in water column parameters such as temperature and salinity, and increase the dilution of contaminants. Therefore water quality in the Bay would be highest under Alternative 4.

Tidal currents would be expected to increase considerably if Alternative 4 were constructed. However, tidal currents still would be considerably below the peak currents of about 4 ft./sec that occur during storm flows.

Salinity in the Upper Bay under dry weather conditions would be expected to be relatively stable at between 28 ppt and 30 ppt in the Unit III basin and between 30 and 33 ppt between PCH Bridge and the dike. Under Alternative 4, the Upper Bay would still be expected to go almost fresh during large storms because of the large volume of water that would enter from San Diego Creek compared to the relatively small volume of water in the Upper Bay. During the approximately 3-day recovery period, the salinity in both basins would gradually rise. Because of the greater volume of water in the Unit II basin under this alternative, salinity in the Unit II basin would not fluctuate with the tides as occurs with the No Project Alternative following storms.

Because both the Unit III and Unit II basins would be at -20 ft. (-6 m) MSL the water column in these basins would be stratified with higher salinity near the bottom. Allen (1988) noticed stratification in the Unit I basin following the Unit I dredging project. During smaller storm events, salinity may remain high near the bottom of the basins with the less dense, fresher water forming a surface lens. During large storms, however, the whole water column in both basins would be expected to have salinity near 0 ppt.

As is true of all of the sediment control alternatives, under Alternative 4 sediments would accumulate in the Unit III and Unit II basins reducing the volume of fine sediments that would pass into the lower portions of the Upper Bay and into Lower Newport Harbor. The trapping of fine sediments in the Unit III and Unit II basins would, thus, reduce turbidity in Newport Bay and reduce the concentrations of contaminants in sediments below the Unit II basin.

Because of the greater volume of the basins, Alternative 4 would require less frequent maintenance dredging than the other alternatives. Maintenance dredging for Alternative 4 would be needed only about every 24 years. Maintenance at this frequency would be consistent with the RWQCB TMDL objective for sediments that requires implementation of sediment control measures in Upper Newport Bay such that basins need not be dredged more frequently than about once every 10 years. Alternative 4 meets the long-term goal of reducing the frequency of dredging to once every 20 to 30 years. The impacts to water quality of maintenance dredging would be similar to the impacts of the initial construction. A somewhat smaller volume of sediments would be dredged during maintenance dredging. This volume would be 2,312,000 cy (1,768,680 cu m) if a clamshell dredge were used and 2,012,000 cy (1,539,180 cu m) if a small hydraulic dredge were used. Maintenance dredging would take between about 29 and 33 months to complete depending on the type of dredge.

<u>Alternative 5</u>

Construction

The impacts of dredging for Alternative 5 would be similar to those described above for Alternative 1. Alternative 5 would expand the Unit III basin but would not restore the Unit II basin. Therefore, most of the impacts of Alternative 5 would occur in the Unit III basin area. Alternative 5 would require dredging a total of 896,000 cy (685,440 cu m) of sediment for the clamshell dredge alternative and 821,000 cy (628,065 cu m) of sediment for the hydraulic dredge alternative. A total of 616,000 cy (471,240 cu m) of the sediment that would be dredged for Alternative 5 would be in the Unit III basin. Dredging for Alternative 5 would take a total of about 1 year. Turbidity curtains, flocculation agents and other methods would be used to contain turbidity to meet the requirement of the RWQCB that turbidity not be elevated more than 20 percent at 100 ft. (30 m) from the dredge. Therefore turbidity would remain localized to the immediate vicinity of the dredge. Impacts to water quality would be adverse but not significant.

Like Alternative 4, Alternative 5 involves relocation of the northerly tern island from the Unit III basin to the Unit II basin. Because sediment that would be disturbed during island creation consists primarily of sand that settles rapidly, turbidity would not be expected to be significantly elevated.

Post Construction

Like all of the sediment control alternatives, Alternative 5 would increase the tidal prism in the Upper Bay and thus would increase flushing and overall water quality. The tidal prism in the Unit III and Unit II basins under Alternative 5 would be about 1,728 acre-feet compared to about 1,559 acre-feet under Alternative 1 and 4,873 acre-feet under Alternative 4. Thus, the increase in tidal flushing under Alternative 5 would be similar to that of Alternative 1.

Alternative 5 would not restore a side channel around New Island the way Alternatives 1 and 4 would. Therefore, Alternative 5 would not have the benefit of increasing circulation and water quality in this channel.

Under Alternative 5, salinity in the Upper Bay under dry weather conditions would be relatively stable. Salinity would be expected to be similar to the initial condition following the Unit III dredging project. Salinity in the Unit III basin would be between 28 and 30 ppt. Salinity in the Unit II basin would be between 30 and 32 ppt. Salinity during storm flows would also be expected to be similar to the without-project initial condition following the Unit III project because Alternative 5 would maintain the uppermost basin but would not restore the Unit II basin. Thus, during storm flows salinity in both the Unit III and Unit II basins would drop to near 0 for about a day. During the recovery period, salinity in the Unit III basin would gradually increase over a period of about 3 days but salinity in the Unit II basin would fluctuate with the tides because of the low volume of water.

Under Alternative 5, most of the sediment that enters the Upper Bay from San Diego Creek would be trapped in the Unit III basin although a significant amount would pass into the Unit II basin. The volume of fine sediments that would pass into the lower portions of the Upper Bay and Lower Newport Bay Harbor would be reduced compared to the No Project Alternative and water quality would, thus, be improved. Alternative 5 would not meet the RWQCB TMDL objective for sediment of maintaining the Unit II basin at a minimum depth of -7 ft. (-2.1 m) MSL. Failure to meet this objective is a significant adverse impact of Alternative 5 that cannot be mitigated to insignificant.

Under Alternative 5, maintenance dredging would be required about every 10 years. Thus, Alternative 5 would just barely meet the TMDL objective of implementing sediment control measures such that the basins would not need to be dredged more frequently than about once every 10 years. Maintenance dredging would have similar impacts to the initial dredging. For the clamshell dredge alternative, it would take a little over 14 months to complete the maintenance dredging for Alternative 5. If a small hydraulic dredge were used, maintenance dredging would take a little over 11 months. Because some sediment would bypass the Unit III basin under this alternative and accumulate in the Unit II basin, more material would need to be dredged from the channel through the Unit II basin during maintenance dredging than during initial construction. During initial construction 77,000 cy (58,905 cu m) would be dredged from the Unit II basin. During maintenance dredging, 131,000 cy (100,215 cu m) would be dredged.

Alternative 6

Construction

Alternative 6 would deepen the Unit III basin to -20 ft. (-6 m) MSL and would expand its footprint to a lesser degree than Alternatives 4 and 5. The mudflats in the northeast corner would be retained. The northerly least tern island would be relocated to the Unit II basin. The Unit II basin would be deepened to -20 ft. (-6 m) MSL and expanded to the west. The impacts of dredging would be similar to those of the other sediment control alternatives. Dredging for Alternative 6 would take about 22 months if a clamshell dredge were used and 28 months if a hydraulic dredge were used. Turbidity curtains, flocculation agents and other methods would be used to contain turbidity to meet the requirement of the RWQCB that turbidity not be elevated more than 20 percent at 100 ft. (30 m) from the dredge. Therefore turbidity would remain localized to the immediate vicinity of the dredge. Impacts to water quality would be adverse but not significant.

Relocation of the northerly least tern island from the Unit III basin to the Unit II basin might result in some disturbance of sediments but because mostly sand sized particles would be involved, elevation of turbidity is not expected to be significant. If necessary turbidity curtains would be used to comply with RWQCB requirements to confine turbidity to within 100 ft. (30 m) of construction.

Post Construction

Alternative 6 would add about 2,894 acre-feet to the tidal prism in the Unit III and Unit II basins. This addition would be considerably less than for Alternative 4 but greater than for Alternatives 1 and 5. Expansion of the tidal prism in the Upper Bay would improve tidal flushing and water quality. Tidal currents would be elevated over the existing condition but would be below the peak storm currents of 4 ft./sec.

Salinity in the Upper Bay after construction of the Alternative 5 basins would be expected to be similar to that described for Alternative 4. During dry weather, salinity in both the Unit III and Unit II basins would be relatively stable. During large storms the salinity in the Upper Bay would be expected to drop to near 0 ppt. During the approximately 3 day recovery period following storms, salinity in both basins would gradually return to normal without the tidal fluctuations observed under the No Project Alternative. Because the Unit III and Unit II basins would be deepened to -20 ft. (-6 m) MSL, stratification of the water column would occur. During smaller storms higher salinity may remain near the bottoms of the basins although the whole water column would go fresh during large storms.

The expanded Unit III and Unit II basins would effectively trap most of the sediment that enters the Bay from San Diego Creek. The reduction in fine sediment transported to the lower portions of the Upper Bay and to Lower Newport Harbor would reduce turbidity and improve water and sediment quality in these areas.

In order to maintain the trapping efficiency of the basins, the Alternative 6 basins would need to be dredged approximately every 21 years. Alternative 5 would meet the RWQCB TMDL objective for sediment of implementing sediment control measures such that basins need not be dredged more frequently than every 10 years. Maintenance dredging for Alternative 6 would take about 20 months if a clamshell dredge were used and about 23 months if a small hydraulic dredge were used. The impacts of maintenance dredging would be similar to the initial dredging.

4.3.3.3 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

Because turbidity would be strictly controlled by such measures as turbidity curtains and a flocculation agent, significant adverse impacts to water quality from dredging would not occur.

4.3.4 <u>Habitat Restoration Alternatives</u>

4.3.4.1 Ground Water

None of the habitat restoration alternatives would involve any withdrawal of ground water or addition to ground water and none would involve dredging that would intersect any ground water aquifers. Therefore, none of the habitat restoration alternatives would be expected to have any impact on ground water.

4.3.4.2 Surface Water and Sediment Quality

<u>Addition of Sand to Least Tern Islands</u>

Localized increases in turbidity may occur during the excavation of sand from a beach near the Entrance Channel and placement on the tern island(s). Because sand sized particles settle rapidly and usually have low concentrations of contaminants, impacts to water quality of this habitat restoration alternative would be insignificant. If necessary, turbidity would be controlled by curtains or berms to meet RWQCB requirements to restrict turbidity increases of greater than 20 percent to within 100 ft. (30 m) of the construction activity.

<u>Construction of Dendritic Channel through the Marsh</u>

This habitat restoration alternative would construct a dendritic channel through Shellmaker Island. Approximately 9,650 cy (7,382 cu m) would be dredged using a backhoe. Turbidity generated during the excavation would be localized primarily within the newly constructed channel. The end of the channel could be blocked off to reduce impacts to adjacent bay waters. Impacts of this habitat restoration alternative on water quality would be insignificant. After construction was finished, the new channel would increase water circulation in and around Shellmaker Island. Increase in circulation would have a beneficial effect on water quality.

<u>Construction of New Least Tern Island in Unit II Basin</u>

The base of the new least tern island would be constructed from sediments that would otherwise be dredged from the Unit II basin. Construction at the base of tern island, thus, would not increase the water quality impacts of the project

Construction of the top of the island could impact water quality by increasing turbidity near the work site. Because the island would be topped with sand, which settles rapidly, and usually has low contaminant levels, impacts to water quality would be insignificant. If necessary, sediment control devices such as turbidity curtains or a berm on the borrow beach would be used to limit turbidity elevation to within 100 ft. (30 m) or less of the construction site. Impacts to water quality of construction of a new least tern island would be insignificant.

<u>Restoration of Wetlands in Filled Areas</u>

This alternative would restore wetlands by removing fill material at up to four locations in the Upper Bay (Section 2.3.7.4, Figure 2.3-8). Depending on which and how many wetlands restoration alternatives were selected, between 34,000 cy (26,010 cu m) and 112,800 cy (86,292 cu m) of material would be excavated to a depth of about -2.0 ft. (-0.6 m) MSL. Excavation of sediments would have the potential to create turbidity near the construction site. Turbidity curtains or other sediment control devices would be used to meet RWQCB requirements that turbidity not be elevated at a distance of over 100 ft. (30 m) from project activities. Excavated material not suitable for such beneficial uses as adding sand to tern islands would be discharged at the LA-3 ocean disposal site. Impacts of wetlands restoration on water quality would be insignificant. The new wetlands would slightly increase the tidal prism in the Upper Bay. The new wetlands areas would, thus, have a slight beneficial effect on water quality.

<u>Restoration of Side Channels</u>

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Dredging of the side channels would be done using a hydraulic dredge. Limited near-bottom turbidity would be created by the cutterhead during dredging. This turbidity would be confined to an area of less than 100 ft. (30 m) by the use of turbidity curtains or berms across the channel. Dredged material would be pumped to a disposal scow. A flocculation agent would be used to ensure that turbidity would not be elevated by overflow from the scow. Impacts of the dredging of side channels on water quality would be insignificant. Between 14,500 cy (14,410 cu m) and 43,500 cy (33,278 cu m) of dredged sediments would be discharged at the LA-3 ocean disposal site. Impacts to water and sediment quality from this discharge would be insignificant. Restoration of side channels would improve circulation around the islands. This improved circulation would have a beneficial impact on water quality.

Restoration of Eelgrass Beds in the Lower Portions of the Upper Bay

To implement this habitat restoration alternative, divers would collect eelgrass from existing beds in the Lower Bay and transplant it to an unvegetated area near Shellmaker Island. Divers would generate localized near-bottom turbidity while harvesting and replanting the eelgrass. This turbidity would have an insignificant impact on water quality. Re-establishment of eelgrass beds would help to stabilize sediments and, thus, would have a beneficial impact on water quality.

Removal of Segments of the Main Dike

This habitat restoration alternative would limit access to sensitive marsh areas by removing segments of the main dike with a backhoe. Some sediment may enter the water and create localized turbidity. Impacts on water quality would be minimal.

4.3.5 Cumulative Impacts

Development of the watershed may increase the input of pathogens and of contaminants such as metals and hydrocarbons. The Upper Newport Bay Habitat Restoration Project along with upstream controls would help to offset the negative impacts to water quality of urban runoff. By trapping sediments and their associated contaminants in upstream basins, water quality downstream would be improved. The increased tidal prism that would result from increasing the volume of the basins would dilute contaminants and pathogens and moderate water quality parameters.

The proposed Irvine Ranch Water District (IRWD) freshwater discharge into San Diego Creek may increase the freshwater influence in the upper basins. The expansion of these basins by the Habitat Restoration Project would help to offset the negative impacts of increased freshwater discharge. Substantial fluctuations in salinity with tidal cycles would not occur during dry weather with the maintenance of the basins.

The Upper Newport Bay Habitat Restoration Project would act cumulatively with the maintenance of in-stream basins in San Diego Creek and other upstream controls and Best Management Practices (BMPs) to improve water quality in Newport Bay. The more effective upstream controls are, the less maintenance dredging would be required to maintain the Unit III and Unit II basins.

Development of Upper Newport Bay Regional Park would include habitat restoration and the development of interpretive facilities. Because development would occur on upland habitat, this project would not impact water quality of the Bay and would not interact with the Habitat Restoration Project to impact cumulatively Bay water quality.

The expansion and maintenance of basins in the upper portions of the Bay as part of this project may reduce the need for dredging in Lower Newport Harbor and the Upper Bay marinas. If harbor dredging occurred concurrently with dredging of the Unit III and Unit II basins, two areas of localized turbidity would be created within the Bay. However, because all dredging projects within the Bay would be required to comply with the RWQCB standard to not increase turbidity beyond 100 ft. (30 m) of the project, a significant adverse impact to water quality would not occur.

4.4 BIOLOGICAL RESOURCES

4.4.1 Significance Criteria

An impact to biological resources would be considered significant if a project alternative results in:

- A direct adverse affect on a population of a threatened, endangered or candidate species or the loss or disturbance of important habitat for a listed or candidate species.

- A net loss in the habitat value of a sensitive biological habitat or area of special biological significance. For the purposes of this analysis, saltmarsh habitat is considered a sensitive biological habitat and the entire Upper Newport Bay Ecological Reserve is considered an area of special biological significance.
- Substantial impedance to the movement or migration of fish or wildlife.
- Substantial loss to the population of any native fish, wildlife or vegetation. For the purpose of this analysis, substantial is defined as a change in a population or habitat that is detectable over natural variability for a period of 5 years or more.
- Substantial loss in overall diversity of the ecosystem.

Appendix E contains the Fish and Wildlife Coordination Act Report provided by the U.S. Fish and Wildlife Service for this project.

4.4.2 No Project Alternative

Under the No Project Alternative, basins in the Upper Bay would not be maintained and they would fill with sediment. The increasing sedimentation would change open water habitat to intertidal mudflat. Intertidal mudflats would eventually transform into saltmarsh and, over a very long period of time, saltmarsh would transition to uplands. Table 4.4-1 shows the habitat changes in the Upper Bay that would be expected to occur over the next 50 years under the No Project Alternative. Based on the results of the sedimentation model, within the next 50 years there would be a loss of 81.2 percent of open water habitat in Upper Newport Bay and substantial gains in intertidal mudlflat and saltmarsh habitats. Although intertidal mudflats and saltmarsh are valuable habitats, the loss of most of the open water habitat in the Upper Bay under the No Project Alternative would be a significant adverse impact because the loss of open water would result in a substantial decrease in biodiversity in the Upper Bay ecosystem.

Table 4.4-1
Changes in Habitat Acres Predicted by Sedimentation Model in Upper Newport Bay in Next 50 Years

Habitat	Year 0	Year 20	Year 50	Percent Change
Open Water	216.4	135.2	42.5	-81.2
Mudflat	217.2	294.7	321	+47.8
Low Saltmarsh	141.7	144.4	171.3	+20.9
Mid Saltmarsh	182.6	184.1	193.9	+ 6.2
High Saltmarsh	9.3	9.3	38.1	+310

As described in Section 4.3.2, the increased sedimentation under the No Project Alternative would not only cause a loss of open water habitat; it would lead to a degradation in water quality. The lower volume of water in the Upper Bay would result in decreased tidal flushing. Because of the sediment deposition, some of the side channels and back areas might only experience tidal exchange during low tides. Because of the smaller volume of water, decreased tidal flushing, and isolation of side channels and back areas, extreme temperatures and salinities and low dissolved oxygen levels would be expected to occur more frequently. Conditions in the Upper Bay would become more extreme and tolerant species would be favored over more sensitive ones.

Because of the decreased volume of water in the Upper Bay, the freshwater influence of San Diego Creek is expected to become more pervasive. On ebbing tides the water in the Upper Bay, especially the Unit III and Unit II basins, would be dominated by San Diego Creek flows. The salinity model predicted that by Year 50 under low flow conditions, the Unit III basin would experience salinity decreases of almost 10 ppt on ebbing tides and the Unit II basin would have salinity declines of about 5 ppt (Corps 1998). The increased influence of San Diego Creek that would be expected under the No Project alternative would result not only in lower salinity but also in increased influence of sediments, nutrients, and pollutants from San Diego Creek. The accumulation of fine sediment within the Upper Bay would increase turbidity and the resuspension of contaminants associated with the fine particles.

The increased freshwater influence would be expected to result in a shift in the composition of the plankton from a predominantly marine assemblage to one dominated by freshwater and euryhaline species. Freshwater phytoplankton have been found to be common in Upper Newport Bay during periods of high runoff (Corps 1993). With the increased freshwater influence under the No Project alternative these freshwater species would be expected to persist year round especially in the Unit III basin.

The reduced circulation in the side channels and back areas of the Upper Bay would be expected to promote nuisance blooms of green algae (*Ulva* sp. and *Enteromorpha* sp.). The elevated turbidity related to the continual deposition of fine sediments would be expected to continue to prevent the re-establishment of eelgrass beds within the Upper Bay.

As was true of the plankton, the benthic invertebrate community would be expected to become dominated by species tolerant of reduced salinity. Brackish and freshwater species including insect larvae, oligochaetes and freshwater ostracods have been found to occur seasonally during periods of reduced salinity. These euryhaline and freshwater taxa would be expected to persist year round under the No Project Alternative. Marine bivalves and other taxa sensitive to freshwater would probably be absent from the upper portions of the Newport Bay ecosystem. Species sensitive to more extreme temperatures, reduced oxygen, and contaminants also would be expected to decrease. Overall, under the No Project alternative the diversity of the benthic invertebrate fauna is expected to decrease. In most parts of the Upper Bay, the benthic community would be dominated by opportunistic and tolerant taxa. In the Unit III basin, freshwater and euryhaline taxa would be expected to dominate. Strictly marine species would probably be limited to the lower portions of the Upper Bay near the PCH Bridge.

Under the No Project Alternative, the quality and quantity of habitat for fishes in the Upper Bay would decline. The sedimentation model predicts that over 80 percent of the open water habitat would be lost within 50 years. Almost no subtidal habitat would remain in the Unit III basin and subtidal habitat would be greatly reduced in the rest of the Upper Bay.

The quality of the remaining habitat for fishes would decline with the increased influence of San Diego Creek and the more frequent occurrences of high temperatures and low dissolved oxygen levels. The expected shift in the planktonic and benthic invertebrate communities to opportunistic species would decrease the quality of the forage base for some fish species. The fish community of Upper Newport Bay would be expected to become dominated by tolerant species such as California killifish. More sensitive fish species such as Califoria halibut and deepbody anchovy would be expected to avoid much of the Upper Bay and probably would be largely restricted to the lowest portions near the PCH Bridge. Even relatively tolerant fish species such as topsmelt might become less common in the upper portions of the Bay. Allen (1988) has shown that the distribution of topsmelt in Upper Newport Bay is positively correlated with salinity. Under the No Project Alternative the abundance and diversity of fishes in Upper Newport Bay would be expected to decrease.

Under the No Project Alternative, bird species, including diving ducks, grebes, pelicans, gulls and terns, dependent on open water would lose a substantial portion of their habitat because of sediment deposition in open water areas. Conversely, bird guilds such as shorebirds, rails, herons and egrets, dependent on intertidal mudflat and saltmarsh habitats would benefit from a substantial gain in the total area of these habitats.

Under the No Project alternative, many species of birds would have a diminished forage base because of the predicted degradation in water quality. As discussed above, the increased freshwater influence, reduced tidal prism, and increased turbidity would be expected to reduce the diversity of fish and invertebrate populations in the Upper Bay. Invertebrate species, such as most clams and some crustaceans , sensitive to freshwater would be absent from the Unit III basin and probably reduced in abundance in the Unit II basin. Clams and crustaceans are the preferred prey of a number of bird species. For example, lesser scaup prefer to forage on clams. The Unit III and Unit II basins would, thus, be reduced in quality as a foraging area for lesser scaup. Similarly, light-footed clapper rails forage heavily on shore crabs (*Hemigrapsus oregonensis* and *Pachygrapsus crassipes*). These crab species appear to be reduced in abundance in wet years (Hoffman 1998) suggesting that they are negatively affected by freshwater. Again, a lower abundance of preferred food would reduce the habitat quality for clapper rails. Shorebirds forage on a variety of invertebrate prey. The diversity of food resources in the intertidal is one of the reason such high densities of so many different shorebird species can all feed in these areas. A reduced diversity of intertidal invertebrate species would be expected to reduce the foraging opportunities for shorebirds. Piscivorous birds also would have a poorer foraging base under the No Project Alternative. Fishes that prefer higher salinity would be expected to avoid the Unit III basin and become less abundant in the Unit II basin. These fish species that prefer higher salinities include topsmelt and deepbody anchovy, the most important forage fishes in the bay. The Unit II and especially the Unit III basin would thus support less fish prey for such birds as gulls, terns, pelicans cormorants, mergansers, herons and egrets.

Much of the open water habitat would be lost and open water areas would largely be confined to the main channel under the No Project Alternative. Waterfowl using the main channel are vulnerable to frequent disturbance by boaters using this channel. As a watercraft approaches a group of waterfowl, the birds usually flush (E. Burres, CDFG, personal communication). Therefore these birds would lose valuable foraging time during periods when there is significant boating activity in the Upper Bay. Finally, the silting in of side channels would make marsh birds and birds using intertidal mudflats more vulnerable to terrestrial predators such as raccoons, coyotes and dogs and cats.

Listed species that would be adversely affected by the loss of open water habitat and the decreased forage base in the remaining open water habitat include the California brown pelican and the California least tern. Because California least terns breed in Upper Newport Bay the loss of foraging habitat would be a significant adverse impact of the No Project Alternative. Several bird species of concern would also be negatively impacted by the loss of open water habitat and decreased forage base. These bird species of concern include American white pelican, common loon, double-crested cormorant, California gull, elegant tern, black skimmer and osprey.

The federal-threatened western snowy plover does not currently breed in Upper Newport Bay but may occasionally forage there especially during the non-breeding season. This shorebird would gain foraging habitat because of the increase in intertidal mudflats under the No Project Alternative. Because snowy plovers feed on a variety of small invertebrates including insects, they would probably find adequate food throughout the Upper Bay. Long-billed curlew, a species of concern, would also gain foraging habitat from the increase in mudflats. Although this species can exploit a variety of invertebrates, it often feeds on clams and crabs and would be expected to find a decreased forage base in the upper portions of the Bay under the No Project Alternative.

Marsh-associated birds, including the federal- and state-endangered light-footed clapper rail and the state-threatened black rail, would benefit by a substantial gain in low saltmarsh under the No Project Alternative. However, the quality of low saltmarsh habitat would be diminished by a decreased foraging base and greater vulnerability to terrestrial predators. If channels within the low saltmarsh become isolated from tidal action, some cordgrass habitat could be lost because cordgrass is largely dependent on tidal action. The light-footed clapper rail prefers to nest in cordgrass.

The state-endangered Belding's savannah sparrow would benefit from the substantial gain in saltmarsh habitat under the No Project Alternative. The silting in of side channels, however, would make this species more vulnerable to terrestrial predators.

A more pervasive freshwater influence in the Upper Bay might increase brackish and freshwater habitat. Riparian plants such as willows and mule fat might increase along channel banks. An increase in riparian habitat would benefit riparian-associated bird species including many kinds of songbirds. Riparian-associated species of concern that would benefit from increased riparian vegetation include western yellow warbler, yellow-breasted chat, Cooper's hawk and sharp-shinned hawk.

Primarily terrestrial organisms including insects, mammals and reptiles and amphibians would benefit from increased upland, riparian and high saltmarsh habitat under the No Project Alternative.

A modified-HEP model was used to predict the changes in total habitat values resulting from both changes in habitat acres and changes in habitat quality that would occur under the No Project condition and the project alternatives. The details of the model are presented in Appendix A. The modified-HEP analysis selects a suite of indicator species to represent the species dependent on each habitat and calculates a Habitat Quality Index (HQI) for each indicator species for each habitat under existing and future with- and without-project conditions. HQI considers the importance of each habitat to each indicator species and variables that affect the quality of the habitat for that species. For the modified-HEP, variables used to compute HQI were confined to factors such as water depth and salinity that could be affected by sedimentation. The HQI is multiplied by the number of acres of each habitat to determine the total Habitat Units (HU) for each indicator species. Because a different number of indicator species was selected to represent each habitat, the total HU for each habitat is divided by the number of indicator species to compare HU amongst habitats and to compute total HU for with- and without-project conditions. Table 4.4-2 compares total HU for each of the indicator species for the next 50 years for the No Project alternative. Table 4.4-3 compares total HU for each habitat. The modified-HEP analysis predicts that under the No Project Alternative, all indicator species that are most dependent on marine open water habitat would suffer a significant loss of HU by Year 50. On the other hand, species dependent on intertidal mudflat and saltmarsh habitats would gain HU. Under the No Project Alternative the Upper Newport Bay ecosystem is predicted to suffer a net loss of 20 HU by Year 20 and 40 HU by Year 50. The net loss in habitat value of the Upper Newport Bay ecosystem under the No Project Alternative would be a significant adverse impact because the Upper Newport Bay Ecological Reserve is an area of special biological significance.

In summary, significant adverse impacts to biological resources that would occur under the No Project Alternative include a net loss of critical foraging habitat for the federal- and state-endangered California least tern, an overall net loss of habitat value (as determined by the Modified-HEP analysis in Appendix A) in the Upper Newport Bay Ecological Reserve, a substantial (81.2 percent) loss of marine open water habitat, and a corresponding substantial loss of overall diversity of the ecosystem. Beneficial impacts include an increase in valuable intertidal mudflat habitat and an increase in sensitive saltmarsh habitat.

4.4.3 <u>Sediment Control Alternatives</u>

4.4.3.1 Alternative 1

Construction

<u>Clamshell Dredge</u>

Dredging to remove sediment from the Unit III and Unit II basins and the various channels would destroy most of the benthic invertebrates in the sediments that would be dredged. Some individuals of mobile species such as crabs may escape the dredge. In addition to organisms directly destroyed by dredging, invertebrates living adjacent to the dredging area may suffer lethal or sublethal effects from burial and turbidity from sediments disturbed by the dredge. Once dredging in an area is ended, recolonization would be expected to occur rapidly. The Upper Newport Bay benthic invertebrate community is dominated by opportunistic species, many of them hardy species that have been introduced to southern California from other parts of the world (MBC and SCCWRP 1980). Therefore it is expected that within a year the community composition would be similar to the pre-dredging condition. However, some species such as large clams are slow growing and recruit irregularly. Some of these species may take many years to re-establish. Therefore, re-establishment to a fully diverse benthic community may take as long as 10 years.

Table 4.4-2
Total HUs by Indicator Species for Entire Bay

Year 0							
	MOW	IMF	LSM	MSM	HSM	Total	
halibut	138	57	0	0	0	**195**	
anchovy	131	57	0	0	0	**188**	
western grebe	141	65	0	0	0	**206**	
lesser scaup	114	32	0	0	0	**146**	
least tern	138	57	0	0	0	**195**	
pintail	8	137	0	0	0	**145**	
great egret	0	87	57	18	1	**163**	
avocet	0	109	0	0	5	**113**	
clapper rail	0	0	71	55	2	**127**	
shorebirds	0	151	24	0	0	**175**	
Belding's savannah sparrow	0	0	28	91	3	**122**	
	672	751	180	164	10	**1,776**	
Year 20							
	MOW	IMF	LSM	MSM	HSM	Total	HU Change
halibut	84	65	0	0	0	**150**	-45
anchovy	76	65	0	0	0	**141**	-47
western grebe	82	88	0	0	0	**171**	-35
lesser scaup	72	37	0	0	0	**108**	-38
least tern	84	65	0	0	0	**150**	-46
pintail	6	221	0	0	0	**226**	81
great egret	0	118	58	18	1	**195**	32
avocet	0	147	0	0	5	**152**	39
clapper rail	0	0	72	55	2	**129**	2
shorebirds	0	174	17	0	0	**191**	16
Belding's savannah sparrow	0	0	29	92	3	**124**	1
	404	980	176	166	10	**1,736**	-40
Year 50							
	MOW	IMF	LSM	MSM	HSM	Total	HU Change
halibut	25	69	0	0	0	**94**	-101
anchovy	23	69	0	0	0	**92**	-96
western grebe	23	96	0	0	0	**119**	-87
lesser scaup	22	35	0	0	0	**56**	-90
least tern	25	74	0	0	0	**99**	-96
pintail	1	242	0	0	0	**243**	98
great egret	0	128	69	19	4	**220**	57
avocet	0	161	0	0	19	**180**	67
clapper rail	0	0	86	58	8	**151**	24
shorebirds	0	185	20	0	0	**205**	30
Belding's savannah sparrow	0	0	34	97	11	**143**	20
	118	1,058	209	175	42	**1,602**	-174

Table 4.4-3
Total HUs by Habitat

Year 0						
Habitat	**Segment 1**	**Segment 2**	**Segment 3**	**Total HU**	**# Species**	**Adjusted HUs for # Species**
MOW	139	130	403	**672**	6	112
IMF	177	312	261	**751**	9	83
LSM	41	105	34	**180**	4	45
MSM	89	27	48	**164**	3	55
HSM	0	5	5	**10**	4	3
Total	**446**	**579**	**751**	**1,776**		**298**
Year 20						
Habitat	**Segment 1**	**Segment 2**	**Segment 3**	**Total HU**	**# Species**	**Adjusted HUs for # Species**
MOW	37	51	316	**404**	6	67
IMF	254	351	375	**980**	9	109
LSM	41	101	33	**176**	4	44
MSM	90	28	48	**166**	3	55
HSM	0	5	5	**10**	4	3
Total	**422**	**536**	**778**	**1,736**		**278**
Year 50						
Habitat	**Segment 1**	**Segment 2**	**Segment 3**	**Total HU**	**# Species**	**Adjusted HUs for # Species**
MOW	2	16	101	**118**	6	20
IMF	157	313	588	**1,058**	9	118
LSM	57	117	34	**209**	4	52
MSM	93	34	48	**175**	3	58
HSM	26	11	5	**42**	4	10
Total	**334**	**492**	**776**	**1,602**		**258**

Notes: MOW = Marine Open Water; IMF = Intertidal Mud Flat; LSM = Low Saltmarsh; MSM = Mid Saltmarsh; HSM = High Saltmarsh; HU = Habitat Units

Planktonic organisms would be subjected to impacts from the turbidity plumes that would be generated by the resuspension of sediments during dredging. Turbidity can impact plankton populations in a variety of ways including lowering the light available for phytoplankton photosynthesis and by clogging the filter feeding mechanisms of zooplankton. As discussed in Section 4.3.3.2, the RWQCB sets standards for dredging projects and generally requires that turbidity at 100 ft. (30 m) from a dredging project be limited to an elevation of not greater than 20 percent over ambient conditions. Turbidity curtains would be placed around the dredge and disposal scow to comply with this condition. Therefore, the impacts of turbidity would be temporary and localized. Turbidity impacts on biological resources would be adverse but insignificant.

Most fishes would leave the dredging area as soon as the dredge started working. The dredge may kill individuals of some small, burrowing species such as gobies. Fishes in areas adjacent to the dredge would be impacted by turbidity. Fishes exposed to suspended sediments in the laboratory have been shown to suffer mortality as well as sublethal signs of stress (Soule and Oguri 1976; O'Conner et al. 1977). In addition to the turbidity, the noise and disturbance associated with the dredging would be expected to cause fishes to avoid the dredging area. Fish surveys following dredging projects in Marina del Rey have recorded an unusually low number of fishes right after dredging ended, but fish abundances returned to normal within months (Soule et al. 1993). Therefore, project dredging would be expected to cause a temporary drop in fish use of the dredging areas but the fish community would rapidly re-establish once dredging was completed in an area. Impacts of dredging on fishes would be adverse but insignificant.

Bird species that use the open water habitat of the Bay would be expected to be disturbed by dredging activities. Most birds would avoid the area occupied by the dredge and disposal scow. Birds also would be disturbed by the turbidity generated during dredging. Most piscivorous birds are visual feeders and the turbid waters would interfere with their ability to find prey. Furthermore, because fishes would avoid turbid water few forage fish would occupy the turbid waters surrounding the dredge. Because turbidity curtains would be used, the turbid water would be limited to a radius of 100 ft. (30 m) around the dredge and disposal scow. Therefore, at most times when the dredge was operating, a minimum of about a 0.75 acre area contained by the turbidity curtain would be avoided by waterfowl and diving birds (gulls, terns, and pelicans). This area is about 0.3 percent of the open water habitat in the Upper Bay and the temporary direct disturbance of less than 1 percent of the open water habitat by the dredge would be an adverse but insignificant impact. The noise from the dredging might cause waterfowl to avoid a somewhat larger radius around the dredge. Because ambient noise levels in the Upper Newport Bay area often exceed 65 A-weighted decibels (dBA) (Table 3.6-2 and Table 3.6-4), it was assumed that waterfowl are unlikely to be sensitive to noise below this threshold. The noise analysis in Section 4.6.3.1 indicated that in most cases the noise level around the dredge would be at 65 dBA at a distance of 178 ft. (53.5 m) from the dredge. Thus, if noise caused waterfowl to avoid an area within 178 ft. (54 m) of the dredge, the amount of open water habitat disturbed at any one time by dredging would be about 2.3 acres, or a fraction over 1 percent of the open water habitat in Upper Newport Bay. Again, temporary disturbance of about 1 percent of the open water habitat of Upper Newport Bay is considered to be an adverse but insignificant impact.

Waterfowl would also be disturbed by the tugs and disposal scows as they traveled up and down the main channel. Ducks and other waterfowl in the path of the scow would be expected to vacate the area as the vessels approached. Because disposal scows would make a maximum of 3 round trips a day, this disturbance would not be expected to cause a significant adverse impact to waterfowl.

Disturbance to terns using the nesting islands in the Unit III basin is a particular concern. If the dredge comes too close to the nest sites, there is a danger that the birds might abandon their nests. Even temporary flushing of nesting birds is a concern because unprotected eggs are vulnerable to predation from gulls and other aggressive birds. Impacts to the federal- and state-endangered California least tern, which nests on the southerly island, is a particular concern. Disturbance to California least terns during the breeding season would be a significant adverse impact. This impact can be mitigated to insignificant by avoiding any dredging near the tern islands in the Unit III basin between April and September. Because Alternative 1 entails dredging of 219,000 cy (167,535 cu m) in the Unit III basin, which should take less than 3 months, this mitigation measure is easily implemented for Alternative 1.

Birds using intertidal and saltmarsh habitats adjacent to the basins and channels being dredged might be disturbed by the noise of the dredge and tugboats. A small portion of intertidal mudflat habitat adjacent to the dredging area might be disturbed by the noise of the dredge. Although shorebirds appear to be relatively insensitive to steady noise, they might be expected to flush at a sudden loud noise. In a worst case in which the dredge was dredging a narrow side channel between areas of mudflat (for example, the lower portion of the side channel by New Island) about 2 acres of intertidal habitat might be subjected to noise levels of over 65 dBA. This area represents less than 1 percent of the intertidal mudflat habitat of the Upper Bay. Disturbance to intertidal mudflat birds during dredging is thus considered to be an adverse but insignificant impact.

Marsh birds might be more sensitive than shorebirds to noise from dredging. Vocalization is important to federal- and state-endangered light-footed clapper rails. Noise from dredging could interfere with communication in this species or startle nesting birds and cause them to abandon their nests. Observations on clapper rails were made during the Unit III dredging project (Hoffman 1998), but the impact of dredging on clapper rail nesting success was inclusive. Nesting success was lower than expected, but the reduced success was most likely related to the severe El Nino weather conditions rather than the dredging. Disturbance to light-footed clapper rails during the nesting season would be a significant adverse impact of dredging. This impact could be mitigated to insignificant by avoiding dredging near low saltmarsh habitat during the clapper rail nesting season of March through September. It may not be possible to avoid dredging near all low saltmarsh habitat during these months. An alternative mitigation would be to avoid dredging near the highest density nesting area, which is located near the salt dike, during the nesting season and monitor nests for evidence of disturbance in the other areas. If disturbance were observed, the dredge would be required to cease operating near clapper rail nests.

Clapper rail nests could also be damaged by the wake of the disposal scows and tugboats. This potentially significant adverse impact could be mitigated to insignificant by placing floats along the channels near low saltmarsh habitat to attenuate wave action. Again monitoring would be required to ensure the proposed mitigation measure was successful.

The State Endangered Belding's savannah sparrow is a songbird that relies on vocalization to establish territories. This species also could be disturbed by noise from the dredge. Significant mid saltmarsh habitat within 200 ft. (60 m) of the dredging footprint occurs near the channel between the Unit III and Unit II basins above the salt dike and also along Upper and Middle Islands. Interference with Belding's savannah sparrow nesting would be a significant adverse impact. Impacts could be mitigated by avoiding dredging near high density areas during the breeding season to the extent possible and monitoring activities at nests near dredging during the breeding season.

Because dredging for Alternative 1 would be completed in less than a year, disturbance to biological resources would only occur during one spring/summer breeding season and one wintering season.

The dredge, tugboats and other waterborne equipment would take on fuel every 2 to 3 days from a fuel barge located at Shellmaker Island. There is a slight risk that an accidental spill of fuel could occur. Because the dredging contractor would be required to have a spill prevention and containment plan, spills would be prevented from spreading and contacting marsh habitat. The impacts of a fuel spill would be adverse but insignificant.

Hydraulic Dredge

The impacts of using a small hydraulic dredge would be similar to the impacts of using a clamshell dredge but many of the potential impacts would be reduced in magnitude. As discussed in Section 4.3.3.2, the hydraulic dredge would be expected to create less turbidity at the dredging site than the clamshell dredge. Because the dredged material would be sucked into a pipe rather than lifted to the surface, little surface turbidity would be expected. Dislodging of the sediments by the cutterhead would create a plume near the sea bottom. In compliance with RWQCB requirements, this plume would be contained within 100 ft. (30 m) of the dredge by a turbidity curtain. The impacts of dredging and associated turbidity on benthic invertebrates would be the same as for the clamshell dredge. However, because there would be less turbidity in the upper water column, turbidity impacts on plankton and water column fishes would be less than for the clamshell dredge. Birds would probably still avoid the area contained by the turbidity curtain. Therefore, disturbance to birds would be similar to the clamshell dredge alternative. No significant turbidity would be created by overflow from the disposal scow located at Shellmaker Island because a flocculating agent would be used to clarify the overflow water. This flocculating agent would not be discharged at concentrations that could affect aquatic life.

Because it would not be necessary to deepen the main channel between the PCH Bridge and the Unit II basin to provide an access channel for the dredge, less area would be impacted by dredging for the hydraulic dredge alternative compared to the clamshell dredging alternative. Thus, benthic invertebrates, plankton, fishes and birds would not be disturbed by any dredging activities below the Unit II basin. Furthermore, it would not be necessary for tugs and disposal scows to make trips between the dredge and the disposal site. Disposal scows would be filled near Shellmaker Island via a pipeline. Thus the disturbance to birds from scows and tugboats moving up and down the main channel would be avoided above Shellmaker Island. The potential damage to clapper rail nests from the wake of these vessels would be avoided.

The hydraulic dredge would also be less noisy than the clamshell dredge. As discussed in Section 4.6.3.1, the noise of the hydraulic dredge would attenuate to 65 dBA within 126 ft. of the dredge. Therefore, the area disturbed by dredge noise would be about 1.15 acres which is about 0.5 percent of the open water habitat in Upper Newport Bay. Similarly, the percentage of intertidal mudflat that would be disturbed by dredging noise at any one time would be smaller than for the clamshell dredge and, for most of the dredging, would be less than an acre. Noise impacts on marsh birds from the hydraulic dredge would affect a very small area at any one time because, except for the dredging of the inlet to the Santa Ana-Delhi channel, the dredge would not have 126 ft. of low saltmarsh on both sides of the dredge. Therefore, the maximum amount of low saltmarsh that would be disturbed by the noise of the hydraulic dredge at any one time would be about 0.6 acres. However, any disturbance to low saltmarsh habitat during the breeding season would be a potentially significant adverse impact because it might lower the reproductive success of the light-footed clapper rail. Very little mid-saltmarsh habitat is within 126 ft. of the dredge footprint for Alternative 1. However, any noise disturbance that lowered the breeding success of the Belding's savannah sparrow would be a significant adverse impact.

For the hydraulic dredging alternative, dredged material would be pumped through a pipeline to disposal scows at Shellmaker Island or an alternative location near the PCH Bridge. Figure 2.3-6 shows the proposed location of the pipeline and pumps. The pipeline would cross some mid saltmarsh habitat in the Unit III basin and low saltmarsh habitat in the Unit II basin. Impacts of placing the pipe would not be significant if it were done in the non-breeding season and if care were taken to minimize disturbance to marsh vegetation. Booster pumps would generate a noise similar to that of the hydraulic dredge. The noise of the pumps could disturb birds by generating a noise greater than 65 dBA within 126 ft. of the pump. Any disturbance that reduced the nesting success of light-footed clapper rail or Belding's savannah sparrow would be a significant adverse impact. To avoid disturbance to nesting marsh birds, booster pumps should be placed over 126 ft. from saltmarsh habitat.

The hydraulic dredging alternative would reduce the chances of a fuel spill because fueling would be done by truck at Jamboree Road. Therefore, if fuel were spilled it would not enter the Bay. Tugboats and scows would still take on fuel in the Bay. Therefore, there is still a very small chance that fuel could be spilled into Bay waters as a result of project activities. Adherence to the spill prevention and containment plan would insure that if fuel were spilled impacts would be insignificant.

Post Construction

Alternative 1 would prevent the loss of marine open water habitat and the degradation of water quality that would occur under the No Project Alternative. The significant losses in biological diversity, least tern foraging habitat, and net habitat value of the Upper Newport Bay Ecological Reserve described in Section 4.4.2 for the No Project Alternative would not occur.

Alternative 1 would increase the amount of marine open water habitat in Upper Newport Bay by 5 percent and decrease the amount of intertidal mudflat habitat by 4 percent relative to the Year 0 (post Unit III dredging) condition. The loss of 4 percent of intertidal mudflat habitat would not affect any listed species, result in a decrease in biodiversity or cause a substantial loss in the population of any fish, wildlife or vegetation. Therefore, loss of intertidal mudflat is considered an adverse but insignificant impact.

Because Alternative 1 maintains the current Unit III basin configuration, Alternative 1 would maintain water quality in the Unit III basin at the Year 0 condition. The substantial degradation of water quality that would occur during the next 50 years under the No Project alternative would be prevented. The increased tidal prism would reduce fluctuations and occurrence of extreme values of water column parameters. For example, summer water temperatures in the Unit III basin in 1999 were lower than had been recorded in several years. Salinity would be similar to the modeled Year 0 condition. The model predicted that following the dredging of the Unit III basin salinity would drop about 2 ppt during an ebbing tide under low flow conditions. During storm flows, the Unit III basin would become fresh for about a day but would recover rapidly to normal salinity. The restoration of the channel between the tern islands would improve circulation around these islands compared to the Year 0 condition. The channel was not dredged in the Unit III project.

The Unit III project did not dredge the Unit II basin. As discussed in Section 4.3.3.2, Alternative 1, which would restore the original Unit II basin footprint, would increase water quality in the Unit II basin compared to the Year 0 condition. High temperatures and low dissolved oxygen levels would be less likely to occur than under existing conditions, and there would be less freshwater influence. Because of the decreased freshwater influence in the Unit II basin under Alternative 1, the Unit II basin would experience less water quality degradation from nutrients, pathogens and contaminants that may be present in San Diego Creek.

Alternative 1, thus, would improve water quality somewhat in Upper Newport Bay over existing conditions. Maintenance of the Alternative 1 basin configuration would also prevent the substantial water quality degradation that would occur within the next 50 years under the No Project Alternative. The maintenance of good water quality in Upper Newport Bay under Alternative 1 would support relatively diverse fish and invertebrate populations. The Unit III basin, in particular, would support a greater diversity of plankton, fish and benthic invertebrates than was found in this area prior to the Unit III dredging project. Fish species such as California halibut and northern anchovy, relatively sparse in the Unit III basin during the 1997 biological surveys, would be expected to increase in abundance in the upper part of the Bay. Similarly, invertebrates sensitive to freshwater would be able to maintain populations in the Unit III basin.

Maintenance of the Alternative 1 basin footprint, would reduce turbidity within the Upper Bay. With the enhanced light levels, eelgrass beds may re-establish in the lower portions of the Upper Bay near the PCH Bridge.

Dredging of the channel between the tern islands would help to protect the northerly tern island from mammalian predators. Creation of access channels to the tern islands would enable California Department of Fish and Game (CDFG) to remove vegetation from the islands and maintain suitable nesting habitat for terns. With the influx of sediments to the Unit III basin during the 1990s, CDFG was unable to access the islands and the quality of nesting habitat substantially degraded. Restoration of the side channel east of New Island in the Unit II basin would protect low saltmarsh and intertidal mudflat habitat on New Island from mammalian predators.

Table 4.4-4 shows the total HUs predicted by the modified-HEP model for each of the indicator species for the sediment control alternatives (see Appendix A for model details). Of the four alternatives, Alternative 1 has the lowest HU for species most dependent on marine open water and the highest HU for species dependent on intertidal mudflat, because Alternative 1 maintains the smallest area of open water compared to intertidal mudflat. All of the other alternatives feature an expanded Unit III basin.

In addition to the effects on habitat quality from maintaining the Alternative 1 basin configuration, Alternative 1 would have the benefit of protecting birds on New Island from terrestrial predators and human disturbance because the side channel between New Island and shore would be restored. Alternatives 1,4 and 6, which would restore the side channel, gained a total of 3 additional HU from this component (see Appendix 6 for calculation).

Table 4.4-5 shows the final HU predicted by the modified-HEP model for the sediment control alternatives. Alternative 1 is predicted to result in a total of 299 HU. Alternative 1 has the second lowest total HU of the 4 sediment control alternatives but provides a significant increase in HU over the 20 and 50 year without-project condition.

Periodic maintenance dredging would be required to maintain the Alternative 1 basin configuration. Based on the criteria that would trigger maintenance dredging (see Section 2.3.4), Alternative 1 would need maintenance dredging about every 7 years. Each maintenance dredging interval would last 12.3 months if a clamshell dredge were used and 9.4 months if a hydraulic dredge were used. The impacts of maintenance dredging would be similar to those described above for the initial dredging project. Dredging the basins and channels at an average of every 7 years would probably prevent the establishment of a mature highly diverse benthic invertebrate community. Long lived species with irregular recruitment might never become established. The frequent dredging would favor opportunistic species. This decrease in biodiversity would be an unmitigable significant adverse impact of Alternative 1. Within the next 50 years, a total of seven maintenance dredging cycles most likely would be necessary under Alternative 1. As shown in Table 2.3-7, within the next 50 years Alternative 1 would involve a total of 2,285 dredging days for the clamshell dredge and 1790 days for the hydraulic dredge. Only Alternative 4 would require more dredging days within the next 50 years. Thus, biological resources would be disturbed by dredging activity most frequently under Alternative 1 and for more total days than Alternatives 5 and 6. Furthermore, if one or more major storm years followed a dredging episode, the small basin capacity of the Alternative 1 configuration might make it necessary to dredge again within 1 or 2 years of a dredging episode.

Table 4.4-4
Total HUs by Indicator Species for Project Alternatives

Alternative 1						
	MOW	**IMF**	**LSM**	**MSM**	**HSM**	**Total**
halibut	148	57	0	0	0	**205**
anchovy	141	57	0	0	0	**198**
western grebe	147	62	0	0	0	**209**
lesser scaup	119	33	0	0	0	**152**
least tern	148	57	0	0	0	**205**
pintail	9	75	0	0	0	**83**
great egret	0	83	56	18	1	**158**
avocet	0	104	0	0	5	**108**
clapper rail	0	0	70	55	2	**127**
shorebirds	0	151	25	0	0	**177**
Belding's savannah sparrow	0	0	28	92	3	**123**
	712	678	179	165	10	**1,745**
Alternative 4						
	MOW	**IMF**	**LSM**	**MSM**	**HSM**	**Total**
halibut	191	47	0	0	0	**238**
anchovy	182	47	0	0	0	**229**
western grebe	184	48	0	0	0	**232**
lesser scaup	140	26	0	0	0	**165**
least tern	191	47	0	0	0	**238**
pintail	13	51	0	0	0	**64**
great egret	0	64	54	19	1	**138**
avocet	0	80	0	0	5	**85**
clapper rail	0	0	68	56	2	**126**
shorebirds	0	125	27	0	0	**152**
Belding's savannah sparrow	0	0	27	93	3	**123**
	902	535	176	167	10	**1,791**
Alternative 5						
	MOW	**IMF**	**LSM**	**MSM**	**HSM**	**Total**
halibut	156	53	0	0	0	**210**
anchovy	150	53	0	0	0	**204**
western grebe	157	60	0	0	0	**216**
lesser scaup	123	30	0	0	0	**153**
least tern	156	53	0	0	0	**210**
pintail	9	72	0	0	0	**81**
great egret	0	80	56	18	1	**154**
avocet	0	100	0	0	5	**104**
clapper rail	0	0	69	55	2	**126**
shorebirds	0	142	24	0	0	**166**
Belding's savannah sparrow	0	0	28	92	3	**122**
	752	643	177	165	10	**1,747**

Table 4.4-4 (Continued)
Total HUs by Indicator Species for Project Alternatives

Alternative 6						
	MOW	IMF	LSM	MSM	HSM	Total
halibut	176	53	0	0	0	**229**
anchovy	165	53	0	0	0	**218**
western grebe	170	54	0	0	0	**224**
lesser scaup	130	33	0	0	0	**162**
least tern	176	53	0	0	0	**229**
pintail	10	62	0	0	0	**71**
great egret	0	72	55	19	1	**147**
avocet	0	90	0	0	5	**95**
clapper rail	0	0	69	56	2	**126**
shorebirds	0	142	27	0	0	**169**
Belding's savannah sparrow	0	0	27	93	3	**123**
	827	613	178	167	10	**1,794**

Table 4.4-5
Final HU for Project Alternatives

Habitat	Alternative 1	Alternative 4	Alternative 5	Alternative 6
Marine Open Water	119	150	125	138
Intertidal Mudflat	76	60	71	69
Low Saltmarsh	46	46	44	46
Mid Saltmarsh	55	56	55	56
High Saltmarsh	3	3	3	3
Total	**299**	**315**	**298**	**312**

4.4.3.2 Alternative 4

Construction

The impacts of Alternative 4 dredging on biological resources would be similar to those of Alternative 1. Because Alternative 4 would involve a considerably larger dredge footprint than Alternative 1, benthic invertebrates would be destroyed in a larger area. However, as was true of Alternative 1, most of the dominant species in Upper Newport Bay are opportunistic and would be expected to re-establish in less than a year. Some of the long lived, irregularly recruiting invertebrates like large clams may take several years to recolonize and grow to full size. Because benthic communities would re-establish following dredging, loss of benthic invertebrates under Alternative 4 is considered an adverse but insignificant impact.

Although a much larger total footprint would be dredged under Alternative 4 compared to Alternative 1, the amount of area disturbed at any one time by noise and turbidity would be limited to the same radius around the dredge described for Alternative 1. For open water and intertidal mudflat habitats this area represents a small fraction of the total habitat in the Upper Bay that would be disturbed at any one time and impacts to birds from turbidity and noise would be adverse but insignificant. However, the expanded Unit II basin under Alternative 4 would require more dredging in close proximity to low saltmarsh habitat. Therefore, under Alternative 4 there is a greater potential that noise could disturb nesting light-footed clapper rails. If noise from project equipment lowered the reproductive success of clapper rails the impact would be significant. The impact could be mitigated by avoiding dredging near the highest density clapper rail habitat in the breeding season and monitoring clapper rail behavior in areas that would be dredged during the breeding season.

Alternative 4 would require more dredging near the southerly least tern island than Alternative 1. A significant adverse impact would occur if disturbance from dredging resulted in a lower reproductive success or abandonment of the island altogether. The impact could be avoided by prohibiting dredging near the tern island between April and September when the terns are present.

In contrast to Alternative 1, which would be completed in under a year, dredging for Alternative 4 would continue for over 3 years (37.3 months for the clamshell dredge and 36.2 months for the hydraulic dredge). Although only a small total area would be disturbed at any one time, scheduling to avoid sensitive resources such as least tern nesting would be more complicated under this alternative. Because it probably would be impossible to avoid dredging near all low saltmarsh habitat during the breeding season, some clapper rail breeding habitat would be disturbed in consecutive years. Furthermore, for the clamshell dredge alternative, scows and tugboats would travel up and down the main channel daily during three consecutive breeding seasons. If impacts to nesting birds cannot be avoided, lowered reproductive success for three consecutive seasons could be disastrous for the clapper rail population.

Waterfowl in the main channel would be disturbed by dredge and tugboat traffic for three consecutive wintering seasons under Alternative 4. Because no more than three daily round trips would occur, this impact is considered adverse but insignificant for Alternative 4.

Alternative 4 would involve the relocation of the northerly tern island to the Unit II basin. It is assumed that relocation of the island would not occur during the tern nesting season. Sand would be taken from the existing island and placed on top of the new island. Additional sand would be excavated from a beach near the entrance channel. Excavation of beach sand would destroy invertebrates living in the sand. Loss of sandy beach invertebrates in a localized area (about 0.26 acres) would be an adverse but insignificant impact. The affected area would be rapidly recolonized from adjacent beach areas. Placement of sand on the new island near the salt dike and spreading of that sand with earth moving equipment would generate noise that might disturb birds in adjacent habitats. As described in Section 4.6.4.1 and shown in Table 4.6-4, earthmoving equipment generates a noise of 89 dBA at 50 ft. (15 m). A distance of 792 ft. (237.8 m) is required for the noise level to drop to 65 dBA. Therefore a relatively large area would be disturbed by noise from this activity. Disturbance to marsh habitat is a particular concern because the highest density of nesting light-footed clapper rails occurs near the salt dike where the island would be created. The total time to create the top of the new tern island would only be 12 to 13 days and would occur during the non-breeding season. Because tern island relocation would not occur during the breeding season, the impact of noise on birds would be adverse but insignificant.

There is always a risk when a breeding island is relocated that it would not be used by the target bird species. Because the island that would be relocated is not used for nesting by California least terns but by other non-listed tern species, the risk that a breeding island would be lost is considered adverse but not significant. There is a chance that the new island may be used by California least terns. It is likely, at the very least, that it would be used by the other tern species that nest in the Bay.

Because the new tern island would have clean unvegetated sand, it would be more attractive to least terns than the existing islands, which have become overgrown with vegetation.

Post Construction

Alternative 4 would prevent the loss of marine open water habitat and the degradation of water quality that would occur under the No Project Alternative. The significant losses in biological diversity, least tern foraging habitat, and net habitat value of the Upper Newport Bay Ecological Reserve described in Section 4.4.2 for the No Project Alternative would not occur.

Alternative 4 would increase the amount of marine open water habitat in Upper Newport Bay by 30 percent and decrease the amount of intertidal mudflat by 26 percent. Although no listed species would be directly affected by this loss of mudflat, the loss of such a substantial portion of intertidal mudflat in Upper Newport Bay might affect some of the shorebird or dabbling duck populations that are dependent on the habitat. The critical threshold at which losses of intertidal habitat become significant to wintering shorebirds and dabbling ducks is not known. Considering the reduced amount of intertidal mudflat habitat that remains in southern California, a long term affect on some shorebird or dabbling duck populations that would be detectable over natural variability is considered likely. Therefore, Alternative 4 is considered to have the potential for a significant adverse impact on shorebirds and dabbling ducks. Conversely the substantial expansion of marine open water habitat under Alternative 4 would be beneficial to fishes and to bird groups such as gulls, terns, diving ducks, pelicans, cormorants, loons, and grebes that depend on open water habitat.

Because it would have the largest, deepest basins, Alternative 4 would have the largest tidal prism and the best water quality of any of the alternatives. Therefore, Alternative 4 would likely support the most diverse fish and invertebrate communities. Alternative 4 would have the least freshwater influence of any of the alternatives. Because of the deep basins in Alternative 4, during small storm events, salinity may remain high near the bottom of the basins. Therefore, disturbance to demersal fish and benthic invertebrates by sudden influxes of freshwater during storms may be limited to major storm events in which the entire basins would be expected to drop to near 0 ppt salinity.

Under Alternative 4, a channel would be dredged between the southerly tern island and shore. Maintenance of this channel would help protect nesting terns from mammalian predators. Maintenance of an access channel to the tern island would enable CDFG to remove vegetation and maintain the island. Alternative 4, thus, would be expected to benefit least terns especially if least terns use the island that would be relocated to the salt dike. Like Alternative 1, Alternative 4 would restore the side channel east of New Island. Restoration of this side channel would protect birds using low saltmarsh and intertidal habitat on New Island from mammalian predators.

The modified-HEP model predicts that, of the four sediment control alternatives, Alternative 4 would have the highest total HU for each of the indicator species dependent on marine open water habitat and the lowest HU for indicator species dependent on intertidal mudflats (Table 4.4-4). The high net habitat value Alternative 4 would have for open water species and low value for intertidal species, is because Alternative 4 would substantially expand the Unit III and Unit II basins at the expense of intertidal mudflat. Because of the enhanced tidal prism, however, the mudflat that did remain under Alternative 4 would be higher quality habitat than the existing condition.

The modified-HEP model predicts that Alternative 4 would result in a total of 315 HU. Alternative 4 is predicted to have the highest total HU of any of the alternatives (Table 4.4-5).

Periodic maintenance dredging would be required to maintain the Alternative 4 basin configuration. Based on the criteria that would trigger maintenance dredging (see Section 2.3.4), Alternative 4 only would need maintenance dredging about every 24 years. Each maintenance dredging interval would last 32.9 months if a clamshell dredge were used and 28.7 months if a hydraulic dredge were used. The impacts of maintenance dredging would be similar to those described above for the initial dredging project although the total quantity of material that would be dredged and time it would take to complete the dredging would be slightly less. Within the next fifty years, it is predicted that only two maintenance dredging cycles would be necessary for Alternative 4. Thus, although, each dredging episode under Alternative 4 would take between 2.5 and 3 years depending on which type of dredge were used, disturbance would be infrequent. Within the approximately 24 years between dredging episodes, a diverse benthic invertebrate community could develop in the Upper Bay. Several generations of birds could reproduce before the local breeding populations would be subjected to the disturbance of dredging. Within the next 50 years, dredging under Alternative 4 would occur for a total of 2,415 days if a clamshell dredge were used and 2,190 days if a hydraulic dredge were used (Table 2.3-6). The total number of dredging days that would be necessary is greater under Alternative 4 than for any of the other alternatives. Thus, although Alternative 4 would require dredging less frequently than the other alternatives, it still would disturb the Upper Bay for more total days.

4.4.3.3 Alternative 5

Construction

The impacts of dredging under Alternative 5 would be similar to those described for Alternatives 1 and 4. As was true for Alternatives 1 and 4, dredging activity would disturb a relatively small area at any one time.

Alternative 5 would expand the Unit III basin, but would only dredge a channel and relocate a tern island in the Unit II basin. The footprint of the Unit III basin under Alternative 5 would be similar to Alternative 4, but the basin would be at a depth of only -14 ft. (-4.2 m) MSL compared to -20 ft. (-6 m) MSL for Alternative 4. The impacts of dredging in the Unit III basin, thus, would be similar to Alternative 4. Dredging near the least tern island would be a particular concern and should be avoided during the nesting season. Because Alternative 4 would dredge a shallower basin, dredging in the Unit III basin would occur for a shorter time under Alternative 5 than Alternative 4 (about 206 days for Alternative 5 compared to 372 days for Alternative 4).

Alternative 5 would dredge only the main channel in the Unit II basin. Disturbance to biological resources in the Unit II basin, thus, would be minimized under this alternative. Very little saltmarsh habitat in the Unit II basin would be subjected to noise levels above 65 dBA. Thus, of the four sediment control alternatives, Alternative 5 has the least potential to cause a significant impact to light-footed clapper rails by noise from the dredge. However, if a clamshell dredge were used, clapper rail nesting could still be affected by tugboats and disposal scows that would travel up and down the main channel to transport dredged sediments to the LA 3 disposal site.

Like Alternative 4, Alternative 5 would involve relocation of the northerly least tern island to the Unit II basin near the salt dike. The impacts of tern island relocation would be similar to those described for Alternative 4 in Section 4.4.3.2. Earthmoving equipment to spread the sand on the new island would generate a loud noise capable of disturbing birds in a relatively large area of marsh. However, because tern island relocation would be done during the non-breeding season, the impacts of tern island relocation on marsh birds would be adverse but insignificant.

Dredging for Alternative 5 would be completed in about 12.8 months if a clamshell dredge were used and 11.7 months if a hydraulic dredge were used. Thus under Alternative 5, biological resources in Upper Newport Bay would only be disturbed by dredging during one summer breeding season and one wintering season.

Post Construction

Like Alternatives 1 and 4, Alternative 5 would prevent the loss of marine open water habitat and the degradation of water quality that would occur under the No Project Alternative. The significant losses in biological diversity, least tern foraging habitat, and net habitat value of the Upper Newport Bay Ecological Reserve described in Section 4.4.2 for the No Project Alternative would not occur.

Alternative 5 would increase the amount of marine open water habitat in Upper Newport Bay by about 11 percent and decrease the amount of intertidal mudflat by 8 percent relative to the Year 0 condition. The loss of about 8 percent of the intertidal mudflat habitat would not affect any listed species, result in a decrease in biodiversity or cause a substantial loss in the population of any fish, wildlife or vegetation. Therefore, loss of intertidal mudflat under Alternative 5 is considered an adverse but insignificant impact.

As discussed in Section 4.3.3.2, the increase in tidal flushing under Alternative 5 would be similar to Alternative 1. Like Alternative 1, Alternative 5 would be expected to increase water quality somewhat over the Year 0 conditions and would prevent the substantial decline in water quality that would occur within the next 50 years under the 50-year without-project condition. Because the Unit II basin would not be restored under Alternative 5, fluctuations in salinity and temperature in this basin would be expected at times. Thus, the habitat quality for fishes and aquatic invertebrates in the Unit II basin would be the lowest under Alternative 5 of the four sediment control alternatives. Habitat quality in the Unit III basin would be higher than under Alternative 1 but lower than Alternative 4. Because the Unit III basin would always be subject to some influence from San Diego Creek, the only really high quality aquatic habitat in the Upper Bay under Alternative 5 would be in the lowest segment of the Upper Bay between Middle Island and the PCH Bridge. It is expected that under Alternative 5, fish and benthic invertebrate diversity would increase throughout the Upper Bay but would be lower than under Alternatives 1 and 4.

Like Alternative 4, Alternative 5 would dredge a channel between the southerly tern island and shore. Maintenance of this channel would help protect nesting terns from mammalian predators. Maintenance of an access channel to the tern island would enable CDFG to remove vegetation and maintain the island. Alternative 5, thus, would be expected to benefit least terns especially if least terns use the island that would be relocated to the salt dike.

Unlike Alternatives 1 and 4, Alternative 5 would not restore the side channel east of New Island. Therefore, Alternative 5 would provide no protection to marsh birds on New Island from mammalian predators.

The modified-HEP model (see Appendix A) predicts that Alternative 5 would provide more HU for marine open water indicator species than Alternative 1 but less than Alternatives 4 and 6 (Table 4.4-4). Alternative 4 would provide less HU for intertidal mudflat indicator species than Alternative 1 but more than Alternatives 4 and 6.

The final HU predicted by the modified-HEP model for Alternative 5 is 298 (Table 4.4-5). Thus, Alternative 5 provides the lowest HU of any of the sediment control alternatives.

Based on the criteria that would trigger maintenance dredging (see Section 2.3.4), Alternative 5 would need maintenance dredging about every 10 years. Approximately 5 maintenance dredging cycles would be required in the next 50 years. Dredging the Unit III basin and the main channel every 10 years might prevent the establishment of a mature, highly diverse benthic community in the Unit III basin. However, most of the Unit II basin would not be disturbed by dredging. Therefore, long-lived organisms such as clams could persist in the Unit II basin. Benthic communities under Alternative 5 would probably be somewhat more diverse than under Alternative 1 but substantially less diverse than under Alternative 4. Disturbance of benthic communities by maintenance dredging at a frequency of every 10 years is considered to be an adverse but insignificant impact for Alternative 5.

Each maintenance dredging cycle for Alternative 5 would take 14.2 months if a clamshell dredge were used and 11.2 months if a hydraulic dredge were used. Thus, maintenance dredging would only disturb one breeding season and one wintering season. The total number of dredging days within the next 50 years under Alternative 5 is estimated to be 1,949 days if a clamshell dredge is used and 1,589 days if a hydraulic dredge is used (Table 2.3-6). Under the clamshell dredge alternative, Alternative 5 would disturb biological resources in Upper Newport Bay for fewer total days than Alternative 1 and Alternative 4, but more days than Alternative 6. Under the hydraulic dredging alternative, Alternative 5 would disturb biological resources for the fewest number of days of any of the alternatives.

4.4.3.4 Alternative 6

Construction

The impacts of Alternative 6 dredging on biological resources would be similar to those described in Sections 4.4.3.1 to 4.4.3.3 for Alternatives 1, 4, and 5. Only a small total fraction of habitat around the dredge would be disturbed at any one time.

Dredging in the Unit III basin under Alternative 6 would be similar to that under Alternative 4, with the exception that the mudflats in the northeast corner would not be dredged under Alternative 6. As was true of the other alternatives, dredging near the least tern island would be a particular concern and should be avoided during the nesting season.

In the Unit II basin, Alternative 5 would dredge a larger footprint than any of the sediment control alternatives except Alternative 4. Alternative 6 would require less dredging in proximity to marsh habitat than Alternative 4 but more than either Alternative 1 or Alternative 5. If noise from dredging equipment lowered the reproductive success of light-footed clapper rails or Belding's savannah sparrow, a significant adverse impact would occur. The impact could be reduced to insignificant by avoiding high density habitat during the breeding season and by monitoring areas that would be near dredging during the nesting season.

Like Alternatives 4 and 5, Alternative 6 would relocate the northerly least tern island to the Unit II basin near the main dike. Noisy earthmoving equipment would spread the sand on the top of the new island. However, because island relocation would not be done during the breeding season the impact of noise on marsh birds would be adverse but insignificant.

Initial dredging to construct the basins in Alternative 6 would require 21.7 months if a clamshell dredge were used and 27.8 months if a hydraulic dredge were used. Thus, under Alternative 6 dredging would disturb two consecutive breeding seasons and two consecutive wintering seasons.

Post Construction

Like the other sediment control alternatives, Alternative 6 would prevent the loss of marine open water habitat and the degradation of water quality that would occur under the No Project Alternative. The significant losses in biological diversity, least tern foraging habitat, and net habitat value of the Upper Newport Bay Ecological Reserve described in Section 4.4.2 for the No Project Alternative would not occur.

Alternative 6 would increase the amount of marine open water habitat by 19 percent and decrease the amount of intertidal mudflat by 17 percent compared to the Year 0 condition. The loss of 17 percent of the intertidal mudflat in the Upper Bay represents a substantial decrease in this habitat. It is not known at what critical threshold loss of mudflat would result in a decrease in the population of any of the bird species that depend on the habitat. Because the enhanced water quality under Alternative 6 would improve the quality of intertidal mudflat habitat and the diversity of the food base for shorebirds and dabbling ducks, loss of mudflats under Alternative 6 would be partially compensated by an improved forage base in the mudflats that remain. Therefore loss of mudflat habitat under Alternative 6 is considered to be an adverse but insignificant impact. An increase in marine open water habitat of 19 percent would be a substantial beneficial impact for fishes, aquatic invertebrates, and bird species that depend on open water habitat.

As discussed in Section 4.3.3.2, the increased basin footprint under Alternative 6 and deeper basins would result in an increase in tidal prism and a substantial improvement in water quality compared to the existing condition. Salinity in the Upper Bay after construction of the Alternative 6 basins would be expected to be similar to that for Alternative 4. The increased marine influence and decrease in influence of San Diego Creek would be expected to support a relatively diverse fish and invertebrate fauna in both the Unit II and Unit III basins. Demersal fishes and benthic invertebrates might find a refuge from freshwater at the bottom of the deep Alternative 6 basins during smaller storms. During major storm events the entire Upper Bay would be expected to go nearly fresh.

Under Alternative 6, a channel would be dredged between the southerly tern island and shore. Maintenance of this channel would help protect nesting terns from mammalian predators. Maintenance of an access channel to the tern island would enable CDFG to remove vegetation and maintain the island. Alternative 6, thus like Alternatives 4 and 5, would be expected to benefit least terns especially if least terns use the island that would be relocated to the salt dike. The new tern island would be more attractive to terns than the existing island because it would have clean unvegetated sand. Like Alternatives 1 and 4, Alternative 6 would restore the side channel east of New Island. Restoration of this side channel would protect birds using low saltmarsh and intertidal habitat on New Island from mammalian predators.

The modified-HEP model (see Appendix A) predicts that Alternative 6 would provide greater HU for marine open water indicator species than Alternatives 1 and 5 but less than Alternative 4 (Table 4.4-4). Conversely, Alternative 6 would provide lower HU for intertidal mudflat indicator species than any alternative except Alternative 4.

The modified-HEP model predicts that Alternative 6 would provide 312 total HU (Table 4.4-5). Alternative 6, thus, would provide slightly less total HU to the Upper Newport Bay ecosystem than Alternative 4 but more than Alternatives 1 and 5.

Based on the criteria that would trigger maintenance dredging (see Section 2.3.4), Alternative 6 would need maintenance dredging about once every 21 years. During the next 50 years, it is predicted that 2 maintenance dredging episodes would be required for Alternative 6. The long period between maintenance dredging intervals is similar to Alternative 4. As was true of Alternative 4, with the over 20 years between dredging episodes, a diverse benthic invertebrate community could develop in the Upper Bay. Several generations of birds could reproduce before the local breeding populations would be subjected to the disturbance of dredging. For Alternative 6, each maintenance dredging episode would take 20.3 months if a clamshell dredge were used and 22.8 months if a hydraulic dredge were used. Thus during each maintenance dredging episode, birds would be disturbed for two consecutive breeding seasons and two consecutive wintering seasons. Table 2.3-6 shows that for Alternative 6, a total of 1,459 days of dredging would occur in the next 50 years if a clamshell dredge were used and 1,719 days if a hydraulic dredge were used. The total dredging days required for Alternative 6 is the lowest of any of the alternatives for the clamshell method. For hydraulic dredging Alternative 6 would require the second lowest total number of dredging days.

4.4.4 Mitigation for Potentially Significant Adverse Impacts of Sediment Control Alternatives

Disturbance by dredging noise and activity to the federal- and state-endangered California least tern during the breeding season - This impact could be mitigated to insignificant by avoiding dredging activities near the tern nesting island between April 15 and September 15 when the terns are present.

Disturbance by dredging noise and activity to listed saltmarsh birds (federal- and state-endangered light-footed clapper rail, state-endangered Belding's savannah sparrow) during the nesting season - This impact could be mitigated to insignificant by avoiding dredging activities near high density nesting areas during the breeding season (March through September for the clapper rail, March through August for Belding's savannah sparrow). Any breeding birds near dredging activities during the breeding season should be carefully monitored. If disturbance is noted, dredging activities near all nests should be ceased until the end of the breeding season.

Damage to nests of the federal- and state-endangered light-footed clapper rail from the wake of disposal scows and tugboats - This impact can be mitigated by placing floats along the channel perimeter of saltmarsh habitat during the clapper rail breeding season of March through September. Nests should be monitored. If damage from wakes is noted, scow traffic in channels near nest should be stopped until after all young in nests near the main channel have fledged.

Disturbance to listed marsh birds from noise of the booster pumps for hydraulic dredge alternative - The pumps should be placed at least 150 ft. (45 m) away from saltmarsh habitat.

4.4.5 Habitat Restoration Alternatives

4.4.5.1 Addition of Sand to Least Tern Islands

Least terns need unvegetated sand for nesting. The nesting islands in the Unit III basin have degraded as nesting habitat because sand has eroded and vegetation has invaded. This restoration alternative would remove vegetation from the island(s) and place clean sand obtained from beaches near the Entrance Channel on the island(s). For Sediment Control Alternative 1, sand would be placed on both the nesting islands. Under Sediment Control Alternatives 4, 5, and 6, the northerly island would be relocated to the Unit II basin. For these alternatives, sand would be placed on the remaining southerly tern island. Placement of clean sand on the tern island(s) would benefit the California least tern and other nesting tern species by providing suitable nesting habitat. Modified-HEP analyses were done to estimate the benefits of the habitat restoration alternatives (see Appendix A for details). The modified-HEP model predicted that for Alternative 1, in which sand would be placed on two islands, the gain in HU for terns would be 0.8. For Alternatives, 4,5 and 6, in which sand would be placed on one island, the gain in HU for terns was estimated to be 0.2.

Excavation of sand from a beach near the Entrance Channel, would destroy invertebrates living in the beach sand. Because a relatively small amount of sand would be excavated (23,000 cy if sand were placed on 2 islands and 10,000 cy if sand were placed on one island) and because invertebrates would recolonize the area from adjacent beach habitat, impacts of this alternative to benthic invertebrates would be adverse but insignificant. Earth moving equipment would be used to spread the sand on top of the tern island(s). Earthmoving equipment is relatively noisy. The noise level would be above 65 dBA for a distance of 792 ft. (237.8 m) around the island(s). Noise above 65 dBA might disturb birds within this radius. All of the Unit III basin is within this radius. Very little saltmarsh is within this area but a considerable amount of marine open water and intertidal mudflat habitat would be affected. Because this alternative would not be implemented during the breeding season and because the disturbance would occur for a maximum of 10 days (for two islands under Alternative 1), the impacts of disturbance to birds from equipment noise would be adverse but insignificant.

4.4.5.2 Construct Small Dendritic Channels through the Marsh

This alternative would construct one dendritic channel through Shellmaker Island. Construction of the channel would be a pilot project to identify the impacts and benefits of restoring dendritic channels through marsh areas. Construction of the channel is predicted to benefit birds using saltmarsh and intertidal mudflat habitats, by providing some protection from mammalian predators and human disturbance. The channel would also provide foraging opportunities to marsh birds by bringing fish and aquatic invertebrate prey into close proximity to protective marsh habitat. Finally the channel would increase circulation and water quality in the area. The modified-HEP analysis estimated that the total gain in HU for this habitat restoration measure would be 0.5.

Excavation of the channel would be done with a backhoe or other small piece of earthmoving equipment. Section 4.6.4.2 estimates that the noise of this equipment would reach 65 dBA at a distance of 500 ft. (150.1 m). This noise could be disturbing to birds in the majority of the saltmarsh habitat on Shellmaker Island. However, the excavation would not be done in the breeding season and it would only take 3 days to complete. Therefore the impacts of disturbance to birds from construction of a small channel on Shellmaker Island would be adverse but not significant.

4.4.5.3 Restoration of Wetlands in Filled Areas

This alternative would restore one or more filled areas to wetland habitat. Wetland species would be benefited by the creation of additional tidally influenced habitat in the bay. Three potential areas for wetlands restoration have been identified.

Northstar Beach. This alternative would create an island of intertidal mudflat surrounded by subtidal channels. Therefore, this alternative would benefit species that use marine open water habitat and species that use intertidal mudflat. The modified-HEP analysis in Appendix A predicted that the gain in HU for this alternative would be 1.38.

Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin. This alternative would restore intertidal mudflat habitat to about 3.7 acres of degraded uplands. All species that use intertidal mudflats would benefit. The modified-HEP anbalysis predicted that the gain in HU would be 1.29.

Dredge Spoil on Shellmaker Island. This restoration measure would restore approximately 3 acres of intertidal mudflat by excavating dredge spoil areas on Shellmaker Island. The modified-HEP analysis predicted that there would be a net gain of 1.17 HU from this restoration measure.

Because all of these areas identified for wetlands restoration are currently degraded uplands habitat, the conversion to wetlands would have little direct negative impacts to biological resources. There is some potential that saltmarsh birds-beak or other sensitive plant species may be present. Disturbance to a sensitive plant species would be a significant adverse impact. A sensitive plant survey should be done prior to excavation of any of these areas and if sensitive plants are found, they should be avoided. The excavation of these areas would most likely be done by dredge. Dredging noise and activity could disturb birds in the area surrounding the dredge. This disturbance was estimated to affect an area of about 178 ft. (53.5 m) around the dredge if a clamshell dredge were used and an area of about 126 ft. (37.8 m) if a hydraulic dredge were used. Because wetlands restoration would not be done in the breeding season, and because excavation of each of these areas would take between 12 days (for Shellmaker Island) and 14 days (for the land in the Unit I/III basin), the impacts of disturbance would be adverse but insignificant.

4.4.5.4 Restoration of Side Channels

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Each of these side channels would be excavated to a depth of -5 ft. (-1.5 m) MSL. Restoration of these side channels would provide some protection from mammalian predators and human disturbance for birds on the islands. Marine open water species would benefit from additional habitat. Finally, the side channels would improve circulation and water quality around the islands. The modified-HEP analysis in Appendix A predicted that the net gain in HU from excavation of a side channel on the west side of Middle Island would be 2.32. The modified-HEP model predicted that the net gain in HU from excavation of a side channel on the East Side of Shellmaker Island would be 3.19.

Excavation of the side channel on the west side of Middle Island would result in a loss of 3.0 acres of intertidal mudflat habitat. This is less than 2 percent of the intertidal mudflat habitat in Upper Newport Bay. Because the amount of intertidal mudflat that would be lost by implementation of this alternative is small, because the side channels were historically of subtidal depth, and because intertidal mudflat habitat on Middle Island would benefit from the increased protection provided by the channel, loss of intertidal habitat is considered to be an adverse but insignificant impact. Restoration of the side channel east of Shellmaker Island could result in a loss of as much as 3.5 acres of intertidal habitat. Again, this loss is considered an adverse but insignificant impact.

Dredging of the side channel(s) would be done during dredging of the Unit II basin area using a hydraulic dredge. Noise from the hydraulic dredge would disturb birds in an area of about 126 ft. (37.8 m) around the dredge. Because these channels would not be dredged during the breeding season and because dredging of the channels would take a short time (7 days for Middle Island and 8 days for Shellmaker Island), the impacts of noise on birds is considered to be adverse but insignificant.

4.4.5.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

This alternative would restore eelgrass to Shellmaker Island. It is estimated that 0.6 acre in these areas could be revegetated by eelgrass. Restoration would be done by SCUBA divers using small boats for support. Eelgrass stabilizes the substrate, increases productivity, and provides structure to the otherwise monotonous soft bottom habitat. Both fishes and benthic invertebrates have been found to be higher in abundance and diversity in eelgrass beds compared to unvegetated soft bottom habitat. Eelgrass improves habitat value for fishes by providing, structure, shelter and increasing the food base. The modified-HEP model in Appendix A predicted that restoration of 0.6 acre of eelgrass would provide 0.32 HU.

Eelgrass for revegetation would be collected by divers from beds in Lower Newport Bay. The existing beds, thus, would lose plants. The loss of eelgrass in existing beds would be insignificant because plants would be collected at intervals throughout the bed to insure there was no loss in total cover of the bed. The small holes created by the harvesting the plants would quickly be revegetated from the surrounding bed. Impacts would be insignificant.

Divers and their support boats would disturb an area of 100 ft. (30 m) or less around the area in which they were working. This disturbance would occur for a period of about 3 to 4 days. These impacts would be adverse but insignificant.

4.4.5.6 Removal of Segments of the Main Dike

This restoration measure would reduce disturbance to wetlands birds from humans and terrestrial predators by removing segments of the main dike. Segmentation of the dike would eliminate a heavily used access route into the marsh. Protection would primarily be from humans and their pets. The modified-HEP model (Appendix A) predicts that the total gain in HU from segmentation of the main dike would be 0.52.

A backhoe would work from the dike to remove the segments. Therefore, no direct disturbance to the marsh would occur. The noise from the backhoe would be above 65 dBA for a distance of about 500 ft. (150 m). However, it would take only about 1 day to segment the dike. The impacts from this proposed restoration measure would be insignificant.

4.4.6 Cumulative Impacts

Development of the watershed surrounding Upper Newport Bay is likely to increase human recreational use of the Bay and pressures on wildlife. By maintaining the quality of wetlands habitats in the Upper Bay, the Upper Newport Bay Restoration Project would help to some extent to offset human impacts. CDFG is developing a management plan for the Upper Newport Bay Ecological Reserve. The management plan would identify specific measures to reduce human intrusion into the Upper Newport Bay ecosystem.

As discussed in Section 4.3.5, increased development in the watershed could increase the input of pathogens and contaminants to the Bay. However, the San Diego Creek Watershed Study is identifying measures to improve the quality of water that enters the Upper Bay. The Upper Newport Bay Habitat Restoration project would act cumulatively with the maintenance of in-stream basins in San Diego Creek and other upstream controls and BMPs to improve water quality in Upper Newport Bay. Improved water quality would benefit fishes and aquatic invertebrates in Upper Newport Bay and would help to maintain a diverse aquatic ecosystem.

The proposed IRWD freshwater discharge into San Diego Creek may increase the freshwater influence in the upper basins. Increased freshwater influence would favor brackish and freshwater-tolerant species over more marine species and would decrease the overall diversity of the aquatic ecosystem. The expansion of the Unit III and (except for Alternative 5) Unit II basins by the Habitat Restoration Project would help to offset the negative impacts of increased freshwater discharge.

Development of Upper Newport Bay Regional Park would include habitat restoration and the development of interpretive facilities. Restoration of uplands habitat surrounding the Bay would increase the overall diversity of the ecosystem. Interpretive facilities would increase public awareness of the ecology of Upper Newport Bay and this increased awareness may decrease human intrusion.

The expansion and maintenance of the Unit II and Unit III basins as part of this project may reduce the need for dredging in Lower Newport Harbor and the Upper Bay marinas. Reduced dredging in the lower portions of the Bay would reduce disturbance to biological resources in those areas. If harbor dredging occurred concurrently with dredging of the Unit III and Unit II basins, two areas of localized disturbance would occur simultaneously within the Bay. Because disturbance around the dredge affects about 1 percent or less of the open water habitat in the Upper Bay at any one time, the cumulative impact of two concurrent dredging projects would be adverse but insignificant.

4.4.7 Environmental Commitments

Mitigation Measure 1: Avoid dredging activities within 200 ft. (60 m) of the least tern nesting island between April 15 and September 15.

To avoid disturbance by dredging noise and activity to the federal- and state-endangered California least tern during the breeding season, no dredging or other construction activity shall be conducted in the vicinity of the tern islands during the April 15 to September 15 breeding season.

Approvals Required: None

Timing: Include stipulations in project contracts before project activities begin. Avoid dredging activities near the tern islands between April 15 and September 15.

Monitoring Program: The County of Orange shall establish a monitoring program.

Reporting: Reports shall be submitted monthly during construction, or as required should there be any violations.

Standards for Compliance: Compliance with this measure will occur if the above time restrictions for activities near the tern islands are enforced. In addition, the absence of least terns on the tern islands at the end of the season should be confirmed by a qualified biologist before dredging activities near the tern islands resume.

Mitigation Measure 2: Avoid high density nesting areas of the federal- and state- endangered light-footed clapper rail and state-endangered Belding's savannah sparrow during the nesting season, and monitor nests of listed bird species near dredging activities.

To avoid disturbance by dredging noise and activity to listed saltmarsh birds (federal- and state-endangered light-footed clapper rail, state-endangered Belding's savannah sparrow) dredging or other construction activities should be avoided near high density nesting areas during the breeding season (March through September for the light-footed clapper rail, March through August for Belding's savannah sparrow). A qualified biologist approved by the U.S. Fish and Wildlife Service and California Department of Fish and Game shall monitor any nests by listed species that are near dredging activities. If disturbance is noted, project activities near the affected nest(s) shall cease until the after the breeding season.

Approvals Required: The qualifications of the biological monitor(s) shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.

Timing: Include stipulations in project contracts before project activities begin. Avoid high density nesting areas between March and September for the light-footed clapper and between March and August for Belding's savannah sparrow. The biological monitor shall monitor light-footed clapper rail nests near dredging activities between March and September and Belding's savannah sparrow nests between March and August.

Monitoring Program: The biological monitor shall monitor and document the behavior of listed bird species during dredging activities. The biological monitor shall monitor and report compliance of the dredging contractor to avoid impacts to nesting light-footed clapper rails and Belding's savannah sparrow.

Reporting: Monthly, during construction during the nesting season. A final report shall be submitted by the biological monitor to the Corps after the end of the nesting season.

Standards for Compliance: This measure will be complied with if disturbance to listed marsh bird species is avoided during the nesting season.

Mitigation Measure 3: Place floats along the channel perimeter of saltmarsh habitat during the March to September breeding season of the light-footed clapper rail. Monitor clapper rail nests to insure damage from the wakes of scows and tugs is not occurring.

To avoid damage to nests of the federal- and state- endangered light footed clapper rail from the wake of disposal scows and tugboats, floats shall be placed along the channel perimeter of saltmarsh habitat during the clapper rail breeding season of March through September. A qualified biologist approved by the U.S. Fish and Wildlife Service and California Department of Fish and Game shall monitor clapper rail nests near the channel. If damage from wakes is noted, scow traffic in channels near the nest shall be stopped until after all young in nests near the main channel have fledged.

Approvals Required: The qualifications of the biological monitor(s) shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.

Timing: Include stipulations in project contracts before project activities begin. Floats should be placed prior to the start of the March light-footed clapper rail breeding season. The biological monitor shall monitor light-footed clapper rail nests near the channel between March and September.

Monitoring Program: The biological monitor shall monitor and document the status of light-footed clapper rail nests near the navigation channel. The biological monitor shall monitor and report compliance of the dredging contractor to avoid impacts to light-footed clapper rail nests.

Reporting: Monthly, during construction during the nesting season. A final report shall be submitted by the biological monitor to the Corps after the end of the nesting season.

Standards for Compliance: This measure would be complied with if floats are placed along the channel perimeter near saltmarsh habitat, if the nests are monitored by a qualified biologist, and if the dredging contractor follows any instructions from the biological monitor to avoid damage to clapper rail nests.

Mitigation Measure 4: If a hydraulic dredge is selected, place booster pumps at least 150 ft. (45 m) away from saltmarsh habitat.

To avoid disturbance to listed marsh bird species (light-footed clapper rail and Belding's savannah sparrow), place booster pumps to move sediments in the pipes from the hydraulic dredge to the disposal scows at least 150 ft. (45 m) away from saltmarsh habitat.

Approvals Required: None

Timing: The location for the booster pumps should be established prior to the beginning of dredging.

Monitoring Program: The County of Orange shall establish a monitoring program to insure compliance.

Reporting: Prior to construction.

Standards for Compliance: Compliance with this measure will occur if booster pumps are placed over 150 ft. (45 m) from saltmarsh habitat.

Mitigation Measure 5: For the habitat restoration measure that would convert uplands to wetlands, conduct a sensitive plant survey to insure no sensitive plant species would be destroyed by the excavation of uplands habitat. If sensitive plants are observed, avoid disturbing areas where they occur.

Excavation of degraded uplands habitat to restore wetlands has the potential to disturb sensitive plant species. A survey by a qualified botanist approved by the U.S. Fish and Wildlife Service and California Department of Fish and Game would identify any sensitive plant populations in the proposed restoration area. If sensitive plants are identified the excavation footprint shall be revised to avoid disturbance to the sensitive plants.

Approvals Required: The qualifications of the botanist who performs the sensitive plant survey shall be submitted to the U.S. Fish and Wildlife Service and the California Department of Fish and Game for approval.

Timing: The sensitive plant survey shall be conducted during the project final design phase prior to any excavation in uplands habitat and at the proper time of year to identify sensitive plant species that have the potential to occur.

Monitoring Program: The County of Orange shall establish a monitoring program.

Reporting: The results of the sensitive plant survey shall be reported to the Corps of Engineers upon completion of the survey.

Standards for Compliance: Compliance with this measure will occur if the sensitive plant survey is conducted and any observed sensitive plant populations avoided.

4.5 AIR QUALITY

4.5.1 Significance Criteria

The South Coast Air Quality Management District (SCAQMD) has established air pollution thresholds against which a proposed project can be evaluated and assist lead agencies in determining whether or not the proposed project is significant. If the thresholds are exceeded by a proposed project, then it should be considered significant. Separate impact criteria have been established for both short-term construction and long-term operations. Because the project involves only short-term air quality emissions, construction impact criteria are applicable to the project.

Construction Phase - Thresholds of Significance

The SCAQMD sets threshold standards for assessing construction-term impacts, which are averaged over a 3-month period to include only actual working days. The following significance thresholds for air quality have been established by the SCAQMD on a daily basis for construction emissions:

- 75 pounds per day for Reactive Organic Gases (ROG)
- 100 pounds per day for oxides of nitrogen (NO_X)
- 550 pounds per day for carbon monoxide (CO)
- 150 pounds per day for particulate matter less than 10 micrometers in diameter (PM_{10})
- 150 pounds per day of oxides of sulfur (SO_X)

The following significance thresholds for air quality have been established by the SCAQMD on a quarterly basis for construction emissions:

- 2.5 tons per quarter of ROG
- 2.5 tons per quarter of NO_X
- 24.75 tons per quarter of CO
- 6.75 tons per quarter of PM_{10}
- 6.75 tons per quarter of SO_X

During construction, if any of the identified daily or quarterly air pollutant thresholds are exceeded by the proposed project, then the project's air quality impacts may be considered significant.

The SCAQMD has indicated in Chapter 6 of their *Handbook*, that they consider a project to be mitigated to a level of insignificance if its primary effects are mitigated below the thresholds provided above.

4.5.2 No Project Alternative

Under the No Project Alternative there would be no dredging within the Upper Bay ecological reserve or disposal of materials. No new emissions would be produced and no air quality impacts are projected. While recreational activities may be slightly curtailed (i.e., canoeing and sightseeing), any air quality benefits associated with these activities would be small and inconsequential. Additionally, silt which accumulates in the Upper Bay would eventually work its way down into the navigational channel and could therefore require subsequent dredging in those areas; they are not a part of the project at hand and would not be addressed further in this analysis.

4.5.3 Sediment Control Alternatives

4.5.3.1 Alternative 1

Construction

Exhaust Emissions

This analysis deals specifically with the emissions produced by the use of clamshell and hydraulic dredging and quantifies daily emissions associated with each. Emissions are presented on a daily basis and compared to the daily criteria noted in Section 4.5.1, above. Because construction is also subject to quarterly criteria, subsequent sections of this analysis would describe differences associated with differing dredge methods and compare these to the quarterly criteria.

With Clamshell Dredge

Under this scenario, dredging would be conducted from a floating barge by a crane equipped with a 5 cy grab bucket or by a CAT backhoe, also using a 5 cy bucket. As material is removed, it is placed on a scow with a 1,500 cy capacity. Dredge operations are projected to occur 24 hours per day, 6 days per week with 276 days of operation. A tug boat would be used to position the scow and move it to the end of Shellmaker Island where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to a disposal site at LA-3. Round-trip travel time is approximately 4 hours and three trips are projected on a daily basis. Both the dredge and tugs are expected to use diesel-powered generators for night-lighting. A guide boat would accompany the tug and barge movements and a survey boat would monitor all operations every 2 days. A quality control boat would be used daily. Fueling is expected to occur every 2 to 3 days and seven workers are projected to perform these operations. However, these operations are extremely minor and the associated emissions are minuscule when compared with those produced by the dredge and tugs and would not change the results of the analysis. Table 4.5-1 lists the projected horsepower (hp) ratings and daily hours of operations used in calculating emissions associated with the equipment.

Table 4.5-1
Equipment Operations and Horsepower Ratings
Used in Clamshell Dredging Emissions Calculations

Emission Source	Number	Horsepower	Total Hours per Day
Dredge	1	1,000	24
Tugboats	2	1,600	15[1]
Miscellaneous Boats	3	50	17[2]
Generators	3	250	19.5[3]

[1] Includes three round-trips of 1 hour for dredge to Shellmaker Island and three round-trips of 4 hours for LA-3 disposal.
[2] Includes one boat at 3 hours of tug escort to Shellmaker Island, one boat at 12 hours for tug escort to LA-3 disposal, and one boat at 2 hours for survey and QC.
[3] Assumes that the barge and each tug are equipped with a generator and each generator operates half of the time (e.g., at night) during these operations

For the purposes of this analysis, it is assumed that the dredge is pushed into position by the tug boat. The clamshell would use a diesel engine of approximately 1,000 hp. However, once the dredge is in-place very little actual movement would be required and any emissions associated with its movement would be inconsequential as it could be accomplished using the tug which would transport sediment to Shellmaker Island. Furthermore, while the dredge is being moved, it would in all probability not be operational (i.e., dredging) and therefore any emissions associated with its movement would not exceed those produced during actual dredging operations which are expected to run continuously 24 hours per day.

As noted, intermittently, the dredge or tugs would require fueling. However, this too is considered insignificant as these vessels can typically sustain for several days operating 24 hours per day before refueling and fuel depots are located proximate to project operations. Additionally, crew boats would transfer personal and materials to the dredge. These boats would launch out of the local marina and when compared to the emissions produced by the dredge and tug, would not add substantially to daily emissions.

As noted, dredged sediments would be loaded on a scow for subsequent delivery. This scow would be pulled using a tug boat. Another tug is then used to transfer these sediments to the LA-3 disposal area. Tugs can be powered by engines ranging in size from a few hundred hp to as much as 3,600 hp. A value of 1,600 hp was used in ascertaining vessel emissions. To derive tug emissions fuel consumption must first be ascertained. Presented below are the specifics for marine vessel fuel consumption.

Fuel Type	Diesel
Fuel Density, lb/gal	7.12
Specific Fuel Consumption, lb/hp/hr	0.40
Idle Load Factor	0.20
Maneuver Load Factor	0.50
Cruise Load Factor	0.80

Because of the short distance between the dredge site and Shellmaker Island, the in-bay tug is assumed to make a round-trip in 1 hour and three round-trips are assumed on a daily basis. The tug is assumed to operate at idle for 20 minutes per round-trip and maneuver for 40 minutes per round-trip. Note that because of the relatively short distance, this tug is never assumed to get to "cruise." Thus, 1 hour is spent at idle while 2 hours are spent maneuvering on a daily basis. The tug which takes the scows from Shellmaker Island to LA-3 is also expected to be at idle for 30 minutes per round-trip and maneuver for 90 minutes per round trip as it operates within the bay and at the LA-3 site. Once out in open ocean, the remaining 2 hours of the round-trip are assumed to be in cruise. Therefore, all told, the two tugs operate at idle for 2.5 hours, at maneuver for 6.5 hours, and cruise for 6 hours. Emissions for these tugs are based on Table II-3.3 included within AP-42, A Compilation of Air Pollutant Emission Factors (EPA, 1985). Based on a rating of 1,600 hp, the tugs would consume approximately 18 gallons per hour at idle, 45 gallons per hour when maneuvering, and 72 gallons per hour at cruise. Therefore, based on the noted hours of operation, the two tugs could consume approximately 770 gallons per day. Crew boat hours are expected to mirror the tugs' hours by operational phase. Therefore, crew boats are projected to operate at idle for 2.8 hours per day, maneuver for 7.4 hours per day, and cruise for 6.8 hours per day and fuel consumption is estimated at 27 gallons per day. Table 4.5-2 outlines the projected emissions associated with the use of clamshell dredging.

Note that NO_X emissions are projected to exceed both the daily and quarterly criteria for clamshell dredging operations.

Table 4.5-2
Daily and Quarterly Emissions for Vessels and Equipment Associated with Clamshell Dredging (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Dredge[1]	132.0	312.0	15.4	9.7[2]	16.8
Tug Boats[3]	65.1	382.6	23.4	23.9	23.2
Crew Boats[4]	3.8	9.2	4.9	0.7	0.8
Generators[5]	26.8	63.4	3.1	2.0[2]	3.4
Total Daily Emissions	227.7	767.2	47.2	36.3	44.2
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	Yes	No	No	No
Total Quarterly Emissions (tons)[6]	8.0	26.9	1.7	1.3	1.5
SCAQMD Daily Significance Criteria (tons)	24.75	2.5	2.5	6.75	6.75
Exceeds Quarterly Significance Threshold?	No	Yes	No	No	No

1 Based on a 1,000 hp diesel engine operating 24 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
2 Based on a sulfur content of 0.05 percent as directed by SCAQMD Rule 431.2.
3 See text for hp and hours of operation. Emission factors for CO, NO_X and ROG are as per AP-42, 1985, Table II-3.3. Emission factors for SO_X and PM_{10} are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
4 See text for hp and hours of operation. Emission factors for CO, NO_X, ROG, and SO_X are as per AP-42, 1985, Table II-3.5. Emission factors for PM_{10} are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
5 Based on a 250 hp diesel engine operating 19.5 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
6 Assumes 70 days operation per quarter.

With Hydraulic Dredge

Under this scenario, dredging would be conducted from a floating hydraulic dredge of modest size (approximately 440 hp). Dredge operations are projected to occur 24 hours per day, 6 days per week with 243 days of operation. As sediment material is removed, it pumped to a scow located at Shellmaker Island. Three booster pumps each of about 400 hp would be used in the pumping operations. A fourth pump of similar size is assumed for scow dewatering. While these pumps could be either electric- or diesel-powered; as a reasonable worst-case scenario, diesel is assumed. An ocean-going tug would then move the scow(s) to a disposal site at LA-3. Round-trip travel time is approximately 4 hours and three trips are projected on a daily basis. Both the dredge and tugs are expected to use diesel-powered generators for night-lighting. As with clamshell operations, three small boats would be used to assist the operations. Table 4.5-3 lists the projected hp ratings and daily hours of operations used in calculating emissions associated with the equipment.

Table 4.5-3
Equipment Operations and Horsepower Ratings
Used in Hydraulic Dredging Emissions Calculations

Emission Source	Number	Horsepower	Total Hours per Day
Hydraulic Dredge	1	440	24
Pumps	4	400	96
Tugboats	1	1,600	12[1]
Miscellaneous Boats	3	50	14[2]
Generators	2	250	18[3]

[1] Includes three round-trips of 1 hour for dredge to Shellmaker Island and three round-trips of 4 hours for LA-3 disposal.
[2] Includes one boat at 12 hours for tug escort to LA-3 disposal, and two boats at 1 hour each for survey and QC.
[3] Assumes that the barge and tug are equipped with a generator and each generator operates half of the time (e.g., at night) during these operations

As with clamshell operations, the tug which takes the scows from Shellmaker Island to LA-3 is also expected to be at idle for 30 minutes per round-trip and maneuver for 90 minutes per round trip as it operates within the bay and at the LA-3 site. Once out in open ocean, the remaining 2 hours of the round-trip are assumed to be in cruise. Emissions for the tug are based on Table II-3.3 included within AP-42, A Compilation of Air Pollutant Emission Factors (EPA, 1985). As with clamshell operations, based on a rating of 1,600 hp, the tug would consume approximately 18 gallons per hour at idle, 45 gallons per hour when maneuvering, and 72 gallons per hour at cruise. Therefore, based on the noted hours of operation, the tug could consume approximately 661.5 gallons per day. Crew boat hours are expected to mirror the tugs' hours by operational phase. Therefore, crew boats are projected to operate at idle for 1.75 hours per day, maneuver for 5.25 hours per day, and cruise for 7 hours per day and fuel consumption is estimated at 24 gallons per day. Table 4.5-4 outlines the projected emissions associated the use of hydraulic dredging.

Note that NO_X emissions are projected to exceed both the daily and quarterly criteria and are roughly 35 percent greater then would be projected for clamshell dredging operations. Table 4.5-5 compares the total emissions for the two types of dredging.

Based on the reduced time schedule for hydraulic dredging, total NO_X are approximately 20 percent greater than clamshell dredging as opposed to about 35 percent greater on either a daily or quarterly basis.

Dust Emissions

Dredged sediments would be saturated with sea water and would not be expected to raise substantial quantities of dust. As such, no dust impacts are projected for either clamshell of hydraulic dredging and dust would not be addressed further in this analysis.

Odor Emissions

Sediments to be placed on the scows would not be situated in populated areas, nor would they contain a high level of organic debris and thus, while an odor may be noted, it would be typical of any odor associated with low tide conditions. This impact is therefore considered as potentially adverse, but not significant and will not be addressed further in this analysis.

Table 4.5-4
Daily and Quarterly Emissions for Vessels and Equipment Associated with Hydraulic Dredging (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Hydraulic Dredge[1]	58.1	137.3	6.8	4.3[2]	7.4
Pumps[3]	211.2	499.2	24.6	15.5[2]	26.9
Tug Boat[3]	50.1	347.3	17.4	20.6	19.9
Crew Boats[4]	3.4	8.2	4.3	0.6	0.7
Generators[5]	24.8	58.5	2.9	1.8[2]	3.2
Total Daily Emissions	347.6	1,050.5	56.0	42.8	58.1
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	Yes	No	No	No
Total Quarterly Emissions (tons)[6]	12.2	36.8	2.0	1.5	2.0
SCAQMD Daily Significance Criteria (tons)	24.75	2.5	2.5	6.75	6.75
Exceeds Quarterly Significance Threshold?	No	Yes	No	No	No

1 Based on a 440 hp diesel engine operating 24 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
2 Based on a sulfur content of 0.05 percent as directed by SCAQMD Rule 431.2.
3 Based on four 400 hp diesel engines each operating 24 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
4 See text for hp and hours of operation. Emission factors for CO, NO_X and ROG are as per AP-42, 1985, Table II-3.3. Emission factors for SO_X and PM_{10} are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
5 Based on a 250 hp diesel engine operating 18 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
6 Assumes 70 days operation per quarter.

Table 4.5-5
Total Alternative 1 Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	31.4	105.9	6.5	5.0	6.1
Hydraulic Operations[2]	42.2	127.6	6.8	5.2	7.1

1 Based on 276 days of construction.
2 Based on 243 days of construction.

Post Construction

Post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width. While this could be construed as an operational phase and subject to operational criteria, in actuality, based on the equipment used and its infrequent occurrence, it is more like construction and such for the purposes of this analysis subject to the same criteria as noted for construction, above.

The need for maintenance dredging is a function of time and weather conditions. Obviously, wet weather would require more frequent dredging as sediments are washed into the bay. Assuming a similar mix of equipment, daily dredging operations, when required, would produce a similar level of emissions as noted for construction. Additionally, based on the provided analysis, significant NO_X impacts would be projected on both a daily and quarterly basis with hydraulic dredging producing roughly 35 percent more NO_X than clamshell dredging. However, the time frame necessary for the dredging is dependant on the type of dredging performed. Table 4.5-6 compares the total emissions for the two types of dredging.

Table 4.5-6
Total Alternative 1 Post-Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	32.7	110.1	6.8	5.2	6.3
Hydraulic Operations[2]	38.2	115.6	6.2	4.7	6.4
[1] Based on 287 days of post-construction. [2] Based on 220 days of post-construction.					

4.5.3.2 Alternative 4

Construction

Under this scenario, clamshell dredging operations would require 873 days while hydraulic dredging would be extended to 848 days. Assuming a similar level of activity as noted for Alternative 1, daily and quarterly emissions for either type of dredging operations would be similar to those projected for Alternative 1 and NO_X emissions would be expected to exceed both their daily and quarterly criteria producing a significant impact. Table 4.5-7 presents the total projected volumes of construction emissions associated with each type of dredging operations.

Table 4.5-7
Total Alternative 4 Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_{XX}	PM_{10}
Clamshell Operations[1]	99.4	334.9	20.6	15.8	19.3
Hydraulic Operations[2]	147.4	445.4	23.7	18.1	24.6
[1] Based on 873 days of construction. [2] Based on 848 days of construction.					

Post Construction

As with Alternative 1, post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width and is a function of time and weather conditions. Assuming a similar mix of equipment, daily dredging operations, when required, would produce a similar level of emissions as noted for construction. Additionally, based on the provided analysis, significant NO_X impacts would be projected on both a daily and quarterly basis. However, the total volume of emissions is dependant on both the type of dredging performed and the projected duration of this dredging. Table 4.5-8 presents these total projected emissions.

Table 4.5-8
Total Alternative 4 Post-Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	87.8	295.8	18.2	14.0	17.0
Hydraulic Operations[2]	116.6	352.4	18.8	14.4	19.5
[1] Based on 771 days of post-construction. [2] Based on 671 days of post-construction.					

4.5.3.3 Alternative 5

Construction

Under this scenario, clamshell dredging operations would require 299 days while hydraulic dredging would be extended to 274 days. Assuming a similar level of activity as noted for Alternative 1, daily and quarterly emissions for either type of dredging operations would be similar to those projected for Alternative 1 and NO_X emissions would be expected to exceed both their daily and quarterly criteria producing a significant impact. Table 4.5-9 presents the total projected volumes of construction emissions associated with each type of dredging operations.

Post Construction

As with Alternative 1, post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width and is a function of time and weather conditions. Assuming a similar mix of equipment, daily dredging operations, when required, would produce a similar level of emissions as noted for construction and significant NO_X impacts would be projected on both a daily and quarterly basis. Table 4.5-10 presents the total projected emissions for each type of dredging operation.

Table 4.5-9
Total Alternative 5 Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	34.0	114.7	7.1	5.4	6.6
Hydraulic Operations[2]	47.6	143.9	7.7	5.9	8.0
[1] Based on 299 days of construction. [2] Based on 274 days of construction.					

Table 4.5-10
Total Alternative 5 Post-Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	37.5	126.2	7.8	6.0	7.3
Hydraulic Operations[2]	45.7	138.1	7.4	5.6	7.6
[1] Based on 329 days of post-construction. [2] Based on 263 days of post-construction.					

4.5.3.4 Alternative 6

Construction

Under this scenario, clamshell dredging operations would require 507 days while hydraulic dredging would be extended to 651 days. Again assuming a similar level of activity as noted for Alternative 1, daily and quarterly emissions for either type of dredging operations would be similar to those projected for Alternative 1 and NO_X emissions would be expected to exceed both their daily and quarterly criteria producing a significant impact. Table 4.5-11 presents the total projected volumes of construction emissions associated with each type of dredging operations.

Table 4.5-11
Total Alternative 6 Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	57.7	194.5	12.0	9.2	11.2
Hydraulic Operations[2]	92.8	280.5	15.0	11.4	15.5
[1] Based on 507 days of construction. [2] Based on 651 days of construction.					

Post Construction

As with Alternative 1, assuming a similar mix of equipment, daily dredging operations, when required, would produce a similar level of emissions as noted for construction and significant NO_X impacts would be projected on both a daily and quarterly basis. Table 4.5-12 presents the total projected emissions for each type of dredging operation.

Table 4.5-12
Total Alternative 6 Post-Construction Emissions for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Operations[1]	54.2	182.6	11.2	8.6	10.5
Hydraulic Operations[2]	92.8	280.5	15.0	11.4	15.5
[1] Based on 476 days of post-construction. [2] Based on 534 days of post-construction.					

4.5.3.5 Comparison of the Alternatives

As noted in Section 4.5.1, the significance of any potential air quality impacts is based on both daily and quarterly emissions criteria. Thus, based on SCAQMD methodology, it makes no difference to the impact analysis if a construction project goes on for 1 year or 50 years. However, for comparison purposes, the total volume of emissions associated with each alternative is presented in Table 4.5-13. Note that these values are based on current technology and when maintenance dredging is considered, the project could go on for 50 years as was projected in this analysis. Its would certainly be expected that as future air quality rules become more stringent, future equipment emissions would be reduced and the values presented in the table overestimate actual emissions. Still, as a reasonable worst-case scenario, the presented emissions represent an overall basis for comparison between the various alternatives.

Table 4.5-13
Total Emissions for Both Clamshell and Hydraulic Dredging Operations by Alternative (tons)

Emission Source	Total Days	CO	NO_X	ROG	SO_X	PM_{10}
Alternative 1						
Clamshell Operations	2,285	260.1	876.5	53.9	41.5	50.5
Hydraulic Operations	1,790	311.1	940.2	50.1	38.3	52.0
Alternative 4						
Clamshell Operations	2,415	274.9	926.4	57.0	43.8	53.4
Hydraulic Operations	2,190	380.6	1,150.3	61.3	46.9	63.6
Alternative 5						
Clamshell Operations	1,949	221.9	747.6	46.0	35.4	43.1
Hydraulic Operations	1,589	276.2	834.6	44.5	34.0	46.2
Alternative 6						
Clamshell Operations	1,459	166.1	559.7	34.4	26.5	32.2
Hydraulic Operations	1,719	298.8	902.9	48.1	36.8	49.9

4.5.3.6 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

With Clamshell Dredge

As noted in the previous analysis, both daily and quarterly NO_X emissions are projected to exceed their respective criteria producing a significant impact. The mobile nature of the types of equipment used in dredging is such that no receptors are exposed to any significant offsite concentrations of equipment exhaust for any length of time. Applicable mitigation measures include the use of the Best Available Control Technology (BACT). These BACT measures include:

- Maintain equipment in tune as per manufacturer's specifications.
- Utilize catalytic converters on gasoline-powered equipment.
- Utilize an electric dredge, if feasible.
- If an electric dredge is not feasible, utilize selective catalytic reduction and ammonia injection on the dredge.

- Install high pressure fuel injectors.

- Use reformulated, low-emissions diesel fuel.

- Where applicable, equipment would not be left idling for prolonged periods.

- Curtail (cease or reduce) construction during periods of high ambient pollutant concentrations (e.g., Stage I smog alerts).

- Reduce the number of pieces of equipment involved thereby extending the construction period.

- Retard diesel engine fuel injection timing by 2 degrees on the tug boats. (Note that in accordance with AP-42, this measure is already assumed in the analysis for both the dredges, pumps, and generators.)

The inclusion of these mitigation measures would reduce emissions to the maximum extent feasible.

If the dredge, its generator, and pumps, can be replaced by an electric unit of similar horsepower rating, emissions can be substantially reduced. Table 4.5-14 illustrates the magnitude of this reduction. Table 4.5-15 goes on to quantify the emissions associated with and electrified clamshell dredge and its on-board generator and SCR on the tugs. Table 4.5-16 presents a similar scenario using an electrified hydraulic dredge and its on-board generator and associated pumps as well as SCR on the tugs. Based on the expense to change this equipment over, both the crew boats and the generators situated on the tugs are assumed to remain unconverted, diesel-powered.

If an electric dredge is not feasible, the use of SCR and ammonia injection both on the dredge and on the tugs is projected to reduce NO_X and ROG by 80 percent and particulate matter by 50 percent for these pieces of equipment (California Air Resources Board, 1992). While the use of an electric dredge and SCR and ammonia injection on all other diesel-powered equipment, or even the use of SCR and ammonia injection on all diesel-powered equipment, including the dredge could reduce both daily and quarterly levels of all emissions, NO_X emissions would still exceed both daily and quarterly threshold levels and a significant unavoidable impact is projected. However, in this case the hydraulic dredge would produce fewer emissions than the clamshell dredge.

Table 4.5-14
Daily Emissions Associated with the Use of an Electric Versus Diesel Dredge, Generator, and Pumps[1]

Alternative	Power Rating	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell dredge and on-board generator	27,000 hp-hr/day	148.5	351.0	17.3	10.9	18.9
	27,000 kw-hr/day[2]	5.4	31.1	0.3	3.2	1.1
Hydraulic dredge, on-board generator and four pumps	51,960 hp-hr/day	285.8	675.5	33.3	21.0	36.4
	51,960 kw-hr/day[2]	10.4	59.8	0.5	6.2	2.1

[1] Electric dredge includes electric ancillary equipment whereas a diesel dredge includes diesel ancillary equipment. Each upper row represents the use of diesel equipment while the lower row represents the use of electric equipment.

[2] Assumes a 75 percent conversion efficiency. Emission factors based on SCAQMD Handbook, Table A9-11-B.

Table 4.5-15
Emissions Associated with the Use of an Electric Clamshell Dredge and its On-Board Generator and SCR and Ammonia Injection on the Tug Boat (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Clamshell Dredge and on-board generator[1]	5.4	31.1	0.3	3.2	1.1
Tug Boats[2]	65.1	76.5	4.7	23.9	11.6
Crew Boats	3.8	9.2	4.9	0.7	0.8
Generators[3]	10.3	24.4	1.2	0.8	1.3
Total Daily Emissions	84.6	141.2	11.1	28.6	14.8
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	Yes	No	No	No
Total Quarterly Emissions (tons)[4]	3.0	4.9	0.4	1.0	0.5
SCAQMD Daily Significance Criteria (tons)	24.75	2.5	2.5	6.75	6.75
Exceeds Quarterly Significance Threshold?	No	Yes	No	No	No

[1] Based on a 27,000 kw-hr/day and includes the dredge and on-board generator.
[2] Assumes an 80 percent control efficiency for NO_X and ROG and 50 percent for PM_{10}.
[3] Based on a 250 hp diesel engine operating 7.5 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.

Table 4.5-16
Emissions Associated with the Use of an Electric Hydraulic Dredge and its On-Board Generator and SCR and Ammonia Injection on the Tug Boat (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Hydraulic Dredge, on-board generator and assorted pumps[1]	10.4	59.8	0.5	6.2	2.1
Tug Boat[2]	50.1	69.5	3.5	20.6	10.0
Crew Boats	3.4	8.2	4.3	0.6	0.7
Generators[3]	8.3	19.5	1.0	0.6[2]	1.1
Total Daily Emissions	72.2	118.0	9.3	28.0	13.9
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	Yes	No	No	No
Total Quarterly Emissions (tons)[4]	2.5	4.1	0.3	1.0	0.5
SCAQMD Daily Significance Criteria (tons)	24.75	2.5	2.5	6.75	6.75
Exceeds Quarterly Significance Threshold?	No	Yes	No	No	No

[1] Based on a 51,960 kw-hr/day and includes the dredge and its on-board generator and the booster and dewatering pumps.
[2] Assumes an 80 percent control efficiency for NO_X and ROG and 50 percent for PM_{10}.
[3] Based on a 250 hp diesel engine operating 6 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[4] Assumes 70 days operation per quarter.

Because the NO_X impact remains significant, further mitigation was investigated. The only additional mitigation available would require that daily operations be restricted. Under the clamshell dredging alternative both daily and quarterly NO_X emissions could be reduced to less than significant levels by reducing daily operations by half (i.e., 12 hours per day). This would reduce daily NO_X levels to approximately 70.6 pounds and quarterly levels to 2.471 tons. Alternatively, if operations were restricted to 5 days a week, daily operations could proceed for 14.5 hours. Daily NO_X levels are then projected at 85.3 pounds while quarterly levels (including 10 percent downtime) are projected at 2.473 tons.

Under the hydraulic dredging scenario, to maintain a 6 day work-week, daily operations would have to be reduced to 14.5 hours. Resultant NO_X emissions are then calculated at 71.3 pounds per day or 2.496 tons per quarter. Alternatively, if operations were restricted to 5 days a week, daily operations could proceed for 17.5 hours. Daily NO_X levels are then projected at 86.0 pounds per day while quarterly levels are projected at 2.495 tons.

Although reducing the hours of operation could reduce NO_x emissions to insignificant if all the other BMPs were implemented and an electric dredge were used, a reduction in operating hours would approximately double the time to complete the project. Extending the length of time to complete the project would extend the length of time that all of the project impacts would occur and is considered unacceptable. Doubling the amount of time to complete the project is, thus, not considered a feasible mitigation measure and air quality impacts would remain significant.

For either type of operation, if SCR and ammonia injection on the tug boats is infeasible, the impact would remain significant. Limitations on daily production alone could not meet the impact criteria as a single trip to the disposal site would exceed NO_X limitations.

4.5.4 <u>Habitat Restoration Alternatives</u>

Under the habitat restoration alternatives dredging would be performed as described for the various alternatives noted above. However, relatively small portion of the dredged material would be used in the construction of habitat areas within the bay. The impact of this construction is addressed by alternative.

4.5.4.1 Addition of Sand to Least Tern Islands

Under this alternative, the vast majority of the dredging operation, and resultant emissions would be as described in Section 4.5.3, above. However, for Alternative 1, sand would be added to both of the existing tern islands in the upper basin. Alternatives 4, 5, and 6 would place sand in the southern island. In either case, this sand would be excavated by backhoe and loaded on a barge via two front-end loaders for delivery to the island(s). Once at the island, this sand would be spread by heavy equipment. This analysis assumes the use of two front-end loaders for spreading the material. Excavation and spreading would occur on alternate days and are not assumed to overlap. As with the prior analysis, a 1,600 hp tug boat is assumed to maneuver the barge and is estimated at an hour for each of the 2 days with 30 minutes at idle and 30 minutes for maneuvering. Relatively few workers would be required to commute to the site, however, the emissions associated with their automobiles are minuscule and would not change the results of the provided analysis. The emissions associated with this equipment averaged from the two days (i.e., 1 day's use of the backhoe and two loaders to load sand, 2 hours use of the tug, and 1 days use of the two loaders to remove and spread the sand) and included in Table 4.5-17. Note that these operations are not projected to exceed the daily criteria and because of their limited duration would not exceed quarterly criteria. However, if these operations are conducted in conjunction with the alternatives as outlined above, they would add to the daily totals and NO_X impacts would be significant on both a daily and quarterly basis and would slightly raise the total project-generated emissions.

Table 4.5-17
Daily Emissions for Vessels and Equipment Associated with Tern Island Restoration (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Loaders[1]	9.2	30.4	3.7	2.9	2.7
Backhoe[2]	2.7	6.8	0.6	0.6	0.6
Tug Boat[3]	4.8	9.3	2.6	1.0	0.9
Total Daily Emissions	16.7	46.5	6.9	4.5	4.2
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	No	No	No	No

[1] Based on a total of 16 hours' use of wheel loaders per day. Emission factors are as per AP-42, 1985, Table II-7.1.
[2] Based on a total of 4 hours' use of a miscellaneous piece of heavy construction equipment per day. Emission factors are as per AP-42, 1985, Table II-7.1.
[3] See text for hp and hours of operation. Emission factors for CO, NO_X and ROG are as per AP-42, 1985, Table II-3.3. Emission factors for SO_X and PM_{10} are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.

4.5.4.2 Construct Small Dendritic Channels Though the Marsh

Under this alternative a backhoe would be used to construct a channel though the Shellmaker Island. This material would then be loaded onto a barge for subsequent delivery to LA-3. Emissions for this operation are included in Table 4.5-18. Note that in this case, only the two pieces of heavy equipment are considered as the delivery of this material to LA-3 would be accomplished with the on-going dredge operations thereby extending total dredge operations by approximately 2 days. The two pieces of equipment could perform the work in approximately three days time.

Table 4.5-18
Daily Emissions for Equipment Associated with Dendritic Channel Excavation (pounds/day)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Loader[1]	4.6	15.2	1.8	1.5	1.4
Backhoe[2]	5.4	13.6	1.2	1.2	1.2
Total Daily Emissions	10.0	28.8	3.0	2.7	2.6
SCAQMD Daily Significance Criteria	550	100	75	150	150
Exceeds Daily Significance Threshold?	No	No	No	No	No

[1] Based on a total of 8 hours' use of wheel loaders per day. Emission factors are as per AP-42, 1985, Table II-7.1.
[2] Based on a total of 8 hours' use of a miscellaneous piece of heavy construction equipment per day. Emission factors are as per AP-42, 1985, Table II-7.1.

4.5.4.3 Restoration of Wetlands in Filled Areas

Under this alternative, additional dredging would be performed to restore wetlands areas within the bay. Each restoration opportunity could use either the clamshell or hydraulic dredge and daily emissions associated with their use is as previously described. As such, the project could exceed both daily and quarterly NO_X criteria producing a significant impact. Furthermore, the total volume of emissions would be augmented. Table 4.5-19 provides a rough estimation of the additional emissions which would be expected for each type of dredging activity by restoration opportunity.

Table 4.5-19
Total Additional Emissions Associated with Each Restoration Opportunity for Both Clamshell and Hydraulic Dredging Operations (tons)

Emission Source	CO	NO_X	ROG	SO_X	PM_{10}
Northstar Beach[1]					
Clamshell Operations	1.5	4.8	0.3	0.2	0.3
Hydraulic Operations	2.2	6.9	0.2	0.3	0.4
Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin[2]					
Clamshell Operations	1.6	5.4	0.3	0.2	0.3
Hydraulic Operations	2.4	7.4	0.4	0.3	0.4
Dredge Spoil on Shellmaker Island[3]					
Clamshell Operations	1.3	4.6	0.3	0.2	0.3
Hydraulic Operations	2.1	6.3	0.3	0.3	0.3

1 Based on 13 days of construction.
2 Based on 14 days of construction.
3 Based on 12 days of construction.

4.5.4.4 Restoration of Side Channels

Under this alternative material would be dredged to the west side of Middle Island and/or east side of Shellmaker Island. This would be accomplished using the hydraulic dredge and the use of a clamshell is not proposed here. Daily emissions would approximate those noted for Alternative 1 and NO_X emissions would be expected to exceed their daily criterion. Furthermore, because these operations would be conducted sequentially with channel dredging, quarterly NO_X emissions would also be expected to exceed their criterion. The restoration of these side channels would then augment the total project-generated emissions. Table 4.5-20 provides a rough estimation of the additional emissions which would be expected for this dredging activity.

4.5.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

This alternative would relocate eelgrass to portions of the Upper Bay. The procedure would require four to six SCUBA divers. All work would be done by hand and the only required equipment would be a small boat of about 50 hp. Based on the small number of required divers, emissions due to their commuting to the side would be inconsequential when compared with the overall dredging program. Assuming that the crew boats is used 1 hour per day it would produce about 0.6 pound of NO_X or about 1.8 pounds over a period of 3 days. When the project is viewed as a whole, this value is also inconsequential.

Table 4.5-20
Total Additional Emissions Associated with Side Channel Hydraulic Dredging Operations (tons)

CO	NO_X	ROG	SO_X	PM_{10}
Middle Island				
1.2	3.7	0.2	0.2	0.2
Shellmaker Island				
1.4	4.2	0.2	0.2	0.2
Both Islands				
2.6	7.9	0.4	0.4	0.4

[1] Based on 7 days of construction.
[1] Based on 8 days of construction.
[1] Based on 15 days of construction.

4.5.4.6 Removal of Segments of the Main Dike

Under this alternative, a backhoe would remove portions of the main dike. The backhoe would be transported to the dike aboard a small barge. This operations is estimated to require less than 1 day and any emissions associated with this equipment would be inconsequential when compared to the dredging operations as a whole.

4.5.5 Cumulative Impacts

The project is projected to create both daily and quarterly impacts for NO_X. Aggressive implementation of the provided mitigation measures can minimize pollutant construction impacts. Construction would reduce emissions associated with future dredging projects by reducing the need and frequency for future dredging. Therefore, the proposed project would provide insignificant and beneficial cumulative air quality impacts within the region.

4.5.6 CO Microscale Analysis

As noted in the SCAQMD Handbook, the long-term effects of projects are required to demonstrate that vehicle trips associated with their implementation would not create or add to the severity of exceedance conditions of either the State or Federal Ambient Air Quality Standards. Because the project is of limited duration, a CO analysis is not required in this situation. Furthermore, because the project only generates minimal construction worker trips, they would not degrade the level of service on local roadways or freeways.

4.5.7 Air Quality Management Plan (AQMP) Consistency Analysis

CEQA requires that projects be consistent with the AQMP. A consistency determination plays an essential role in local agency project review by linking local planning and unique individual projects to the AQMP in the following ways. It fulfills the CEQA goal of fully informing local agency decision-makers of the environmental costs of the project under consideration at a stage early enough to ensure that air quality concerns are fully addressed. And, it provides the local agency with ongoing information assuring local decision-makers that they are making real contributions to clean air goals contained in the AQMP. Only new or amended General Plan elements, Specific Plans, and significant projects need to undergo a consistency review. This is because the AQMP strategy is based on projections from local General Plans. Therefore, projects that are consistent with the local General Plan are considered consistent with the air quality-related regional Plan. Implementation of the proposed project would conform to the AQMP's purpose of reducing or eliminating the severity and number of violations of NAAQS and in attaining air quality standards in a timely manner.

4.5.8 Federal Conformity

Federal law requires that a federal lead agency for a project make a "determination" that the federal action in question "conforms" to the applicable State Implementation Plan (SIP) prior to the commencement of any work (40CFR93.150 [b]). The Conformity Determination has been made a part of this document and is contained in Appendix J.

4.5.9 Environmental Commitments

Mitigation Measure 6: The dredging contractor shall use Best Available Control Technology and/or an electric dredge to reduce emissions to the maximum extent feasible. In addition, the dredging contractor may be required to purchase emissions credits to achieve conformity with the SIP.

To reduce significant NO_X emissions, the dredging contractor shall submit a plan demonstrating that Best Available Control Technology is being used to reduce emissions.

Approvals Required: The Corps of Engineers or its designated environmental monitor shall approve the contractor's plan to use Best Available Control Technology to reduce emissions. The SCAQMD also shall review and approve the air quality plan and will approve the purchase of emissions credits. The contractor shall demonstrate that any equipment subject to an air quality permit has been permitted by the SCAQMD.

Timing: Air quality stipulations shall be included in project contracts. The Corps of Engineers or its designated environmental monitor shall approve the equipment and applicable Best Available Control Technology proposed by the contractor prior to the beginning of dredging.

Monitoring Program: Prior to construction, the County of Orange shall survey all equipment to assure it is in compliance with the plan submitted by the contractor. The County of Orange shall conduct spot checks during dredging to insure that all equipment is operating as specified in the contractor's plan.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards for Compliance: Compliance with this measure will occur if Best Available Control Technologies as approved by the Corps of Engineers and SCAQMD are implemented throughout project construction.

4.6 NOISE

4.6.1 Significance Criteria

Discussion with Robert Kain of the City of Newport Beach (personal communication, September 23, 1999) revealed that, while the project area is located within the geographical boundaries of the City, the bay is County property and therefore subject to County standards. Further discussion with Dave Kiff of the City of Newport Beach (personal communication, September 23, 1999) revealed that in the past, the City has waived any noise restrictions due to dredging in the Newport Bay. However, because noise knows no arbitrary geographical boundaries, this document shall address both the City and County standards.

The project is considered as construction and therefore subject to those ordinances which relate directly to construction. The City places no performance standards or noise limitations on construction other than to restrict loud noise that disturbs, or could disturb a person of normal sensitivity who works or resides in the vicinity of the construction, to between the hours of 7:00 a.m. and 6:30 p.m. on weekdays and 8:00 a.m. and 6:00 p.m. on Saturdays. Construction is prohibited on Sundays and holidays if it disturbs or could disturb a person of normal sensitivity who works or resides in the vicinity. Note that the City does not quantify the term "loud."

The City provides for exceptions to this ordinance. Of relevance, the ordinance notes that the maintenance or improvement of any public work or facility by public employees, by any person or persons acting pursuant to a public works contract, or by any person or persons performing such work or pursuant to the direction of, or on behalf of, any public agency is exempt from any noise restrictions. Note that this provision would apply to the contractor performing the dredging as well as the operators of the tug boats and any other relevant equipment involved in the project.

Because the project is located on County property, it is subject to the noise limitations promulgated at the County level. The County sets performance standards which apply to noise intrusion on residential property. The County sets an acceptable level of 55 dBA for noise created between the hours of 7:00 a.m. and 10:00 p.m. and 50 dBA for noise created between the hours of 10:00 p.m. and 7:00 a.m. Note that these noise levels are as measured at the receiving property. These values are not to be exceeded for a period of 30 minutes in any hour. The standards allow for these noise levels to be increased by 5 dBA for 15 minutes during the hour, 10 dBA for 5 minutes within the hours and 15 dBA for 1 minute in the hour. The standard is not to be exceeded by 20 dBA for any period. However, like the City, the County also exempts noise created from construction projects I performed within certain hours and days. The County specifies that construction performed between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday or a federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a federal holiday presents an acceptable intrusion on the populous.

Based on the preceding discussion, the following are used as noise criteria and take in the various standards promulgated at both the City and County level and shall be used as criteria by which to gauge the significance of any noise impacts. These criteria were discussed with Dave Kiff of the City of Newport Beach (personal communication, September 23, 1999), and found acceptable.

- Noise produced between the hours of 7:00 a.m. and 6:30 p.m. on weekdays and 8:00 a.m. and 6:00 p.m. on Saturdays is exempt from all standards,
- Noise produced between the hours of 6:30 p.m. and 8:00 p.m. on weekdays or 9:00 a.m. and 8:00 p.m. on Sundays or federal holidays is subject to a 55 dBA standard, and
- Noise created between 8:00 p.m. and 7:00 a.m. on weekdays, 8:00 p.m. and 8:00 a.m. on Saturdays, or 8:00 p.m. and 9:00 a.m. on Sundays or federal holidays is subject to a 50 dBA standard.

Note that these criteria do not negate the requirements that all equipment and vehicles be equipped with the manufacture's recommended mufflers and/or air intake silencers.

4.6.2 No Project Alternative

Under the No Project Alternative there would be no dredging within the Upper Bay Ecological Reserve or disposal of materials. No noise would be produced and no impacts are projected. While recreational activities may be slightly curtailed (i.e., canoeing and sightseeing), any noise benefits associated with these activities would be small and inconsequential. Additionally, while silt which accumulates in the Upper Bay would eventually work its way down into the navigational channel and could therefore require subsequent dredging in those areas, any such dredging is not a part of the project at hand and would not be addressed further in this analysis.

4.6.3 Sediment Control Alternatives

4.6.3.1 Alternative 1

Construction

This analysis deals specifically with the noise impacts produced by the use of clamshell and hydraulic dredging and is associated equipment and quantifies noise impacts associated with each.

With Clamshell Dredge

Under this scenario, dredging would be conducted from a floating barge equipped with a clamshell dredge. As material is removed, it is placed on a scow with a 1,500 cy capacity. Dredge operations are projected to occur 24-hours per day, 6 days per week. A tug boat would be used to position the scow and when filled, move it to the end of Shellmaker Island where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to a disposal site at LA-3. A guide boat would accompany the tug and barge movements and a survey boat would monitor all operations every 2 days. A quality control boat would be used daily. Construction operations are estimated at 276 days.

The noise created by the dredge is best projected by measurements obtained for the Unit II project by Mestre Greve and documented by Helix Environmental (October 1996). In the Helix document, noise created from clamshell dredging is presented as having an L_{50} value of 70 dBA as measured at a reference distance of 100 ft. Based on an attenuation rate of 6 dBA per doubling of the distance for point-source noise, the 55 dBA contour falls at a distance of approximately 562 ft. The 50 dBA contour extends this distance to 1,000 ft. Table 4.6-1 presents the projected noise levels at various distance from the dredging operations.

Table 4.6-1
Clamshell Dredge or Tug Boat Noise at Various Distances

Distance (feet)	Noise Level (dBA)
100	70
178	65
316	60
562	55
1,000	50

In addition to the clamshell dredge, for the purposes of this analysis, it is assumed that the dredge is pushed into position by the tug boat. This same tug would also be used to move filled scows into the marshaling area. While the tug uses a slightly larger engine than the dredge (i.e., 1,600 hp for the tug as opposed to 1,000 hp for the dredge), the engine is better shielded within the hull of the boat. Furthermore, while the dredge operates at its engine's capacity as it "digs" into the sediment, the tug is typically at idle or maneuver speed while operating within the bay using only a fraction of its available power. (However, tug start-up could produce a slightly louder noise.) As such, the noise of the tug is not expected to exceed that of the dredge, and in all probability, for the most part is actually quieter than the dredge. Therefore, as a reasonable worst-case, the two are assumed to produce an equivalent noise level and the tug is also estimated to produce an L_{50} of 70 dBA as measured at a distance of 100 ft. When the tug and dredge are working in unison in proximity, the combined noise is then estimated at 73 dBA. In this case the 55 dBA contour would fall at a distance of about 794 ft. while the 50 dBA contour lies at approximately 1,413 ft. from the source. The noise created by this combination of equipment at varying distances is presented in Table 4.6-2.

Table 4.6-2
Clamshell Dredge and Tug Boat Noise at Various Distances

Distance (feet)	Noise Level (dBA)
100	73
251	65
447	60
794	55
1,413	50

This however is a rare occurrence when the tug delivers or picks up a scow and in those instances when the tug is used to position the dredge, dredging is not projected to occur and the resultant noise level would not exceed that projected for dredging with no tug in proximity. Also note that the noise generated by the crew boats is relatively small when compared to these larger pieces of equipment and as their use is limited, they would not add substantially to the projected noise levels nor change the results of this analysis.

Dredging is to occur within Unit III to maintain its depth and would add channels around the tern islands. Unit II and the side channels are to be restored. This would place dredging operations in proximity to those residents and businesses located along Jamboree Road and in the Eastbluff housing area as well as residents and businesses located to the west of the channel. Because this noise is fairly continuous and is projected to exceed the 55 dBA criterion for operations between 6:30 p.m. and 8:00 p.m. as well as the 50 dBA criterion for operations between 8:00 p.m. and 7:00 a.m. (8:00 a.m. on Saturdays), a significant impact is projected.

Additionally, as the tug transports the scows to Shellmaker Island, and the second tug removes these barges to LA-3, they would pass residents located further downstream and some local residents located along the channel between the dredging operations and the harbor entrance would be subject to tug boat noise. While this noise is not continuous, when performed between the hours of 8:00 p.m. and 7:00 a.m. (8:00 a.m. on Saturdays), it has the potential to exceed the standard plus 10 dBA (i.e., 60 dBA) for a period of 10 minutes in any hour or even the standard plus 15 dBA (i.e., 65 dBA) for a period of 1 minute in any given hour for those residents located directly along the channel. This would then produce a potentially significant impact.

With Hydraulic Dredge

Under this scenario, dredging would be conducted from a floating hydraulic dredge of modest size (approximately 440 hp). As with the clamshell dredge, these operations are projected to occur 24-hours per day, 6 days per week. Unlike the clamshell dredge which loads sediments onto a scow to be marshaled to Shellmaker Island, the hydraulic dredge would use three booster pumps placed along the channel and sediments would be conveyed by pipeline. A fourth pump would be used at Shellmaker Island to dewater the scow. For the purposes of this analysis, the booster pumps and the dewatering pump are all assumed to operate using internal combustion diesel engines with a 400 hp rating. As with clamshell dredging, an ocean-going tug would then move the scow(s) to a disposal site at LA-3. Operations would be reduced from the 276 days projected for clamshell dredging to 243 days.

The noise produced by the hydraulic dredge is based on data included in the Helix report. While that report addressed the use of a 500 hp hydraulic dredge, the reduction to 440 hp is minor and would not cause a notable reduction in noise. As such, the 67 dBA noise value used in the Helix study is also used here. Furthermore, a similar noise value is used for the booster and dewatering pumps. Table 4.6-3 presents the distances to the various noise contours for dredge or pump operations.

Table 4.6-3
Hydraulic Dredge or Pump Noise at Various Distances

Distance (feet)	Noise Level (dBA)
100	67
126	65
224	60
398	55
708	50

If the hydraulic dredge is used the noise envelope is smaller than for the clamshell dredge. However, some local residents could still be located within 398 ft. of dredge operations and far more would be located within 708 ft. and if dredge operations are to proceed 24-hours per day, significant noise impacts would be produced. Additionally, this alternative would place two of the three booster pumps proximate to residents located in the Eastbluff area and they to could be significantly impacted by nocturnal pump noise.

Finally, because this alternative would also require the use of a tug boat to transport scows from Shellmaker Island to LA-3, like clamshell dredging, these tugs would pass residents located further downstream. As with clamshell dredging, while this noise is not continuous, when performed between the hours of 8:00 p.m. and 7:00 a.m. (8:00 a.m. on Saturdays), it has the potential to exceed the noted standards for those residents located directly along the channel producing a potentially significant impact.

Post Construction

Post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width. While this could be construed as an "operational phase" and subject to operational criteria (i.e., it is not exempt from noise restrictions during the day), in actuality, based on the equipment used and its infrequent occurrence, it is more akin to construction and such for the purposes of this analysis subject to the same criteria as noted for construction, above.

The need for maintenance dredging is a function of time and weather conditions. Obviously, wet weather would require more frequent dredging as sediments are washed into the bay. Assuming a similar mix of equipment, daily dredging operations, when required, would produce similar noise levels and evening and nighttime operations would be expected to produce significant noise impacts on the adjacent residents. The duration of the disturbance is estimated at 287 days for the clamshell versus 220 days for the hydraulic dredge and while either dredge would move during its operation and proximate receptors would not be exposed to excessive noise levels for the duration of the project, as noted above, some residents located near booster pumps associated with hydraulic dredge operations could be exposed to continuous, augmented noise levels for the duration of the maintenance operation.

4.6.3.2 Alternative 4

Construction

This scenario would result in more dredging in both the Unit II and III areas then would be incurred for Alternative 1. Furthermore, this scenario would locate the dredge more proximate to residents located in the Eastbluff housing area as well as those residents located to the west of the channel. Therefore, even more residents would be exposed to excessive noise levels. Furthermore, this alternative would extend the construction period exacerbating the impact over Alternative 1. Here, clamshell dredging operations would require 873 days while hydraulic dredging would be extended to 848 days.

Post Construction

As with Alternative 1, post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width and is a function of time and weather conditions. Assuming a similar mix of equipment, daily dredging operations, when required, would produce similar noise levels and the impacts are as stated above. In this case the clamshell dredging is estimated at 771 days while hydraulic dredging is projected at 671 days.

4.6.3.3 Alternative 5

Construction

Under this scenario, clamshell dredging operations would require 299 days while hydraulic dredging would be extended to 274 days. With respect to Alternative 1, more dredging would occur in the Unit III area and this dredging would occur closer to the local residents further exacerbating the impact in this area. Slightly less dredging is projected in the Unit II area and because no side channel is proposed, fewer local residents located proximate to unit II would be exposed to excessive noise which could reduce the impact to these receptors.

Post Construction

Post construction impacts would be the same as projected for the construction effort except that the time frame would extended from approximately 299 to 329 days for clamshell operations and reduced from 274 to 264 days for hydraulic operations.

4.6.3.4 Alternative 6

Construction

Under this scenario, clamshell dredging operations would require 507 days while hydraulic dredging would be extended to 651 days. With respect to Alternative 1, more dredging would occur in both the Unit II and III areas and this dredging would occur closer to the local residents further exacerbating the impact.

Post Construction

Post construction impacts would be the same as projected for the construction effort except that the time frame would reduce from approximately 507 to 476 days for clamshell operations and reduced from 651 to 524 days for hydraulic operations.

4.6.3.5 Comparison of the Alternatives

A comparison of noise impacts between the various alternatives would need to account for both the actual noise levels at receptor locations as well as the duration of the disturbance. Realizing that the exact placement of the equipment relative to local receptors, the sound attenuation provided by such things as the height differential between the dredge operations and local residents, and intervening structures and topographic features are all unknowns and all have the potential to affect the perceived noise levels, there is no way to determine the potential number of receptors affected by the various alternatives and any comparison of alternatives is speculative at best. However, quantification of affected area as a function of time is possible.

If one considers the distance to the 55 dBA contour as a benchmark for impact, the total acreage of noise impact associated with equipment use can be determined. The length of time for this disturbance is based on the proposed schedule for each alternative, and an "acre-day" value can be calculated.

Clamshell dredging and tug boats are projected to create a noise level of 55 dBA at a distance of 562 ft. from the source. Based on the calculation for the area of a circle, either of these events could create a disturbance of approximately 22.8 acres. The two combined would then disturb an area of approximately 45.6 acres. When the two pieces operate in proximity, the 55 dBA contour falls at a distance of 794 ft. and the area of disturbance is approximately 45.5 acres. Therefore, for the purposes of this analysis, it makes little difference as to whether the equipment is operating close together or further apart and only the noise associated with each piece of equipment as well as the total number of pieces in use needs be considered.

With respect to the larger pieces of equipment to be used, clamshell dredging would use the dredge and two tugboats. Assuming that each piece produces a 55 dBA noise level at a distance of 562 ft., the total area of disturbance is estimated at 68.4 acres. Hydraulic dredging is estimated to use the dredge, four pumps, and one tug. Based on the dredge and pumps creating a 55 dBA noise level as measured at a distance 398 ft., each of these pieces would create an area of disturbance of about 11.4 acres. As shown above, the tug has an area of disturbance of 22.8 acres. Altogether, the total area of disturbance for hydraulic dredging is then estimated at 79.8 acres. Table 4.6-4 presents the "acre-day" disturbance associated with each of the alternatives. Note that the table is for comparison purposes and only examines the disturbance to the 55 dBA noise contour regardless of the potential number of residents affected or time of day.

Table 4.6-4
Noise Comparison for Both Clamshell
and Hydraulic Dredging Operations by Alternative (tons)

Type of Operation	Total Days	Area of Disturbance (acres)	Total Disturbance (acre-days)
Alternative 1			
Clamshell Operations	2,285	68.4	156,294
Hydraulic Operations	1,790	79.8	142,842
Alternative 4			
Clamshell Operations	2,415	68.4	165,186
Hydraulic Operations	2,190	79.8	174,762
Alternative 5			
Clamshell Operations	1,949	68.4	133,312
Hydraulic Operations	1,589	79.8	126,802
Alternative 6			
Clamshell Operations	1,459	68.4	99,796
Hydraulic Operations	1,719	79.8	137,176

4.6.3.6 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

The analysis indicates that excessive noise levels are expected at proximate receptor locations from either clamshell or hydraulic dredging and mitigation is warranted to reduce these impacts to less than significant levels. Mitigation may include measures to reduce equipment noise at the source or may place time restrictions on equipment operations.

Noise generated by equipment comes primarily from the exhaust stacks as well as the engine itself. Some noise is also produced by the mechanical aspects of the equipment such as the action of the clamshell dropping into the water, gear noise, mechanical squeaking and vibration, etc., however, controls for these types of noise (other than regular lubrication) is limited and would do little to reduce the overall noise of the dredging operation. While exhaust noise is typically reduced through the use of a proper muffler or routing exhaust gasses beneath the water's surface, the engine noise may be reduced by placing a barrier between the engine and the receptor. The most obvious way to reduce the noise from the engine is to close the engine compartment. As noted in the Helix document, noise projections were based on field measurements of a dredge in operation with its engine compartment open. While engine enclosures vary from boat to boat, a minimum of 5 dBA of noise reduction is typically achieved by closing the engine compartment. For those engines that are not enclosed, an acoustic shroud or a lead curtain can achieve a 5 to 10 dBA reduction. A lead curtain is a piece of canvas cloth with lead sheets sown into the material. These curtains are typically hung around a piece of equipment to act as a temporary noise barrier. An acoustic shroud can be an enclosure constructed of either wood or metal and insulated with a sound absorbent material such as fiberglass. The enclosure is then placed over the offensive piece of equipment. Obviously some allowances must be made to route hoses and provide for cooling, however, such an enclosure can be extremely efficient in reducing mechanical engine noise. Other means of reducing engine noise include air intake silencers.

However, the most efficient means of reducing equipment noise is to replace any diesel-powered equipment with electric equipment. This applies to the dredge and for hydraulic operations, the pumps, but cannot be feasibly applied to the tug boats.

Another means of reducing the impacts of noise is to place time restrictions on equipment use. As noted in the significance criteria, assuming that all equipment meets the manufacture's specifications and is operating properly, construction performed between the hours of 7:00 a.m. (8:00 a.m. on Saturdays) and 6:30 p.m. is considered as an acceptable intrusion on the local populous. Thus, any operations performed during these hours are considered as less than significant. While time restrictions may prove infeasible for dredging operations if the project is to be completed in a timely fashion, this may be the only viable method to reduce tug boat noise to less than significant levels.

Based on the preceding discussion, the following measures are proposed to reduce an noise impacts to below significant levels.

- All dredging equipment and tug boats shall be operated only with their engine hatches (if so equipped) in a closed position. If such equipment uses a free-standing or exposed engine, an acoustic shroud, lead curtain, or other such devise shall be employed to reduce mechanical noise.

- All internal combustion engines (including dredge, tugs, and pumps) shall be fitted with properly operating mufflers or exhaust gasses shall be routed below the water line.

- All exposed mechanical apparatus which employs metal-on-metal wear points, e.g., gears, pulleys, etc.) shall be well lubricated and maintained as per manufacture's specifications.

- Internal combustion equipment may be replaced by electric equipment.

If the above measures are employed, the Applicant shall have an independent consultant monitor noise levels at a representative number proximate receptor locations during the night to ensure that operations doe not exceed the performance standards promulgated at the County level. The consultant shall be knowledgeable in noise measurement techniques with demonstrated experience. The number of and location of the measurements shall be based on methodology developed by the consultant but shall include dredge operations (including the tug boat used to move the scows for clamshell dredging and all pumps for hydraulic dredging) as well as any tug boat operations in the lower channel. Furthermore, additional measurements shall be obtained if and when the dredge is relocated more than 500 ft. closer to proximate residents than was recorded for the prior measurements.

In lieu of the above, or if monitoring demonstrates that project-generated noise levels continue to exceed the noted County performance standards, the Applicant may make additional modifications to assure compliance. In the event that the offensive operations still exceed the performance standards (either dredge, tug boat, or both), or the Applicant chooses not to make the equipment modifications, they shall be restricted to between the hours of 7:00 a.m.(8:00 a.m. on Saturdays) and 6:30 p.m. The inclusion of these measures would ensure that any potentially significant impacts are reduced to less than significant levels.

4.6.4 Habitat Restoration Alternatives

Under the habitat restoration alternatives dredging would be performed as described for the various alternatives noted above. However, a relatively small portion of the dredged material could be used in the construction of habitat areas within the bay. The impact of this construction is addressed by alternative.

4.6.4.1 Addition of Sand to Least Tern Islands

Under this alternative, the vast majority of the dredging operation, and resultant noise impacts would be as described in Section 4.6.3, above. However, for Alternative 1, sand would be added to both of the existing tern islands in the upper basin. Alternatives 4, 5, and 6 would place sand in the southern island. In either case, this sand would be excavated by backhoe and loaded on a barge via two front-end loaders for delivery to the island(s). Once at the island, this sand would be spread by heavy equipment.

EPA estimates that heavy construction equipment involved in grading produces a composite noise level of about 89 dBA as measured at a distance of 50 ft. (83 dBA at 100 ft.). Table 4.6-5 presents the estimated attenuation with distance from the use of this equipment.

Table 4.6-5
Heavy Equipment Construction Noise at Various Distances

Distance (feet)	Noise Level (dBA)
100	83
792	65
1,409	60
2,505	55
4,456	50

Based on this analysis, construction using heavy earthmoving equipment could create a significant impact if performed within about 2,505 ft. of any residents between the hours of 6:30 and 8:00 p.m. and within approximately 4,456 ft. if performed between the hours of 8:00 p.m. and 7:00 a.m. (8:00 a.m. on Saturdays). Receptors located proximate to the sand borrow site as well as those located within the Eastbluff housing area are located within these distances and could be subject to a significant impact.

4.6.4.2 Construct Small Dendritic Channels Though the Marsh

Under this alternative, a backhoe would be used to construct a channel though the Shellmaker Island. This material would then be loaded onto a barge for subsequent delivery to LA-3. Note that in this case, only two pieces of heavy equipment are considered as the delivery of this material to LA-3 would be accomplished with the on-going dredge operations thereby extending total dredge operations by approximately 2 days. These two pieces of equipment could be relatively smaller than those noted in Section 4.6.4.2 and are estimated to perform the work in approximately 3 days time.

Based on the reduced number of pieces of equipment, the noise from this construction would be less than that noted for the construction of the least tern islands and a noise level of about 85 dBA would be expected at a distance of 50 ft. (79 dBA as measured at a distance of 100 ft.). Table 4.6-6 presents the estimated attenuation with distance from the use of this equipment.

Table 4.6-6
Heavy Equipment Construction Noise for Small Dendritic Channels

Distance (feet)	Noise Level (dBA)
100	79
500	65
889	60
1,581	55
2,812	50

Based on this analysis, construction using heavy earthmoving equipment could create a significant impact if performed within about 1,581 ft. or local residents if perfomed between the hours of 6:30 and 8:00 p.m. and within approximately 2,812 ft. if perfomed between the hours of 8:00 p.m. and 7:00 a.m. (8:00 a.m. on Saturdays). Residents on either side of the channel are located within these distances and would be subject to a significant impact if this construction is perfomed at night.

4.6.4.3 Restoration of Wetlands in Filled Areas

Under this alternative, additional dredging would be perfomed to restore wetlands areas within the bay. Each restoration opportunity could use either the clamshell or hydraulic dredge and the noise associated with their use is as previously described. However, this alternative would bring the dredge into areas that would not be impacted by its noise in Alternatives 1, 4, 5, and 6. These are described below.

Northstar Beach

Northstar Beach is situated south of Shellmaker Island and well south of the southern-most area that would be dredged under Alternatives 1, 4, 5, or 6. While all alternatives would route tug boat traffic through this area, the tug boats only pass through the area on their way to LA-3 producing an intermittent noise. The Northstar Beach modification would site a dredge in this area producing a continuous noise source for 13 days which would be more of an annoyance to local residents located to the west of the channel who would not be subject to significant dredging noise for Alternatives 1, 4, 5, and 6. The alternative would also add to the overall number of tug boat trips destined for LA-3 thereby extending the duration of this impact.

Bull-Nose Section of Land at Lower End of Northern Side of Unit I/III Basin

This alternative would bring the dredging equipment more proximate to the residents located proximate to the northern portion of the Upper Bay and specifically those residents located in the upper Eastbluff housing area. Because the dredge would operate closer to the shore, more of these residents have the potential for exposure to excessive noise. Furthermore, this modification would prolong this noise by approximately 14 days and add to the overall number of tug boat trips destined for LA-3 thereby extending the duration of this impact.

Dredge Spoil on Shellmaker Island

This modification would require 12 days' dredging in Shellmaker Island area. This area would not be dredged under Alternatives 1, 4, 5, or 6. With respect to clamshell dredging, this modification would produce 18 days of continuous noise in an area that would only be exposed to intermittent tug boat noise thereby exacerbating the impact. With respect to hydraulic dredging, the area is located proximate to the dewatering station and while this area would already be exposed to fairly continuous noise, the volume of noise would increase slightly due to the simultaneous use of both the dredge and dewatering pump. The modification would also extend the time period in which tug boats deliver dredged materials to LA-3 slightly extending the duration of the impact to residents located proximate to lower harbor and the channel entrance.

4.6.4.4 Restoration of Side Channels

Under this alternative material would be dredged to the west side of Middle Island and/or east side of Shellmaker Island. This would be accomplished using the hydraulic dredge. The areas to be dredged are located more proximate to the local residents than the dewatering station and while any residents located proximate to this area would already be exposed to fairly continuous noise under the hydraulic dredging alternatives (due to dewatering operations), the volume of noise would increase slightly. The modification would also extend the project schedule by about 7 to 15 days increasing the time period in which tug boats deliver dredged materials to LA-3 extending the duration of the potential impact to residents located proximate to lower harbor and the channel entrance.

4.6.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

This alternative would relocate eelgrass to a portion of the Upper Bay. The procedure would require four to six SCUBA divers. All work would be done by hand and the only required equipment would be a small boat. The noise generated by the boat is relatively minor and because these operations would only be performed during the daytime, the modification would not increase any impacts associated with the selected alternative.

4.6.4.6 Removal of Segments of the Main Dike

Under this alternative, a backhoe would remove portions of the main dike. The backhoe would be transported to the dike aboard a small barge. This operations is estimated to require less than 1 day and would in all probably be accomplished during the daytime when constriction noise is considered as an acceptable intrusion. As such, any impacts associated with this modification would not be significant.

4.6.5 Cumulative Impacts

Cumulative noise impacts could be produced if simultaneous construction were to occur proximate to the areas to be dredged. However, any construction within the City would be governed by the City's noise ordinance and would therefore be restricted to those daytime hours and days that the City considers as an acceptable intrusion. For construction to occur at night, the project would either have to be a dredging project within the bay (which is beyond City authority), or the construction would have to be the result of some catastrophic, unforeseen emergency. Because no other dredging would occur within the Upper Bay during project implementation, and emergency construction noise is exempt from any noise ordinance (or significance criteria), no cumulative impacts are projected.

4.6.6 Environmental Commitments

Mitigation Measure 7: The following measures shall be implemented by the dredging contractor to reduce noise emissions:

- All dredging equipment and tug boats shall be operated only with their engine hatches (if so equipped) in a closed position. If such equipment uses a free-standing or exposed engine, an acoustic shroud, lead curtain, or other such devise shall be employed to reduce mechanical noise.
- All internal combustion engines (including dredge, tugs, and pumps) shall be fitted with properly operating mufflers or exhaust gasses shall be routed below the water line.
- All exposed mechanical apparatus which employs metal-on-metal wear points, (e.g., gears, pulleys etc.) shall be well lubricated and maintained as per manufacturer's specifications.

To reduce excessive noise levels that are expected at proximate receptor locations from either clamshell or hydraulic dredging, the specified measures would reduce equipment noise at the source.

Approvals Required: The Corps of Engineers or its designated environmental monitor shall approve measures proposed by the dredging contractor to reduce noise levels.

Timing: Noise stipulations shall be included in project contracts. Equipment shall be approved prior to the beginning of dredging.

Monitoring Program: A qualified noise expert shall monitor noise levels at a representative number of proximate receptor locations during the night to ensure that operations do not exceed the local noise standards. The number of and location of measurements shall be such as to include dredge operations (including the tug boat used to move the scows for clamshell dredging and all pumps for hydraulic dredging) as well as any tug boat operations in the lower channel. Furthermore, additional measurements shall be done if the dredge is relocated more than 500 feet closer to proximate residents than was recorded for the prior measurements. If monitoring demonstrates that project-generated noise exceeds County performance standards, the contractor shall make additional modifications to assure compliance.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards for Compliance: Compliance with this measure will occur if noise standards are not exceeded at proximate receptor locations.

4.7 HAZARDS

4.7.1 Significance Criteria

An impact would be considered significant if it subjected humans to a substantial hazard.

4.7.2 No Project Alternative

Under the No Project Alternative, no basins would be maintained to trap sediments in the Upper Bay. When the Unit III basin loses its trapping efficiency, fine sediments from San Diego Creek would be transported into the lower portions of the Upper Bay and Lower Newport Harbor. Navigation channels and marinas would shoal creating a risk that vessels could run aground. As channels and marinas shoal, navigation would become more difficult and the risk of a vessel collision would be increased. Increased navigation hazards in Newport Bay would be a significant adverse impact of the No Project Alternative.

4.7.3 Sediment Control Alternatives

4.7.3.1 Hazardous Materials

No hazardous waste sites are located within the proposed dredging areas. No risk to humans would occur from the excavation of hazardous materials as a result of implementation of any of the sediment control alternatives.

4.7.3.2 Navigation

All of the sediment control alternatives would involve transporting dredged material in disposal scows through the Lower Harbor and out to the LA-3 ocean disposal site. Disposal scows traveling through the navigation channels pose some risk to boaters in Newport Harbor especially during peak summer use days. Disposal scows move slowly but have little ability to turn or stop. Therefore, they could pose an obstruction to emergency craft needing to respond rapidly to an emergency. Furthermore, there is some risk that a scow could collide with a recreational boater. Boat operators in the harbor, especially children, may have a low awareness and poor sailing skills. Obstruction of emergency vessels or collision between a disposal scow and a recreational boater would be a significant adverse impact.

Because disposal scows would travel through Newport Harbor for all sediment control alternatives, the potentially significant risk to boater safety would exist for all alternatives. The hydraulic dredge alternative would not require disposal scows to traverse the Upper Bay above Shellmaker Island while the clamshell dredge alternative would involve daily scow trips from the Unit III or Unit II basin. Therefore, the clamshell dredging method would pose a risk to kayakers and other small boat users in the Upper Bay, but the hydraulic dredging method would not. Alternatives 4 and 6 would involve a substantially greater number of scow trips than Alternatives 1 and 5 (see Tables 2.3-4 and 2.3-5). Therefore, because of the greater number of scows the risk to boaters would be greater for these alternatives.

4.7.3.3 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

The following mitigation measures would reduce the hazards to boaters from disposal scow traffic to insignificant:

- Schedule disposal scow trips through the main navigation channels to avoid peak use hours on summer weekends.
- Coordinate with the Newport Bay Harbormaster, the U.S. Coast Guard and the Orange County Sheriff and Fire Departments to develop disposal scow routes and schedules that would avoid obstructing emergency vessels and would reduce conflicts with recreational boaters.
- Put lookout personnel with communication equipment including megaphones and radios on the scows and/or tugs to warn boaters to avoid the scow. If necessary, employ a small motor boat to herd boaters out of the channels before the approach of the scows.

4.7.4 Habitat Restoration Alternatives

4.7.4.1 Hazardous Materials

No hazardous waste sites are located within any of the areas that would be excavated or dredged. No risk to humans would occur from the excavation of hazardous materials as a result of implementation of any of the habitat restoration alternatives.

4.7.4.2 Navigation

Most of the habitat restoration alternatives including the addition of sand to least tern islands, construction of a small channel through Shellmaker Island, restoration of wetlands in filled areas, and restoration of side channels would involve transporting sediments through Lower Newport Harbor on a barge or disposal scow. Therefore, these habitat restoration alternatives would pose a potentially significant hazard to boaters by obstructing the passage of emergency vessels. For these habitat restoration alternatives there is also a risk that a recreational boater would collide with a barge or scow. Potential hazards to navigation could be mitigated to insignificant through the mitigation measures listed in Section 4.7.3.5. If sufficient sand for tern islands could be found within the Upper Bay then the navigation hazard of barges travelling through Lower Newport Harbor would be avoided for tern island restoration.

Because only 500 cy (382.5 cu m) of material would be removed by segmenting the main dike, potential hazards to navigation from this alternative could be avoided by upland disposal. No barges or scows would be used for restoration of eelgrass beds and there would be no potential hazard to navigation.

4.7.5 Cumulative Impacts

If the Upper Newport Bay Habitat Restoration Project occurred at the same time as another dredging project in Newport Bay, potential hazards to navigation would be cumulative. Because disposal scows from two projects would be traveling through the harbor, coordination would be more complicated. However, implementation of mitigation measures listed in Section 4.7.3.3 would reduce potential hazards to boaters to insignificant.

4.7.6 Environmental Commitments

Mitigation Measure 8: The dredging contractor shall develop a plan to reduce hazards to boaters from dredging and disposal operations. The following measures or approved alternatives shall be incorporated into the plan:

- Scow trips through the main navigation channels shall be scheduled to avoid peak use hours on summer weekends. Peak use summer hours are defined as 9 am to 7 pm on summer weekends and holidays and during any scheduled boating events in the main channel of the Lower Bay.
- Scow routes and schedules shall be coordinated with the U.S. Coast Guard and the Orange County Sheriff-Coroner/Harbor Patrol.
- Lookout personnel with communications equipment shall be placed on the scows, tugs, or an auxiliary boat to warn boaters to avoid the scow.

To avoid risk to boaters from disposal scows, the dredging contractor shall develop a plan to schedule scow trips to minimize risks and to avoid obstructing with emergency vessels.

Approvals Required: The contractor's plan to avoid risks to boaters in Newport Bay shall be approved by the Corps of Engineers or its designated environmental monitor and by the Newport Bay harbormaster, the U.S. Coast Guard and the Orange County Sheriff-Coroner/Harbor Patrol.

Timing: Boating safety stipulations shall be included in project contracts. The boating safety plan shall be approved prior to the commencement of dredging.

Monitoring Program: The County of Orange shall establish a monitoring program.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards of Compliance: Compliance with this measure will occur if the dredging contractor adheres to the measures specified in the approved boating safety plan.

4.8 CULTURAL RESOURCES

4.8.1 Significance Criteria

The significance of cultural resources is evaluated using the criteria for eligibility for the NRHP. The criteria, defined in 36 CFR 60.4, are as follows:

- The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, association, and:

  (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

  (b) That are associated with the lives of persons significant in our past; or

  (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

  (d) That have yielded, or may be likely to yield, information important to prehistory or history.

4.8.2 No Project Alternative

Under the No Project Alternative, no construction activities would take place and there would be no potential disturbance to archaeological sites.

4.8.3 Sediment Control Alternatives

The sediment control alternatives all involve dredging within the bay to deepen or expand existing basins, to restore channels, and to relocate a tern nesting island (Alternatives 4, 5 and 6). All construction would occur below the water line. All archaeological sites are at least a few feet above the water line. Therefore, none of the sediment control alternatives would disturb any archaeological sites and no impacts to cultural resources would occur.

4.8.4 Habitat Restoration Alternatives

With the exception of restoration of wetlands in filled areas and segmentation of the salt dike, habitat restoration alternatives involve activities within the bay below the water line. Therefore, most habitat restoration alternatives would not affect archaeological sites around Upper Newport Bay because all archaeological sites are at least a few feet above the water line. The salt dike is not a significant cultural resource and segmentation would not impact cultural resources. No cultural resource sites are located within the wetlands restoration areas on Northstar Beach and Shellmaker Island. Therefore wetlands restoration at Northstar Beach and Shellmaker Island would not affect cultural resources. However, wetlands restoration of the bullnose section of land north of the Unit I/III basin has the potential to affect archaeological sites ORA-164, ORA-193 and ORA-347 on the north shore of Upper Newport Bay. Grading above the water line would be necessary to restore wetlands at this location. It appears that the sites will not be within the restoration footprint, but a determination of the potential to affect these sites will need to be made during the final design phase. Disturbance of any of these sites for wetlands restoration would be a significant impact to cultural resources. During the project final design phase when plans for wetlands restoration in this area are available, if it appears that a site may be within the area of potential effects, a field reconnaissance by an archaeologist would be necessary to determine whether excavation for wetlands restoration would impact any of these sites.

4.8.5 Mitigation Measures

Based upon evaluation of specific plans for restoration of wetlands north of the Unit I/III basin and, if necessary, a field reconnaissance by an archaeologist, if it appears that ORA-164 or ORA-347 will be affected, a test program shall be performed by a qualified archaeologist. The test program would provide information with which to evaluate the NRHP eligibility of the site or sites and to define the subsurface boundaries of the site or sites. Prior to initiation of the test program, a test plan shall be prepared by the archaeologist for review and approval by the Corps. A test program is not necessary for ORA-193 because previous work by Lyneis (1981) suggests that this site is eligible for the National Register of Historic Places.

If the site or sites that would be affected are determined eligible by the SHPO, based on the results of the test program (or Lyneis' previous work, for ORA-193) and if the sites cannot be avoided as shown in a determination of effects document, a data recovery plan should be prepared for review and approval by the COELA, the SHPO, and the ACHP. When approved, the plan would be implemented. Data recovery may not be necessary for ORA-193 because of the 6 percent sample of the site already excavated by Lyneis. The necessity for data recovery at ORA-193 would be made in consultation with the SHPO.

Implementation of approved data recovery procedures would reduce impacts to cultural resources to insignificant.

4.8.6 Environmental Commitments

Mitigation Measure 9: If during the final design phase it is determined that wetlands restoration north of the Unit I/III basin might affect an archaeological site, a qualified archaeologist shall conduct a field reconnaissance to determine whether archaeological sites ORA-164, ORA-193 and ORA-347 will be affected by work associated with wetlands restoration. If the survey determines that one or more of these sites may be affected a test program will be performed by a qualified archaeologist to provide information with which to evaluate the NRHP eligibility of the site(s) and define the subsurface boundaries of the site(s). A test program is not necessary for ORA-193 but previous work should be evaluated to determine eligibility. If the site(s) are determined eligible by SHPO, the restoration plan shall either be revised to avoid disturbance to the site(s) or a data recovery plan shall be prepared and implemented.

To avoid potential disturbance to cultural resource sites ORA-164, ORA-193 and ORA-347 that may be located within the wetlands restoration area near the Unit I/III basin, the proposed excavation area should be surveyed during the final design phase. If an eligible site is identified within the restoration boundaries, either site avoidance or a data recovery program would reduce impacts to cultural resources to insignificant.

Approvals Required: The Corps of Engineers or its designated environmental monitor shall approve the qualifications of the archaeologist who performs the field survey. If the reconnaissance survey determines that a cultural resource site is located within the project boundaries the Corps, SHPO and ACHP shall approve the proposed test program to determine the site's eligibility.

Timing: During the final design phase it shall be determined if project activities might affect an archaeological site. If so, an archaeological field reconnaissance survey shall be performed during the final design phase prior to any excavation of uplands on the northern side of the Unit I/III basin. If the reconnaissance survey determines that a site or sites is within the project footprint, a test program shall be conducted prior to disturbance of the site (s).

Monitoring Program: If a cultural resource site is identified in or near the project boundaries, a qualified archaeologist shall monitor the excavation to ensure avoidance of the site.

Reporting: If necessary, the results of the field reconnaissance shall be submitted to the Corps of Engineers and the County of Orange prior to any excavation of uplands north of the Unit I/III basin. If it is determined that construction will not adversely affect any archeological sites, written certification will be provided prior to the start of construction. Additional reporting requirements will be determined by the County of Orange based on the results of the field reconnaissance.

Standards for Compliance: Compliance with this measure will occur if no disturbance occurs to cultural resource sites or if an approved data recovery program is conducted at any eligible sites disturbed by the wetlands restoration.

4.9 SOCIOECONOMICS

4.9.1 Significance Criteria

In accordance with generally accepted CEQA criteria, significant socioeconomic impacts would occur if:

- The project would cumulatively exceed official regional or local population projections.
- The project would induce substantial growth in an area either directly or indirectly (e.g., through projects in an undeveloped area or extension or major infrastructure).
- The project would displace existing housing, especially affordable housing.
- The project would disrupt or divide the physical arrangement of an established community.

NEPA does not specifically establish criteria for determining socioeconomic impacts. However, 40 CFR 1508.8 states that indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate.

4.9.2 No Project Alternative

With no dredging program, the sediment would be allowed to continue to build up and fill in open water areas within the Bay. This sedimentation would decrease the extent of tidal inundation, diminish water quality, degrade habitat values, and result in navigation problems in the Upper Bay marinas and channels. With the No Project Alternative, open water areas would evolve into mudflats and marshland areas. Under the No Project Alternative, no direct socioeconomic impacts would result in accordance with the significance criteria presented above. However, indirect socioeconomic impacts have the potential to result from the No Project Alternative. As the Bay silts in, recreation uses would change and boating would diminish. As boating is a major activity in the area, the local economy may be affected by some decreases in boating-related expenditures, which could be considered adverse, but not significant, since the majority of boating in the area occurs in the Lower Bay area. Recreational boating, may be replaced by increased marsh viewing, although the diversity of wildlife would decrease as a result of sediment in-fill.

4.9.3 Sediment Control Alternatives

For all alternatives, the construction and post-construction maintenance efforts are considered to be temporary actions. Construction would vary for initial dredging from 10 months to 3 years depending on the alternative selected, and for maintenance dredging from 9 months to 2.75 years depending on which type of dredge is used and which alternative is selected. The number of construction workers is not expected to exceed 27 workers as a worst-case projection.

This project would not result in construction that would increase population, induce growth, displace housing, or disrupt a community. The relatively low number of construction workers required for the effort would be hired from the greater local area, and would not constrain the immediate area's housing availability or demand. Since these workers would be from the local area and would commute to work no socioeconomic effects on the local area would result. No impacts would occur and no mitigation is required.

4.9.4 Habitat Restoration Alternatives

As above, construction is considered a temporary action, and the workforce would come from the greater local area. No impacts would result and no mitigation is required.

4.9.5 Cumulative Impacts

Compared to the total amount of new construction in the area that may be ongoing concurrently with the proposed project, the number of workers required for this project would be minimal. The overall construction actions in the area would benefit the area economically, in that workers would be employed, and both direct and indirect spending would contribute to an enhanced economy. However, due to the small number of construction workers associated with the proposed project, the economic and socioeconomic benefits of the proposed project would be minimal.

4.10 LAND AND WATER USES

4.10.1 Significance Criteria

Land and nearshore water uses were considered to result in a significant impact if elements of the proposed alternatives result in:

- A permanent change to a land use or water use.
- Conflicts with adjacent land uses or water uses, and/or conflicts with land use and nearshore water use policies.
- A temporary restriction of land or water access due to project activities.

Visual effects were also considered in this section. Impacts were considered to result in a significant impact if elements of the proposed alternatives result in:

- A permanent or long-term temporary change to the visual environment resulting in a negative impression of the viewshed from local viewers.

4.10.2 No Project Alternative

With no dredging program, the sediment would be allowed to continue to build up and fill in open water areas within the Bay. This sedimentation would decrease the extent of tidal inundation, diminish water quality, degrade habitat values, and result in navigation problems in the Upper Bay marinas and channels (see also Section 4.7.2). With No Project, open water areas would evolve into mudflats and marshland areas. Water clarity would diminish and, in areas, water would appear muddy.

As the Bay silts in, recreation uses would change and boating in the Upper Bay would diminish or be eliminated. As no power boats are allowed into the Reserve area north of Shellmaker Island, the Upper Bay is currently used by the casual kayak or canoe, with most boating occurring south of PCH. Commercial and businesses relying on power boating are also located south of PCH. Since the Upper Bay is used for canoeing and kayaking, these activities would be lost if the area would be allowed to silt in. By 2049 marinas in the lower part of the Upper Newport Bay would silt in and there would be a loss of recreational uses. As sediment passes below the PCH Bridge navigation channels and boat docks in the lower Bay would shoal. This would result in a permanent change in water use and would be a potentially significant land use and water use impact.

The perception of the area as an open water area with select marsh areas would change and may have indirect effects on the shoreline land uses. As the area silts-in and tends to degrade, this effect would have the potential to carryover to the adjacent land uses. These uses may also degrade and thus devalue with the No Project Alternative. If this were to occur, a significant impact would result from a change in land use.

The Proposed Project results in a significant impact with developed program plans and policies. The management objectives for restoration and maintenance of a saltwater marsh ecosystem including the combination of improvement of fishery resources; protection and enhancement of wetland habitat; provision for scientific and educational opportunities, provision of recreational opportunities, and provision of aesthetic opportunities would not be met.

The visual appearance of these changes is a subjective determination and would vary by viewer. With the No Project Alternative, open water areas would evolve into mudflats and marshland areas. Water clarity would diminish and, in areas, water would appear muddy. For those who expect to view open water areas, clear of turbidity, the No Project Alternative would result in a significant impact. To those who enjoy mudflat and marshland areas, the appearance of these may not seem adverse. However, in comparison to program policies and management objectives, a significant visual impact would result under this alternative.

With no activities proposed under this alternative, no means would be in place to provide mitigation. The impacts would remain significant.

4.10.3 <u>Sediment Control Alternatives</u>

All alternatives would have beneficial impacts after construction and post-construction for both upper and lower portions of Upper Newport Bay, as the work would enhance recreation and water based opportunities. Habitat enhancement would occur resulting in greater diversity of wildlife for viewing and fishing, as well as greater accessibility for power and non-power boaters. The adverse impacts would differ with each alternative and are presented below.

4.10.3.1 Alternative 1

<u>Construction</u>

Clamshell Dredge

Work under this alternative would involve adding channels around the tern islands and restoring the Unit II basin and side channel. The Unit III basin would be maintained at its current depth. All work would total about 276 days. The clamshell dredge requires dredging of the main channel which is expected to take about 33 days. The channel between Units I and II should take 7 days, the channel bordering Unit II should take 3 days. Other channels would take about 33 days. The major work of dredging Unit III should take about 73 days, and the Unit II dredging about 127 days. A tug boat would be used to position the scow and move it to the end of Shellmaker Island or an alternative location where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to LA-3, at a rate of 3 trips per day.

As noted in Section 3.10.5, recreational use in the upper portion of Upper Newport Bay is currently restricted by both shallow water depth and contamination, and no power boats are allowed into the Reserve area north of Shellmaker Island. During construction activities, canoeing and kayaking in the upper portion would be constrained, resulting in boaters being directed around equipment activities or by completely restricted access. While this portion of the Bay is not heavily used by on water recreationalists, this temporary restriction of access would still result in a significant impact.

In the lower portion of Upper Newport Bay, dredging of the main access channel by the clamshell dredge would necessitate the use of silt fencing during construction which may result in prohibiting boating access through the channel. Also, the movement of the disposal scow through this lower area to the LA-3 disposal site would conflict with recreational boater use. In Lower Newport Bay, conflicts would also occur between scows and recreational users. These activities would result in a significant impact which would have the greatest impacts during the peak boating season. In general all boating access impacts can greatly affect not only the individual boater out for a casual trip, but also planned events such as regattas.

Aesthetically, the equipment working throughout the bay may result in disturbance to viewers, both recreationalists and bluff residents with views. The clamshell dredge appears a floating barge, equipped with a crane with a grab bucket. A scow or barge would almost always appear alongside the clamshell dredge. The dredge would move throughout the footprint of each work area for the duration of that effort. A tugboat would guide the dredge and scow from position to position, and a tugboat would also be used to take the scow to the marshalling area at Shellmaker Island or an alternative location near the PCH Bridge. A tug would also be used to the scows out of Newport Harbor to LA-3.

Even though the dredge would move from position to position, the activity would be visible for the duration of the work effort. Thus, activity would sometimes appear in a viewer's foreground and at other times in a viewer's background. Stationary viewer's would see equipment for that portion of project activity that involves the equipment working within the viewshed. For example those viewers which see primarily the Unit II area would see activity for 127 days. Mobile viewers (recreationists) would see activity for the duration of work (276 days).

The greatest impact would occur in the upper portion of the Upper Newport Bay where no motorized vessels frequent. The presence of a water-borne dredge and associated vessels is not incompatible with Upper Newport Bay's use as a harbor. Dredging is an activity that occurs regularly to maintain harbors. Some viewers may view the presence of dredge equipment as interesting and beneficial while others may find it an annoyance. Overall the visual impact of the dredging equipment is judged to be adverse but insignificant. After construction, the visual environment would be enhanced as a result of the project efforts. Nighttime work would entail the use of lighting which would temporarily impact shoreline residents through the main channel due to glare. Glare is a potentially significant adverse impact.

Hydraulic Dredge

Use of the hydraulic dredge would not require construction of an access channel in the lower bay area resulting in an overall 243 day effort. Boaters would still have access through the area, and no recreational impacts would result in this main channel area. Disposal scows would still move to LA-3 at a rate of 3 trips per day, resulting in conflicts with recreational boaters in both the lower portion of Upper Newport Bay and the Lower Newport Bay areas, and nighttime glare to shoreline residents.

The hydraulic dredge requires placement of a pipeline crossing the marsh in Unit I/III and Unit II and booster pumps along the shore area of Back Bay Drive. Use of the hydraulic dredge results in use of the pipeline instead of the scows moving from Shellmaker Island north into the upper portion of Upper Newport Bay. The hydraulic dredge and crew boats would still be operating in this area. Impacts to recreational boaters in the upper area remain significant during construction under this alternative.

The hydraulic dredge is smaller than the clamshell dredge and is self-propelled. The hydraulic dredge uses a cutterhead to dislodge sediment which would then be pumped through a 12-inch pipeline which would lay along the shoreline from the dredge location to Shellmaker Island and the disposal scow. Three booster pumps would be located along the pipeline, along Back Bay Drive. Three scows would be needed at Shellmaker Island or an alternative location to accommodate disposal and dewatering operations. The pipeline and pumps would move the work effort closer to those recreationalists along Back Bay Drive, would be spread out over a larger area because of the pipeline, and pumps would be more predominant in the viewer's foreground. This, combined with the dredge in the bay may result in a greater perception of an aesthetic impact during construction in the upper area as compared to use of the clamshell dredge. Visual impacts are still considered to be adverse but insignificant.

All other impacts remain the same as those presented for the clamshell dredge.

Post Construction

All impacts as described above for both clamshell and hydraulic dredging remain during post construction maintenance dredging. The difference is in the lengths of time of construction. Use of a clamshell dredge for post construction work is expected to take 287 days, while use of the hydraulic dredge is expected to take 220 days. The main difference between the use of the dredges is that about 67 days would be required to dredge the main access channel if a clamshell dredge is used. In addition, in the hydraulic dredge alternative, movement of the disposal scows between the staging location and the Upper Bay would be avoided. Maintenance frequency under this alternative is expected to be once every 7 years.

4.10.3.2 Alternative 4

Construction

Clamshell Dredge

This alternative involves deepening the Unit III basin and expanding its footprint, removing one least tern island from the uppermost basin, expanding the Unit II basin to the south and west and constructing a new least tern island along the western portion of the dike. All work would total about 873 days. The clamshell dredge requires dredging of the main channel which is expected to take about 25 days. The channel between Units I and II should take 7 days, the channel bordering Unit II should take 3 days. Other channels would take about 33 days. The major work of dredging Unit I/III should take about 373 days, and the Unit II dredging about 432 days. A tug boat would be used to position the scow and move it to the end of Shellmaker Island or an alternative location where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to LA-3, at a rate of 3 trips per day.

As was described for Alternative 1, during construction activities, canoeing and kayaking in the upper portion would be constrained, resulting in boaters being directed around equipment activities or by completely restricted access. While this portion of the Bay is not heavily used by onwater recreationalists, this temporary restriction of access would still result in a significant impact.

In the lower portion of Upper Newport Bay, dredging of the main access channel may necessitate the use of silt fencing during construction which may result in prohibiting boating access through the channel. Also, the movement of the disposal scow through this lower area to the LA3 disposal site would conflict with recreational boater use. Through Lower Newport Bay, scow movement would also result in conflicts with the recreational boater. These activities would result in a significant impact which would have the greatest impacts during the peak boating season.

A component of this alternative that also is different from that of Alternative 1 is the need to move clean sand from the beaches near the Entrance Channel to the new tern island. This would entail use a backhoe to excavate the sand and load it to a barge which would then travel north to the site of the new tern island. A small number of trips would be associated with this effort, but would add to the equipment working in and traveling through the lower portion of the bay (in both the lower portion of Upper Newport Bay as well as Lower Newport Bay). In addition to scows posing conflicts with recreational boaters throughout the Bay, this effort results in potential impacts to the nearshore and onland recreational users of the beach in the area of extraction.

As described, for Alternative 1, aesthetically, the equipment working throughout the bay may result in disturbance to some viewers. The upper portion of the Upper Newport Bay where no motorized vessels frequent would be affected, as would those near the beaches of Entrance Channel beaches where sand would be extracted for the new tern island. The visual impact is considered adverse but insignificant. After construction, the visual environment would be enhanced as a result of the project efforts. Nighttime work would entail the use of lighting which could temporarily impact shoreline residents through the main channel due to glare. Glare is a potentially significant adverse impact.

Hydraulic Dredge

Use of the hydraulic dredge would not require construction of an access channel in the lower bay area resulting in an overall 848 day effort. Boaters would still have access through the area, and no recreational impacts would result in this main channel area. Disposal scows would still move to LA-3 at a rate of 3 trips per day. Conflicts with recreational boaters would occur both in the lower portion of Upper Newport Bay and in Lower Newport Bay. Impacts caused by nighttime glare to shoreline residents would also occur.

Use of the hydraulic dredge results in use of the pipeline instead of the scows moving from Shellmaker Island north into the upper portion of Upper Newport Bay, except that sand would be brought in from the Entrance Channel for construction of the tern island. Also, the hydraulic dredge and crew boats would still be operating in this area. Impacts to recreational boaters in the upper area remain significant during construction under this alternative.

As described for Alternative 1, the pipeline and pumps would move the work effort closer to those onland recreationalists along Back Bay Drive, and result in a greater perception of an aesthetic impact during construction in the upper area as compared to use of the clamshell dredge.

All other impacts remain the same as those presented for the clamshell dredge.

Post Construction

All impacts as described above for both clamshell and hydraulic dredging remain during post construction maintenance dredging. The difference is in the lengths of time of construction. Use of a clamshell dredge for post construction work is expected to take 771 days, while use of the hydraulic dredge is expected to take 671 days. The main difference between the use of the dredges is that about 100 days would be required to dredge the main access channel if a clamshell dredge is used. In addition, in the hydraulic dredge alternative, movement of the disposal scows between the staging location and the Upper Bay would be avoided. Maintenance frequency under this alternative is expected to be once every 24 years.

4.10.3.3 Alternative 5

Construction

Clamshell Dredge

Alternative 5 would involve the removal of the northern "kidney shaped" island in the upper basin, expanding the footprint of the Unit III basin, and creating a new least tern island along the main dike in the middle segment of the Upper Bay. The Unit II basin would not be expanded. All work would total about 299 days. The clamshell dredge requires dredging of the main channel which is expected to take about 22 days. The channel between Units I and II should take 7 days, the channel bordering Unit II should take 3 days. Other channels would take about 33 days. The major work of dredging Unit I/III should take about 205 days, and the Unit II dredging about 25 days. A tug boat would be used to position the scow and move it to the end of Shellmaker Island or an alternative location where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to LA-3, at a rate of 3 trips per day.

As was described for Alternatives 1 and 4, during construction activities, canoeing and kayaking in the upper portion would be constrained, resulting in a significant impact. In the lower portion of Upper

Newport Bay, dredging of the main access channel may necessitate the use of silt fencing during construction which would result in prohibiting boating access, and scows would travel through the lower bay area which would result in conflicts with recreational boaters. Conflicts with recreational boaters and scows would also occur in Lower Newport Bay. These actions would result in a significant impact which would have the greatest impacts during the peak boating season.

A component of this alternative that is different from that of Alternative 1 but similar to Alternative 4 is the need to move clean sand from the beaches near the Entrance Channel to the new tern island. As described in Alternative 4, this would add equipment working in and traveling through the lower portion of the bay. In addition to scows resulting in conflicts with recreational boaters (in both the lower portion of Upper Newport Bay and Lower Newport Bay), potential impacts to the nearshore and onland recreational users of the beach in the area of extraction would also occur.

As described for Alternatives 1 and 4, aesthetically, the upper portion of the Upper Newport Bay where no motorized vessels frequent would be affected, as would those near the Entrance Channel beaches where sand would be extracted for the new tern island. The visual impact of the dredging equipment is considered adverse but insignificant. After construction, the visual environment would be enhanced as a result of the project efforts. Nighttime work would entail the use of lighting that could temporarily impact shoreline residents through the main channel due to glare.

Hydraulic Dredge

Use of the hydraulic dredge would not require construction of an access channel in the lower bay area resulting in an overall 274 day effort. Boaters would still have access through the area, and no recreational impacts would result in this main channel area. Disposal scows would still move to LA-3 at a rate of 3 trips per day, resulting in lower Upper Newport Bay and Lower Newport Bay recreational conflicts and nighttime glare to shoreline residents.

Use of the hydraulic dredge results in use of the pipeline instead of the scows moving from Shellmaker Island north into the upper portion of Upper Newport Bay, except that sand would be brought in from the Entrance Channel for construction of the tern island. Also, the hydraulic dredge and crew boats would still be operating in this area. Impacts to recreational boaters in the upper area remain significant during construction under this alternative.

As described for Alternatives 1 and 4, the pipeline and pumps would move the work effort closer to those onland recreationalists along Back Bay Drive, and may result in a greater perception of an aesthetic impact during construction in the upper area as compared to use of the clamshell dredge.

All other impacts remain the same as those presented for the clamshell dredge.

<u>Post Construction</u>

All impacts as described above for both clamshell and hydraulic dredging remain during post construction maintenance dredging. The difference is in the lengths of time of construction. Use of a clamshell dredge for post construction work is expected to take 329 days, while use of the hydraulic dredge is expected to take 263 days. The main difference between the use of the dredges is that about 66 days would be required to dredge the main access channel if a clamshell dredge is used. In addition, in the hydraulic dredge alternative, movement of the disposal scows between the staging location and the Upper Bay would be avoided. Maintenance frequency under this alternative is expected to be once every 10 years.

4.10.3.4 Alternative 6

<u>Construction</u>

Clamshell Dredge

Alternative 6 would involve deepening and expanding the Unit III basin, removing the northern "kidney shaped" tern island and creating a new tern island at the main dike. The Unit II basin would be widened and deepened. All work would total about 507 days. The clamshell dredge requires dredging of the main channel which is expected to take about 25 days. The channel between Units I and II should take 7 days, the channel bordering Unit II should take 3 days. Other channels would take about 33 days. The major work of dredging Unit I/III should take about 240 days, and the Unit II dredging about 216 days. A tug boat would be used to position the scow and move it to the end of Shellmaker Island or an alternative location where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to LA-3, at a rate of 3 trips per day.

As was described for Alternatives 1, 4, and 5, during construction activities, canoeing and kayaking in the upper portion would be constrained, resulting in a significant impact. In the lower portion of Upper Newport Bay, dredging of the main access channel may necessitate the use of silt fencing during construction which may result in prohibiting boating access, and scow movements would result in conflicts with recreational boaters. Also, scow movements would conflict with recreational boaters in Lower Newport Bay. These would result in a significant impact which would have the greatest impacts during the peak boating season.

A component of this alternative that is different from that of Alternative 1 but similar to Alternatives 4 and 5 is the need to move clean sand from the beaches near the Entrance Channel to the new tern island. As described in Alternative 4, this would add equipment working in and traveling through the lower portion of the bay. In addition to scows resulting in conflicts with recreational boaters (in both the lower portion of Upper Newport Bay and in Lower Newport Bay), potential impacts to the nearshore and onland recreational users of the beach in the area of extraction would also occur.

As described for Alternatives 1, 4, and 5, aesthetically, the upper portion of the Upper Newport Bay where no motorized vessels frequent would be affected, as would areas near the Entrance Channel beaches where sand would be extracted for the new tern island. The visual impacts of dredging equipment are considered an adverse but insignificant impact. After construction, the visual environment would be enhanced as a result of the project efforts. Nighttime work would entail the use of lighting which temp would temporarily impact shoreline residents through the main channel due to glare. Glare is considered a potentially significant impact.

Hydraulic Dredge

Use of the hydraulic dredge would not require construction of an access channel in the lower bay area resulting in an overall 651 day effort. The hydraulic dredge would take about 7 days to dredge between Units I and II, and the channel bordering Unit II would take about 3 days. Other channels take 33 days. The major work of dredging Unit I/III would take about 319 days, and Unit II about 289 days. Boaters would still have access through the area, and no recreational impacts would result in this main channel area. Disposal scows would still move to LA-3 at a rate of 3 trips per day, resulting in conflicts with recreational boaters in both the lower portion of Upper Newport Bay and in the Lower Newport Bay areas, and nighttime glare to shoreline residents.

Use of the hydraulic dredge results in use of the pipeline instead of the scows moving from Shellmaker Island north into the upper portion of Upper Newport Bay, except that sand would be brought in from the Entrance Channel for construction of the tern island. Also, the hydraulic dredge and crew boats would still be operating in this area. Impacts to recreational boaters in the upper area remain significant during construction under this alternative.

As described for Alternatives 1, 4, and 5, the pipeline and pumps would move the work effort closer to those onland recreationalists along Back Bay Drive, and may result in a greater perception of an aesthetic impact during construction in the upper area as compared to use of the clamshell dredge.

All other impacts remain the same as those presented for the clamshell dredge.

Post Construction

All impacts as described above for both clamshell and hydraulic dredging remain during post construction maintenance dredging. The difference is in the lengths of time of construction. Use of a clamshell dredge for post construction work is expected to take 476 days, while use of the hydraulic dredge is expected to take 534 days. The main difference between the use of the dredges is that about 58 days would be required to dredge the main access channel if a clamshell dredge is used. In addition, in the hydraulic dredge alternative, movement of the disposal scows between the staging location and the Upper Bay would be avoided. Maintenance frequency under this alternative is expected to be once every 21 years.

4.10.3.5 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

For all alternatives, mitigation for restricted recreational boater access would be to provide a passageway through or around construction to the extent feasible, or to schedule construction through the areas deemed to be the most problematic in terms of access to the non-peak boater season. In order to avoid recreational conflicts with special events, such as regattas, scow trips through the lower portion of bay shall be restricted to non-peak hours through the summer and on weekends throughout the year. Even with these measures, impacts would be expected to remain significant for boater access through construction areas for the duration of construction.

Mitigation for the glare produced from vessels operating at night shall be to provide shielding that focuses light downward toward the work area and not outward toward land, to the extent feasible. This measure would reduce the impact of glare to insignificant.

4.10.4 Habitat Restoration Alternatives

4.10.4.1 Addition of Sand to Least Tern Islands

The addition of sand to the least tern islands is included as part of Alternatives 1, 4, 5, and 6 would add about 10 days of construction to Alternative 1 and about 4 days to each of the other alternatives. The worst case scenario has assumed that the sand would come from a beach near the entrance channel. The barge and equipment trips associated with this activity have the potential to conflict with recreational boaters both in the lower portion of Upper Newport Bay and in the Lower Newport Bay areas, which would be worst during the peak boating season. This action, as part of the overall sediment control alternatives (Alternatives 1, 4, 5, and 6) would result in significant impacts as presented in Sections 4.10.3.1 through 4.10.3.4.

This alternative would enhance lest tern production and indirectly provide improvements to wildlife viewing in the area.

4.10.4.2 Construct Small Dendritic Channels Through the Marsh

A single channel through Shellmaker Island would be constructed as a pilot project to increase foraging habitat for aquatic-feeding birds, improve circulation, and restrict access for humans and terrestrial predators. A small, but not significant loss of recreational access for humans would be lost under this effort. Excavation efforts would last about 3 days and are not considered to be significant.

4.10.4.3 Restoration of Wetlands in Filled Areas

The wetlands restoration alternatives below would be excavated material by either clamshell or hydraulic dredge, or backhoe.

Northstar Beach - The excavation would avoid dredging out the existing rowing center. An additional 37 scow trips through lower Upper Newport Bay and Lower Newport Bay and an additional 13 days of work would be added to the selected Sediment Control Alternative. No additional impacts are foreseen over those presented for Alternatives 1 through 5.

Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin - An additional 14 days of excavation and 142 scow trips would be added to the selected Sediment Control Alternative. The excavation may effect some trails in the area used by recreationalists. A potentially significant impact would occur. Mitigation would require realignment of these trails as part of the construction effort. If this is conducted, no residual significant impacts would result.

Dredge Spoil on Shellmaker Island - Excavation would required about 12 days of effort and 34 scow trips. No additional impacts other than those already described for Alternatives 1 through 5 are foreseen from this work effort.

4.10.4.4 Restoration of Side Channels

This would involve restoration of side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Access for human use to the islands would be lost, but the impact is not considered significant. Improvements include increased habitat for aquatic species and isolation from predators. Dredging would be done during dredging of Unit II by hydraulic dredge. About 7 days would be required for Middle Island and 8 days for Shellmaker Island. These improvements to one or both islands would be done in conjunction with the overall program. The impacts remain as described for the main alternatives. No additional impacts would result from this effort.

4.10.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

This effort would entail that divers collect existing eelgrass from the Lower Bay around Balboa Island and replant the eelgrass in the Upper Bay. The only mechanized equipment would be a small boat. No impacts would result to land or water uses, or the visual environment.

4.10.4.6 Removal of Segments of the Main Dike

The main dike is presently used for human access as well as access for terrestrial predators such as dogs, cats, and coyotes. By removing the main dike, habitat quality would be improved, however, the human recreational access would be removed. Even though this removal is permanent, this is considered to be an adverse, but not significant impact since the area contains other trails in the area. Equipment activity for this alternative would last one day, resulting in an adverse but not significant impact.

4.10.5 Cumulative Impacts

The only potential cumulative impact would be if other Newport Bay dredging programs would be occurring simultaneously with the proposed project. This would have the potential to cause greater restrictions to recreational boaters and result in a significant impact on recreational use. Mitigation would be to carefully schedule such activities such that they do not overlap or to provide passage for boaters through the construction areas.

4.10.6 Environmental Commitments

Mitigation Measure 10: Provide access for recreational boaters around the dredge.

To avoid interference with recreational activities, a passageway for recreational users shall be provided through or around construction.

Approvals Required: The boating access plan shall be approved by the Corps of Engineers, the Orange County Sheriff-Coroner/Harbor Patrol, and the U.S. Coast Guard.

Timing: Recreational access stipulations shall be included in project contracts. The access plan shall be approved prior to the commencement of dredging.

Monitoring Program: The County of Orange shall establish a monitoring program.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards of Compliance: Compliance with this measure will occur if access around the dredge is provided for boaters.

Mitigation Measure 11: Schedule scow trips through the lower portion of the Bay to avoid peak use use hours on summer weekends.

To avoid conflicts with recreational users of the bay, scow trips through Lower Newport Bay shall be scheduled to avoid hours of peak recreational use during summer weekends. Peak use summer hours are defined as 9 a.m. to 7 p.m. on summer weekends and holidays and during any scheduled boating events in the main channel of the Lower Bay.

Approvals required: The scheduling of scow trips through the lower bay shall be approved by the Corps of Engineers, the Orange County Sheriff-Coroner/Harbor Patrol, and the U.S. Coast Guard.

Timing: Scheduling stipulations shall be included in project contracts. The scow trip schedule shall be approved prior to the commencement of dredging.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards of Compliance: Compliance with this mitigation measure will occur if scow trips through the lower bay avoid times of peak recreational boater use.

Mitigation Measure 12: Lights shall be focused downward and shielded from the surrounding environment.

To avoid glare from night lighting, lights shall be shielded and directed away from the surrounding area.

Approvals Required: None.

Timing: Lighting stipulations shall be included in project contracts.

Monitoring Program: The County of Orange shall establish a monitoring program.

Reporting: Prior to initiation of construction and after completion of construction certifying compliance.

Standards for Compliance: Compliance with this measure shall occur if nightlighting is shielded and directed to avoid disturbing the surrounding area.

4.11 CIRCULATION

4.11.1 Significance Criteria

Traffic circulation is considered to result in a significant impact if:

- The addition of project related traffic would substantially add vehicle trips to cause an increase in Level of Service on local roadways.

4.11.2 No Project Alternative

Under the No Project alternative, no work would occur, and there would be no additional traffic. No impacts would result.

4.11.3 Sediment Control Alternatives

Construction workers are expected to access the work areas via the local roadway network. The number of construction workers on a worst-case estimate is approximately 25 workers. At two trips per day, 50 trips would be added to the local roadway network for the duration of construction and post construction efforts. This is less than significant and would not affect levels of service (LOS) on area roadways.

4.11.4 Habitat Restoration Alternatives

As described in Section 4.11.3, no impacts to the local road network would result.

4.11.5 Cumulative Impacts

All local area projects cumulatively could contribute to the area's traffic congestion and result in potential impacts at key intersections. Each project, especially land use development projects which add traffic on a permanent basis, should be required to be evaluated in terms of traffic concerns and provide mitigation as appropriate in accordance with county and local area planning guidance.

4.12 ENERGY

The impacts of dredging and any proposed development associated with the various alternatives are analyzed with regard to how the level of service currently provided by utility companies and local agencies is able to accommodate the project-related demand. The significance of the impact is determined using the criteria specified below.

4.12.1 Significance Criteria

Electricity and Natural Gas

Impacts would be considered as significant if project-related operations resulted in an increase in electrical and natural gas consumption that met or exceeded supplier distribution allocations or caused supply of capacity constraints that reduced the current level of service in the ROI. As proposed, neither natural gas nor electricity are required for project implementation and any impact on these resources would be less than significant. As such no further discussion on these resources is warranted.

Fossil and Bunker Fuels

Significant impacts could occur if project operations created a demand that met or exceeded existing supplies or reduced the level of service, thereby requiring development of new facilities and sources in excess of those already in existence or planned. Fossil fuel use in the project area can also be compared to regional fuel usage and any fuel usage associated with the proposed project which would result in an additional 1 percent of the regional fuel usage would be considered as a significant adverse impact. Los Angeles County had an annual consumption of 286.0 million gallons (Corps and LAHD, 1992). When the four county region is considered (i.e., Los Angeles, Orange, Riverside, and San Bernardino), regional fuel use is expected to at least double that projected for Los Angeles. As such, an impact would be considered significant if the project were to require more that 5.72 million gallons in any given year.

4.12.2 No Project Alternative

Under the No Project Alternative there would be no dredging within the Upper Bay ecological reserve or disposal of materials. No fuel would be required for dredging operations nor any associated vehicles and no impacts would result. While silt which accumulates in the Upper Bay would eventually work its way down into the navigational channel and could therefore require subsequent dredging in those areas, any energy use associated with that action is not a part of the project at hand and would not be addressed further in this analysis.

4.12.3 Sediment Control Alternatives

4.12.3.1 Alternative 1

Construction

Diesel fuel would be required for the dredge as well as the associated tug and crew boats. Minor quantities of gasoline would be required for passenger vehicles which transport the crew and workers to the site. Due to differing needs for both clamshell and hydraulic dredging, fuel use would also differ. These are then quantified below.

With Clamshell Dredge

Under this scenario, dredging would be conducted from a floating barge by a crane equipped with a grab bucket or by a CAT backhoe, also using a bucket. As material is removed, it is placed on a scow. Dredge operations are projected to occur 24-hours per day, 6 days per week with 276 days of operation. A tug boat would be used to position the scow and move it to the end of Shellmaker Island where it would be exchanged for a second scow. An ocean-going tug would then move the scow(s) to a disposal site at LA-3. Round-trip travel time is approximately 4 hours and three trips are projected on a daily basis. Both the dredge and tugs are expected to use diesel-powered generators for night-lighting. A guide boat would accompany the tug and barge movements and a survey boat would monitor all operations every 2 days. A quality control boat would be used daily. Fueling is expected to occur every 2 to 3 days and seven workers are projected to perform these operations. However, these operations are extremely minor and the associated fuel associated with the workers vehicles (estimated at about 15 gallons of gasoline per day) is minuscule when compared with that used by the dredge and tugs and would not change the results of the analysis. Table 4.12-1 lists the projected horsepower (hp) ratings and daily hours of operations used in calculating fuel use associated with the equipment.

For the purposes of this analysis, it is assumed that the dredge is pushed into position by the tug boat. The clamshell would use a diesel engine of approximately 1,000 horsepower (hp). The SCAQMD *CEQA Air Quality Handbook* (Handbook) (1993) provides a conversion so that the volume of diesel used may be determined from both the horsepower and hours of use. Table A9-3-E of the Handbook denotes that each horsepower-hour requires 0.05 gallon of diesel. Based on this conversion, the 1,000 hp dredge would consume 1,200 gallons of diesel in a 24 hour day. The use of the generators would require an additional 244 gallons.

As noted, dredged sediments would be loaded on a scow for subsequent delivery. This scow would be pulled using a tug boat. Another tug is then used to transfer these sediments to the LA-3 disposal area. Tugs can be powered by engines ranging in size from a few hundred hp to as much as 3,600 hp. A value of 1,600 hp was used in ascertaining vessel fuel consumption. Presented below are the specifics for marine vessel fuel consumption.

Fuel Type	Diesel
Fuel Density, lb/gal	7.12
Specific Fuel Consumption, lb/hp/hr	0.40
Idle Load Factor	0.20
Maneuver Load Factor	0.50
Cruise Load Factor	0.80

Table 4.12-1
Equipment Operations and Horsepower Ratings
Used in Clamshell Dredging Fuel Use Calculations

Emission Source	Number	Horsepower	Total Hours per Day
Dredge	1	1,000	24
Tugboats	2	1,600	15[1]
Miscellaneous Boats	3	50	17[2]
Generators	3	250	19.5[3]

[1] Includes three round-trips of 1 hour for dredge to Shellmaker Island and three round-trips of 4 hours for LA-3 disposal.
[2] Includes one boat at 3 hours of tug escort to Shellmaker Island, one boat at 12 hours for tug escort to LA-3 disposal, and one boat at 2 hours for survey and QC.
[3] Assumes that the barge and each tug are equipped with a generator and each generator operates half of the time (e.g., at night) during these operations

Because of the short distance between the dredge site and Shellmaker Island, the in-bay tug is assumed to make a round-trip in 1 hour and three round-trips are assumed on a daily basis. The tug is assumed to operate at idle for 20 minutes per round-trip and maneuver for 40 minutes per round-trip. Note that because of the relatively short distance, this tug is never assumed to get to "cruise." Thus, 1 hour is spent at idle while 2 hours are spent maneuvering on a daily basis. The tug which takes the scows from Shellmaker Island to LA-3 is also expected to be at idle for 30 minutes per round-trip and maneuver for 90 minutes per round trip as it operates within the bay and at the LA-3 site. Once out in open ocean, the remaining 2 hours of the round-trip are assumed to be in cruise. Therefore, all told, the two tugs operate at idle for 2.5 hours, at maneuver for 6.5 hours, and cruise for 6 hours. Emissions for these tugs are based on Table II-3.3 included within AP-42, A Compilation of Air Pollutant Emission Factors (EPA, 1985). Based on a rating of 1,600 hp, the tugs would consume approximately 18 gallons per hour at idle, 45 gallons per hour when maneuvering, and 72 gallons per hour at cruise. Therefore, based on the noted hours of operation, the two tugs could consume approximately 770 gallons per day. Crew boat hours are expected to mirror the tugs' hours by operational phase. Therefore, crew boats are projected to operate at idle for 2.8 hours per day, maneuver for 7.4 hours per day, and cruise for 6.8 hours per day and fuel consumption is estimated at 27 gallons per day. Therefore, the dredge, the tugs, and the crew boats are projected to use about 2,441 gallons of diesel on a daily basis. Based on a 276 day construction schedule, approximately 673,716 gallons of diesel would be required. All construction would be performed within a 1 year period. This value is well below the significance criterion and does not denote a significant impact.

With Hydraulic Dredge

Under this scenario, dredging would be conducted from a floating hydraulic dredge of modest size (approximately 440 hp). Dredge operations are projected to occur 24-hours per day, 6 days per week with 243 days of operation. As sediment material is removed, it pumped to a scow located at Shellmaker Island. Three booster pumps each of about 400 hp would be used in the pumping operations. A fourth pump of similar size is assumed for scow dewatering. While these pumps could be either electric- or diesel-powered; as a reasonable worst-case scenario, diesel is assumed. An ocean-going tug would then move the scow(s) to a disposal site at LA-3. Round-trip travel time is approximately 4 hours and three trips are projected on a daily basis. Both the dredge and tugs are expected to use diesel-powered generators for night-lighting. As with clamshell operations, three small boats would be used to assist the operations. Table 4.12.2 lists the projected horsepower (hp) ratings and daily hours of operations used in calculating emissions associated with the equipment.

Table 4.12-2
Equipment Operations and Horsepower Ratings
Used in Hydraulic Dredging Fuel Use Calculations

Emission Source	Number	Horsepower	Total Hours per Day
Hydraulic Dredge	1	440	24
Pumps	4	400	96
Tugboats	1	1,600	12[1]
Miscellaneous Boats	3	50	14[2]
Generators	2	250	18[3]

1 Includes three round-trips of 1 hour for dredge to Shellmaker Island and three round-trips of 4 hours for LA-3 disposal.
2 Includes one boat at 12 hours for tug escort to LA-3 disposal, and two boats at 1 hour each for survey and QC.
3 Assumes that the barge and tug are equipped with a generator and each generator operates half of the time (e.g., at night) during these operations

Again using a value of 0.05 gallon of diesel for each horsepower-hour, the dredge would use approximately 528 gallons of diesel per day while the four pumps would consume 1,920 gallons while the generators would require an additional 225 gallons per day.

As with clamshell operations, the tug which takes the scows from Shellmaker Island to LA-3 is also expected to be at idle for 30 minutes per round-trip and maneuver for 90 minutes per round trip as it operates within the bay and at the LA-3 site. Once out in open ocean, the remaining 2 hours of the round-trip are assumed to be in cruise. As with clamshell operations, based on a rating of 1,600 hp, the tug would consume approximately 18 gallons per hour at idle, 45 gallons per hour when maneuvering, and 72 gallons per hour at cruise. Therefore, based on the noted hours of operation, the tug could consume approximately 661.5 gallons per day. Crew boat hours are expected to mirror the tugs' hours by operational phase. Therefore, crew boats are projected to operate at idle for 1.75 hours per day, maneuver for 5.25 hours per day, and cruise for 7 hours per day and fuel consumption is estimated at 24 gallons per day. All told, hydraulic dredging is estimated to require approximately 2,830 gallons of diesel on a daily basis and about 687,690 gallons would be consumed over the 243 days of dredging. Again, all construction would be performed within a 1 year period and does not denote a significant impact.

Post Construction

Post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width. The need for maintenance dredging is a function of time and weather conditions. Obviously, wet weather would require more frequent dredging as sediments are washed into the bay. Assuming a similar mix of equipment, daily dredging operations, when required, would require a similar volume of fuel on a daily basis. Clamshell dredging would require 287 days and 643,096 gallons of diesel. This dredging would be performed in approximately 12.3 months. Hydraulic dredging is estimated at 220 days and 622,600 gallons of diesel all of which would be consumed within a 1-year period. These values are less than significant.

4.12.3.2 Alternative 4

Construction

Under this scenario, clamshell dredging operations would require 873 days while hydraulic dredging would be extended to 848 days. Assuming a similar level of activity as noted for Alternative 1, clamshell dredging would require 1,956,175 gallons of diesel while hydraulic dredging would require 2,399,840 gallons. Based on 37.29 months to perform clamshell dredging, diesel use is estimated at 629,501 gallons per year. Hydraulic dredging is slated to take 36.23 months and equates to 794,868 gallons per year. Neither of these values presents a significant impact on energy resources.

Post Construction

As with Alternative 1, post construction dredging would include occasional dredging for maintaining the appropriate channel depth and width and is a function of time and weather conditions. Assuming a similar mix of equipment, daily dredging operations, when required, would require a similar volume of fuel as noted for construction. However, the total volume of fuel is dependant on both the type of dredging performed and the projected duration of this dredging. Clamshell dredging is estimated at 771 days and would require 1,882,011 gallons of diesel. Based on 32.9 months to perform this dredging, approximately 686,448 gallons could be used during a given year. Hydraulic dredging is estimated to take 671 days and use a total of 1,898,930 gallons of diesel. If performed over a period of 28.7 months, as much as 793,978 gallons could be consumed on a yearly basis. Based on this analysis, neither clamshell nor hydraulic dredging would produce a significant impact.

4.12.3.3 Alternative 5

Construction

Under this scenario, clamshell dredging operations would require 299 days and would use 669,984 gallons of diesel. Hydraulic dredging would be extended to 274 days and could use 775,420 gallons. Clamshell dredging would require as much as 12.76 months and therefore could consume 630,079 gallons during the year. Hydraulic dredging would all be accomplished during the 1-year period. Neither of these values exceeds the significance criterion and no significant impacts are anticipated.

Post Construction

Assuming a similar mix of equipment, daily dredging operations, when required, would have similar fuel requirements as construction dredging. Based on a period of 329 days, clamshell dredging is estimated to require 803,089 gallons of diesel while hydraulic dredging is estimated at 263 days and 744,290 gallons. Assuming 14.13 months for the clamshell, approximately 682,029 gallons would be used in a 1-year period. Hydraulic dredging is estimated at 11.28 months so the entirety of the 744,290 would be used in this yearly period. As with construction, these values are less than significant.

4.12.3.4 Alternative 6

Construction

Under this scenario, clamshell dredging operations would require 507 days while hydraulic dredging would be extended to 651 days. Clamshell dredging would then consume 1,237,587 gallons of diesel while hydraulic dredging is estimated to use 1,842,330 gallons. Based on a time frame of 28.87 months to perform clamshell construction, yearly fuel us is estimated at 514,411 gallons. Hydraulic dredging could be performed in 27.81 months and would require 794,964 gallons per year. Neither of these values presents a significant impact.

Post Construction

Post construction maintenance is estimated at 476 days for clamshell operations and 534 days for hydraulic dredging. Based on these values, clamshell dredging is estimated to require 1,161,916 gallons of diesel while hydraulic dredging could use 1,511,220 gallons. Based on 20.3 months to perform clamshell maintenance, 686,847 gallons of diesel could be used in a 1-year period. Hydraulic dredging would reduce this period to 22.38 months and result in a diesel use of 810,305 gallons over a 1-year period. As with construction, no significant impacts are projected for either form of dredging.

4.12.3.5 Mitigation for Significant Adverse Impacts of Sediment Control Alternatives

While the use of any nonrenewable energy source is adverse, based on the provided criteria, no significant impacts are projected for any of the alternatives. As such, no mitigation is warranted.

4.12.4 Habitat Restoration Alternatives

Under the habitat restoration alternatives dredging would be performed as described for the various alternatives noted above. However, a relatively small portion of the dredged material would be used in the construction of habitat areas within the bay. The impact of this construction is addressed by alternative.

4.12.4.1 Addition of Sand to Least Tern Islands

Under this alternative, the vast majority of the dredging operation, and resultant fuel use would be as described in Section 4.12.3, above. However, for Alternative 1, sand would be added to both of the existing tern islands in the upper basin. Alternatives 4, 5, and 6 would place sand in the southern island. In either case, this sand would be excavated by backhoe and loaded on a barge via two front-end loaders for delivery to the island(s). Once at the island(s), this sand would be spread by heavy equipment. This analysis assumes 20 hours use per day of heavy equipment with a combined hp rating of 500 or 10,000 horsepower-hours per day. Again using a factor of 0.05 gallons per horsepower-hour, an additional 500 gallons of fuel could be used during these heavy-equipment operations. (Actual fuel use could be far less than this as this value assumes that the equipment works continuously at its rated capacity.) A few additional workers would also be required to commute to the site, however, the fuel associated with their automobiles is minuscule and would not change the results of the provided analysis. Because these operations would only occur for a period of about 10 days, as much as 5,000 gallons of additional diesel could be required. This value, even when added to the yearly totals projected for all alternatives, would not exceed the significance criterion and would not produce a significant impact.

4.12.4.2 Construct Small Dendritic Channels Through the Marsh

Under this alternative a backhoe would be used to construct a channel though the Shellmaker Island. This material would then be loaded onto a barge for subsequent delivery to LA-3. Because fewer and smaller pieces of equipment would be required for this operation than presented in Section 4.12.4.1, fuel use would be reduced and heavy equipment fuel use could be on the order of 300 gallons per day. However, the equipment would only operate for 3 days and would not raise the yearly fuel use above a level of significance.

4.12.4.3 Restoration of Wetlands in Filled Areas

Under this alternative, additional dredging would be performed to restore wetlands areas within the bay. Each restoration opportunity could use either the clamshell or hydraulic dredge and daily fuel use associated with each of these operations is as previously described. The longest of these alternatives (section of land by Unit I/III basin) is estimated at 14 days. For clamshell dredging, this would increase the overall fuel use by 30,855 gallons while an additional 38,969 gallons would be required for hydraulic dredging. Because project operations would be extended by the noted duration, this time extension would raise the total fuel use, but would not change the yearly fuel consumption and no significant impacts would be expected.

4.12.4.4 Restoration of Side Channels

Under this alternative material would be dredged to the west side of Middle Island and/or east side of Shellmaker Island. This would be accomplished using the hydraulic dredge and the use of a clamshell is not proposed here. Daily fuel use would approximate that noted for Alternative 1 and because total operations would only take 15 days (thereby extending the project duration), the resultant fuel use value would not exceed the specified criterion which is based on a yearly use.

4.12.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

This alternative would relocate eelgrass to portions of the Upper Bay. The procedure would require four to six SCUBA divers. All work would be done by hand and the only required equipment would be a small boat of about 50 hp. Based on the small number of required divers and required equipment, any additional fuel use would be inconsequential.

4.12.4.6 Removal of Segments of the Main Dike

Under this alternative, a backhoe would remove portions of the main dike. The backhoe would be transported to the dike aboard a small barge. This operations is estimated to require less than 1 day and any additional fuel use would be inconsequential when compared to the dredging operations as a whole.

4.12.5 <u>Cumulative Impacts</u>

The project is projected to require diesel fuel for equipment use including the dredge and associated tugs, and potentially heavy equipment. In no case is this fuel use projected to exceed one-half of one percent of the total fuel demand for the four county region. Furthermore, this use is short-term and while the energy source is nonrenewable, the cumulative impact of this use in not significant.

SECTION 5.0 - COMPARISON SUMMARY OF ENVIRONMENTAL IMPACTS

5.1 INTRODUCTION

This section compares the impacts and benefits of the sediment control alternatives. Table 5.1-1 identifies the impacts and benefits identified for each alternative for each resource category. Section 5.2 summarizes the differences among alternatives for each resource category.

5.2 COMPARATIVE SUMMARY

5.2.1 Earth Resources

Under the No Project Alternative, increased sedimentation would have significant adverse impacts on Upper Newport Bay. Upper Newport Bay would be adversely affected by the loss of open water areas. The topography of Upper Newport Bay would be altered in a way that would have substantial negative effects on the environment. All of the sediment control alternatives would have a beneficial impact on earth resources by preventing those negative effects.

The only adverse impact the sediment control alternatives would have on earth resources is the excavation of sand from a beach near the Entrance Channel to supply sand for a new least tern island in the Unit II basin. The excavation of a small amount of beach sand is considered an adverse but insignificant impact of Alternatives 4, 5, and 6. This impact would not occur for Alternative 1.

5.2.2 Water Quality

Under the No Project Alternative, increased sedimentation in the Upper Bay would result in a significant adverse impact to water quality because of decreased circulation and greater influence of San Diego Creek. All of the sediment control alternatives would improve water quality. Alternative 4 would be expected to have the highest water quality because the large tidal prism and deep basins would result in the greatest amount of tidal influence and least influence of San Diego Creek. Alternative 6 has somewhat smaller basins than Alternative 4 and thus would have a smaller tidal prism. Alternative 1 would have the third highest water quality, because it would restore Unit III and Unit II basin footprints that would be smaller and shallower than Alternatives 4 and 6. Alternative 5 would be predicted to have the lowest overall water quality because it would not restore the Unit II basin and it would only restore the Unit III basins to a depth of -14 feet (ft.) (-4.2 meters [m]) mean sea level (MSL).

Neither Alternative 1 nor Alternative 5 would comply with the Regional Water Quality Control Board (RWQCB) Total Maximum Daily Load (TMDL) objectives for sediment. Alternative 1 would require maintenance dredging at a frequency greater than every 10 years. Alternative 5 would not maintain the Unit II basin at a depth of -7 feet (-2.1 m) MSL. The failure to comply with TMDL objectives is an unavoidable significant adverse impact of these alternatives. Both Alternatives 4 and Alternative 6 would comply with TMDL objectives.

All sediment control alternatives would resuspend sediments and create localized turbidity during initial dredging and periodic maintenance dredging. Because turbidity would be contained largely within 100 feet (30 m) of the dredge, by the use of a turbidity curtain, the extent of Bay waters subjected to increased turbidity at any one time would be the same for all alternatives. Because initial and maintenance dredging for Alternative 6 would occur for the fewest total number of days within the next 50 years if a clamshell dredge were used, Alternative 6 would have the least total impact on Bay water quality followed by Alternatives 5, 1, and 4. If a hydraulic dredge were used, Alternative 5 would impact water quality for the fewest number of days followed by Alternatives 6, 1, and 4, respectively.

Table 5.1-1
Summary of Impacts of Sediment Control Alternatives

Impact	No Project	Alternative 1		Alternative 4		Alternative 5		Alternative 6	
		C	H	C	H	C	H	C	H
Earth Resources									
negative changes in topography	x	+	+	+	+	+	+	+	+
disposal mounds at LA-3	-	o	o	o	o	o	o	o	o
excavation of beach for tern island sand	-	-	-	o	o	o	o	o	o
Water Quality									
degradation from increased sedimentation	x	+	+	+	+	+	+	+	+
conflict with RWQCB TMDL objectives	x	x	x	+	+	x	x	+	+
turbidity during dredging	-	o	o	o	o	o	o	o	o
water column and sediment impacts at LA-3	-	o	o	o	o	o	o	o	0
fuel spill	-	*	*	*	*	*	*	*	*
turbidity from creation of new tern island	-	-	-	o	o	o	o	o	o
Biological Resources									
loss of open water habitat	x	+	+	+	+	+	+	+	+
loss of foraging habitat for least tern	x	+	+	+	+	+	+	+	+
net loss of habitat units	x	+	+	+	+	+	+	+	+
loss of intertidal mudflat	+	o	o	x	x	o	o	o	o
protection by restoration of side channels	-	+	+	+	+	+	+	+	+
loss of invertebrates from dredging	-	x	x	o	o	o	o	o	o
turbidity during dredging	-	o	o	o	o	o	o	o	o
loss of beach invertebrates for tern island	-	-	-	o	o	o	o	o	o
disturbance to least terns from dredging	-	*	*	*	*	*	*	*	*
disturbance to clapper rails from dredging	-	*	*	*	*	*	*	*	*
disturbance to Beldings savannah sparrow	-	*	*	*	*	*	*	*	*
damage to clapper rail nests from wake	-	*	-	*	-	*	-	*	-
fuel spill impacts to listed species or marsh	-	*	*	*	*	*	*	*	*

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Impact	No Project	Alternative 1		Alternative 4		Alternative 5		Alternative 6	
		C	H	C	H	C	H	C	H
Air Quality									
exceedance of total NO_X emission standards during dredging	-	x	x	x	x	x	x	x	x
dust emissions during dredging	-	-	-	-	-	-	-	-	-
odor emissions during dredging	-	o	o	o	o	o	o	o	o
Noise									
exceed noise standards during dredging	-	*	*	*	*	*	*	*	*
Hazards									
decreased navigation	x	*	*	*	*	*	*	*	*
risk to boater safety during dredging	-	*	*	*	*	*	*	*	*
Land and Water Uses									
loss of recreation/land/water uses from increased sedimentation	x	+	+	+	+	+	+	+	+
interference with recreation/land/water uses during dredging	-	x	x	x	x	x	x	x	x
excavation of beach for tern island sand	-	-	-	o	o	o	o	o	o
visual impacts during dredging	-	o	o	o	o	o	o	o	o
glare impacts during dredging	-	*	*	*	*	*	*	*	*
Energy									
annual diesel consumption	-	o	o	o	o	o	o	o	o

C = clamshell dredge
H = hydraulic dredge
X = significant adverse impact that cannot be mitigated to insignificant
* = significant adverse impact that can be mitigated to insignificant
o = adverse but insignificant impact
+ = beneficial effect

For all sediment control alternatives there is the slight chance that a significant adverse to the water quality of the Upper Bay could occur because of a fuel spill. The chance of this impact occurring is considered equally unlikely for all alternatives if a clamshell dredge were used. The small chance of a fuel spill is reduced if a hydraulic dredge is used.

5.2.3 Biological Resources

Under the No Project Alternative, sedimentation would result in a loss of over 80 percent of the marine open water habitat in Upper Newport Bay within the next 50 years. The loss of almost all the open water habitat would be a significant adverse impact. Other significant adverse impacts of the No Project Alternative would be a loss of foraging habitat for the Endangered California least tern and an overall net loss in habitat value of an area of special biological significance, the Upper Newport Bay Ecological Reserve. All of the sediment control alternatives would prevent these significant adverse impacts to biological resources. According to the modified-Habitat Evaluation Procedure (HEP) model (see Appendix A), Alternative 4 would result in the greatest net Habitat Units (HUs) for Upper Newport Bay biological resources. Alternative 6 was second followed by Alternative 1 and Alternative 5. All alternatives would cause a net loss of intertidal mudflat habitat compared to the existing condition. This loss would be 26 percent for Alternative 4. A loss of this substantial amount of mudflat is considered to be an unmitigable significant adverse impact. Alternative 6 would result in the loss of 17 percent of the mudflat. This alternative would also cause a substantial loss of mudflat, but because loss of mudflat would be compensated somewhat by an increase in habitat quality, the loss is considered adverse but insignificant for Alternative 6. Alternatives 1 and 5 would cause a loss of 4 percent and 8 percent respectively. Losses of mudflat for these alternatives are considered adverse but insignificant.

Restoration of side channels around islands would benefit birds by decreasing intrusion of humans and mammalian predators. Alternative 1 would restore a side channel around New Island but would not restore a channel between the southerly tern island and shore. Alternative 5 would restore the channel between the southerly tern island and shore but would not restore the side channel east of New Island. Alternatives 4 and 6 would restore both of these channels.

Dredging for each of the sediment control alternatives would destroy most of the benthic invertebrates within the dredge footprint. Alternative 4 would impact the largest total area. Therefore, Alternative 4 would have the greatest initial impact on benthic invertebrate communities. Recolonization of most species would occur rapidly following dredging, and the benthic invertebrate community would be similar to the pre-dredging community within a year. However, some, long-lived irregularly recruiting organisms might take many years to re-establish. Because it would be over 20 years before Alternative 4 and Alternative 6 would require maintenance dredging, these alternatives would allow the development of a fully diverse benthic invertebrate community. The frequent dredging that would be required under Alternative 1 (about every 7 years) would reduce the benthic invertebrate diversity in the Upper Bay. The loss of benthic invertebrate diversity is considered to be an unmitigable significant adverse impact of Alternative 1. Alternative 5 would require maintenance dredging at a frequency of every 10 years. Although even this frequency might prevent the establishment of some species, little disturbance would occur to the Unit II basin under Alternative 5. Therefore, long lived, irregularly recruiting species would be maintained in most of the Unit II basin.

Turbidity during dredging would disturb plankton, benthic invertebrates, fishes and visually foraging birds. Because turbidity would be contained by a curtain and would impact less than 1 percent of the open water habitat in the Upper Bay at any time, this impact is considered to be adverse but insignificant. Because Alternative 4 would require the most total dredging days over the next 50 years, turbidity impacts would be greatest for this alternative. For clamshell dredging, Alternative 6 would cause turbidity impacts for the fewest number of days. For the hydraulic dredge, Alternative 5 would require the least number of dredging days in the next 50 years.

Alternatives 4, 5, and 6 would also disturb sandy beach organisms by excavating sand from a beach near the entrance channel to place on the relocated least tern island. The impacts of excavating a small amount of beach sand would be adverse but insignificant.

Noise from the dredge would disturb birds within a localized area during dredging. Because only a small percentage of the total habitat would be disturbed by noise at any one time, noise impacts are considered adverse but insignificant for most bird species. However, dredging noise near the least tern nesting island could significantly interfere with the reproductive success of the California least tern. This potentially significant impact could be mitigated to insignificant by avoiding dredging near the island during the breeding season. Because Alternative 1 requires the least dredging in the Unit II basin, impacts are most easily avoided for Alternative 1. Alternative 4 requires the greatest amount of dredging near the tern island and thus would be the alternative in which avoidance of impacts was most difficult. Dredge noise could also have a potentially significant impact on the Endangered light-footed clapper rail. Because clapper rails nest throughout much of the Upper Bay, it might not be possible to completely avoid dredging near clapper rail nests during the breeding season. It is considered that this impact could be mitigated to insignificant by avoiding dredging near high density nesting areas during the breeding season and monitoring nests near dredging in low density areas to make sure that disturbance did not cause clapper rails to leave nests untended or engage in any other unusual behavior that might lower reproductive success. If evidence of such behavior were observed, all dredging near clapper rail nests should cease until after the breeding season. Because Alternative 4 would require the greatest amount of dredging near low saltmarsh habitat where clapper rails preferentially nest, it is the alternative most likely to impact clapper rails. Alternative 5 requires minimal dredging in the Unit II basin and thus would be the alternative least likely to impact clapper rails. The state-endangered Belding's savannah sparrow could also be impacted adversely by dredge noise. This impact could be avoided if no dredging near high density habitat occurred during the breeding season. If dredging occurs near a low density nesting area, nests should be monitored to ensure that dredge noise is not negatively affecting behavior. Alternative 4 would require the greatest amount of dredging near mid saltmarsh, the Belding savannah sparrow's preferred habitat, and thus would be the alternative most likely to have an adverse impact on this species. Alternative 5 would have the least amount of dredging near mid saltmarsh.

The wake of the disposal scows and tugs that would travel up and down the main channel of the Upper Bay for the clamshell dredging alternative could damage clapper rail nests. This impact could be mitigated to insignificant by placing floats along the edges of the marsh to buffer wakes. Because Alternative 4 would occur over 3 breeding seasons compared to 2 for Alternative 6 and one for Alternatives 1 and 5, it would have the greatest potential to affect clapper rail nests. This impact would not occur if a hydraulic dredge were used.

5.2.4 Air Quality

Table 5.2-1 compares the total construction emissions of the four alternatives with the emissions of the habitat restoration measures included in the calculations. Alternative 4 would have the greatest total emissions during construction followed by Alternative 6. Alternative 1 would have the lowest total emissions.

The significance of any potential air quality impacts is based on both daily and quarterly emissions criteria. Thus, based on South Coast Air Quality Management District (SCAQMD) methodology, it makes no difference to the impact analysis if a construction project goes on for 1 year or 50 years. However, to compare the air quality impacts of the alternatives, the total volume of emissions associated with each alternative over the next 50 years is presented in Table 5.2-2. It would certainly be expected that as future air quality rules become more stringent, future equipment emissions would be reduced and the values presented in the table overestimate actual emissions. Still, as a reasonable worst-case scenario, the presented emissions represent an overall basis for comparison between the various alternatives. Note the oxides of nitrogen (NO_X) emissions will be exceeded in each of the Alternatives, however the amount of exceedance varies between Alternatives with Alternative 6, 5, 1, and 4 in order from least to most NO_X emissions exceedance, respectively.

Table 5.2-1
Total Construction Emissions with Emissions of Habitat Restoration Alternatives Included (Tons)

Emission Source	CO	NOx	ROG	SOx	PM10
Alternative 1					
Clamshell	38.5	128.8	7.8	6	7.4
Hydraulic	51.6	156.3	8.1	6.5	8.6
Alternative 4					
Clamshell	106.4	357.8	21.9	16.8	20.6
Hydraulic	156.7	474.1	25	19.4	26.1
Alternative 5					
Clamshell	41	137.6	8.4	6.4	7.9
Hydraulic	56.9	172.6	9	7.2	9.5
Alternative 6					
Clamshell	64.7	217.4	13.3	10.2	12.5
Hydraulic	102.1	309.2	16.3	12.7	17

Table 5.2-2
Total Emissions for Both Clamshell
and Hydraulic Dredging Operations by Alternative (tons)

Emission Source	Total Days	CO	NO_X	ROG	SO_X	PM_{10}
Alternative 1						
Clamshell Operations	2,285	260.1	876.5	53.9	41.5	50.5
Hydraulic Operations	1,790	311.1	940.2	50.1	38.3	52.0
Alternative 4						
Clamshell Operations	2,415	274.9	926.4	57.0	43.8	53.4
Hydraulic Operations	2,190	380.6	1,150.3	61.3	46.9	63.6
Alternative 5						
Clamshell Operations	1,949	221.9	747.6	46.0	35.4	43.1
Hydraulic Operations	1,589	276.2	834.6	44.5	34.0	46.2
Alternative 6						
Clamshell Operations	1,459	166.1	559.7	34.4	26.5	32.2
Hydraulic Operations	1,719	298.8	902.9	48.1	36.8	49.9

CO = Carbon monoxide
NO_X = Oxides of nitrogen
ROG = Reactive organic gases
SO_X = Oxides of sulfur
PM_{10} = Particulate matter less than 10 micrometers in diameter

5.2.5 Noise

Under the No Project Alternative, there would be no dredging within the Upper Bay or disposal of materials. No noise would be produced and no impacts would occur. The clamshell dredging noise associated with all alternatives will exceed noise thresholds, therefore affecting those residents and businesses located west of Jamboree Road and in the Eastbluff housing area as well as residents and business located to the west of the channel. Additionally, depending on the hours of operation, tug transports of the scow have the potential to result in a significant impact for those residences within the channel. Although the noise envelope for the hydraulic dredge is smaller that for the clamshell dredge, depending on the hours of operation, significant noise impacts could be produced. Alternatives 4 and 6 require more dredging within Unit II and III than Alternative 1. Additionally, the dredge would be closer to the residents located in the Eastbluff housing area and west of the channel, therefore more residents would be exposed to excessive noise levels. Alternative 5 requires more dredging in Unit III than Alternative 1 resulting in more local residents exposed to excessive noise levels in this area. Conversely, Alternative 5 requires less dredging in Unit II, therefore fewer local residents would be exposed to excessive noise levels in this area.

If one considers the distance to the 55 A-weighted decibels (dBA) contour as a benchmark for impact, the total acreage of noise impact associated with equipment use can be determined. The length of time for this disturbance is based on the proposed schedule for each alternative, and an "acre-day" value can be calculated.

With respect to the larger pieces of equipment to be used, clamshell dredging would use the dredge and two tugboats. Assuming that each piece produces a 55 dBA noise level at a distance of 562 feet, the total area of disturbance is estimated at 68.4 acres. Hydraulic dredging is estimated to use the dredge, four pumps, and one tug. Based on the dredge and pumps creating a 55 dBA noise level as measured at a distance 398 feet, each of these pieces would create an area of disturbance of about 11.4 acres. Based on a noise level of 55 dBA at a distance of 562 feet from the source, the tug has an area of disturbance of 22.8 acres. Altogether, the total area of disturbance for hydraulic dredging is then estimated at 79.8 acres. Table 5.2-3 presents the acre per day disturbance associated with each of the alternatives. Note that the table is for comparison purposes and only examines the disturbance to the 55 dBA noise contour regardless of the potential number of residents affected or time of day.

Table 5.2-3
Noise Comparison for Both Clamshell and Hydraulic Dredging Operations by Alternative (tons)

Type of Operation	Total Days	Area of Disturbance (acres)	Total Disturbance (acre-days)
Alternative 1			
Clamshell Operations	2,285	68.4	156,294
Hydraulic Operations	1,790	79.8	142,842
Alternative 4			
Clamshell Operations	2,415	68.4	165,186
Hydraulic Operations	2,190	79.8	174,762
Alternative 5			
Clamshell Operations	1,949	68.4	133,312
Hydraulic Operations	1,589	79.8	126,802
Alternative 6			
Clamshell Operations	1,459	68.4	99,796
Hydraulic Operations	1,719	79.8	137,176

5.2.6 Hazards

Under the No Project Alternative, the lack of sediment trapping basins would cause increased sedimentation that would lead to significant adverse impacts on Upper Newport Bay. Navigation channels and marinas would shoal therefore creating an increased risk that vessels could either run aground or collide. All of the sediment control alternatives would prevent potential shoaling. No hazardous waste sites are located within the proposed dredging areas and therefore exposure to hazardous materials does not pose a risk to humans. All the alternatives include disposal scows travelling through the navigation channels. As a result, all the alternatives have the potential to either interfere with an emergency craft needing to respond to an emergency or collide with a recreational boater in Newport Harbor.

The hydraulic dredge alternative does not require disposal scows to traverse the Upper Bay above Shellmaker Island, therefore, the clamshell dredging method would pose a risk to kayakers and other small boaters in the Upper Bay, but the hydraulic dredging method would not. Since Alternatives 4 and 6 require more scow trips than Alternatives 1 and 5, the risk to boaters would be greater for those alternatives.

5.2.7 Cultural Resources

The No Project Alternative would not impact any archaeological sites. The archaeological sites listed in Tables 3.8-1 through 3.8-3 are at least a few feet above the water line and since all impacts from the various alternatives would be limited to below the water line, the sediment control alternatives will not impact any of the archaeological sites. One habitat restoration alternative, wetlands creation north of the Unit III basin, may have the potential to impact a cultural resource site.

5.2.8 Socioeconomics

With the No Project Alternative, the sediment would be allowed to continue to build up and fill in open water areas within the Bay. Eventually, the open water areas would evolve into mudflats and marshland areas. As the Bay silts in, recreation uses would change and boating would diminish. Indirect socioeconomic impacts of the No Project Alternative include a potential decrease in the local boating economy offset by an increase in marsh viewing. The sediment control alternatives are considered temporary actions and therefore will not impact socioeconomics.

5.2.9 Land and Water Uses

Under the No Project Alternative, sediment would be allowed to continue to build up and fill in open water areas within the Bay. Recreational uses will change and boating in the Upper Bay will diminish or be eliminated. By 2049, marinas in the lower part of Upper Newport Bay would silt in and affect recreational uses. As sediment passes below the PCH Bridge, navigation channels and boat docks in the lower Bay would also shoal. This would permanently change water use and result in a significant impact.

All Sediment Control Alternatives would have beneficial impacts after construction and post-construction actions that would result in enhanced recreation and water based opportunities. There will be greater diversity of wildlife for viewing and fishing and greater accessibility for power and non-power boaters.

Significant adverse impacts to recreation uses would result for all alternatives with use of either the clamshell or hydraulic dredges. With either dredge, access for canoeing and kayaking in the upper portion of Upper Newport Bay would be constrained during construction. In the lower portion of Upper Newport Bay, use of the clamshell dredge would require dredging of the main access channel which may result in prohibiting boating access, and movement of the scow through this area would also conflict with recreational uses, especially during the peak boating season. These impacts are eliminated with use of the hydraulic dredge. With either dredge, disposal scows would still move to LA-3 through the lower portion of Upper Newport Bay and Lower Newport Bay resulting in potential conflicts with boaters as well as nighttime glare impacts to shoreline residents.

Alternatives 4, 5, and 6 have the additional impact associated with moving clean sand from beaches near the Entrance Channel for construction of a new tern island. This activity would add equipment working in and traveling through both the lower portion of Upper Newport Bay and Lower Newport Bay. Scows would not only pose conflicts with boaters but additional impacts to the nearshore and onland recreational users of the beach in the area of sand extraction would result.

Aesthetically, the clamshell dredge will result in visual impacts to both recreationists and bluff residents with views. The clamshell dredge with scow and tug boats would move from location to location within the footprint of the work area. The hydraulic dredge, while smaller, would involve piping and booster stations that would be spread out along Back Bay Drive. For many bluff residents, portions or all of the pumping stations and pipeline may be hidden from view, thus the hydraulic dredge would appear less impacting. However, for recreationists, the activity would be closer to the viewer, resulting in a slightly greater level of impact. Thus, the overall difference between the two dredges can be considered minimal. Visual impacts of the dredge are considered adverse but insignificant.

The other differences in construction and post-construction recreation and visual impacts for these alternatives vary primarily based on the length of time that the dredging operations will occur. As shown in Tables 5.2-4 and 5.2-5, Alternative 1 is of shortest duration, while Alternative 4 is the longest. The time differential between use of the clamshell verses hydraulic dredge is the elimination of the time to dredge a main channel except for Alternative 6 which would dredge deeper and thus faster under that alternative. In terms of construction time, then, Alternative 1 is the least impacting. In addition, Alternative 1 does not have the extra impacts associated with tern island construction.

In consideration of maintenance frequency, it is highly likely that most of the population living or frequenting the area would change over a 21 to 24 year period, and that some of the population would change over a 7 to 10 year period. Thus, if it can be assumed that the majority of the population that would be affected by the proposed activity would be affected once, maybe twice by the construction, then Alternative 1 which has the shortest duration would still be the least impacting of all alternatives. Alternative 5 is considered almost equal to Alternative 1 in terms of overall comparative impact, in that for only an additional 23 days of construction, three years of maintenance frequency is gained. However, this alternative has the added impact associated with tern island construction. The additional lengths of time associated with Alternative 6, followed by Alternative 4 would then be considered as next to last and last in terms of most impacting of the alternatives.

Table 5.2-4
Clamshell Dredge - Time Differential between Alternatives (In Days)

Alternative	Total Effort	Main Channel	Channel Between Units I - II	Channel Bordering Unit II	Other Channels	Unit III	Unit II	Maintenance Frequency (Years)
1	276	33	7	3	33	73	127	7
4	873	25	7	3	33	373	432	24
5	299	22	7	3	33	205	26	10
6	507	25	7	3	33	240	216	21
Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt. 6, the clamshell dredge rate is 4,000 cy/day due to greater basin depths.								

Table 5.2-5
Hydraulic Dredge - Time Differential between Alternatives (In Days)

Alternative	Total Effort	Main Channel	Channel Between Units I - II	Channel Bordering Unit II	Other Channels	Unit III	Unit II	Maintenance Frequency (Years)
1	243	NA*	7	3	33	73	127	7
4	848	NA*	7	3	33	373	432	24
5	274	NA*	7	3	33	205	26	10
6	651	NA*	7	3	33	319	289	21
*Not applicable. Main channel dredging eliminated with use of hydraulic dredge. Dredge productivity for al alternatives is 3,000 cy/day.								

5.2.10 Circulation

The No Project Alternative would not require any work and therefore there would be no additional traffic. The sediment control alternatives will result in a minimal amount of traffic to local roadways, therefore a less than significant circulation impact will occur.

5.2.11 Energy

The No Project Alternative would not require any dredging and would therefore not impact any fuel or energy sources. Each sediment control alternative will require diesel consumption, but will not result in a significant impact. Alternative 1 requires the most fuel consumption, followed by Alternatives 5, 4, and 6, respectively, with Alternative 6 requiring the least amount of fuel consumption.

5.3 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

Table 5.3-1 lists the unavoidable significant adverse impacts of the project alternatives. The No Project Alternative has the greatest number of unavoidable significant adverse impacts with 8, these impacts include alteration of the topography of Upper Newport Bay in a way that would have negative effects. The No Project Alternative would be in conflict with the RWQCB TMDL objectives for sedimentation because in-bay basins would not be maintained. Under the No Project Alternative there would be an 81 percent loss of marine open water habitat with a corresponding loss in the biological diversity of the Upper Newport Bay ecosystem. The State and Federal Endangered California least tern would lose critical foraging habitat near its nesting island. The modified-HEP model predicts a net loss in habitat value of Upper Newport Bay. Shoaling of the navigation channels would result in hazards to boaters. The shoaling of navigation channels and marinas would result in a significant loss in the land and water uses of Newport Bay.

Table 5.3-1
Unavoidable Significant Adverse Impacts of Project Alternatives

NO PROJECT	Alternative 1	Alternative 4	Alternative5	Alternative 6
1. Sedimentation 2. Water Quality 3. TMDL Non-compliance 4. Loss of Open Water 5. Loss of least tern foraging area 6. Net loss of habitat units 7. Decreased navigation 8. Loss of land/water use	1. TMDL Non-compliance 2. Loss of benthic invertebrate diversity 3. Interference with land/water use 4. Exceedance of NO_X emissions standards	1. Loss of intertidal mudflat 2. Interference with land/water uses 3. Exceedance of NO_X emissions standards	1. TMDL Non-compliance 2. Interference with land/water uses 3. Exceedance of NO_X emissions standards	1. Interference with land/water uses 2. Exceedance of NO_X emissions standards

Alternative 1 is the sediment control alternative with the greatest number of unavoidable significant adverse impacts with Alternative 4. Alternative 1 would require maintenance dredging at a frequency of once every 7 years which is in non-compliance with the RQWCB TMDL objective to limit maintenance dredging to no greater than once every 10 years. This frequent disturbance to the benthic invertebrate community by maintenance dredging would result in a loss of the diversity of that community. Alternative 1 would have a significant adverse impact on land and water uses by interfering with various boating activities during dredging. Finally, Alternative 1 would have a significant air quality impact by exceedance of NO_X emissions.

Alternatives 4 and 5 each have three unavoidable significant adverse impacts. In addition to interference with boating activities during dredging and exceedance of NO_X emissions, Alternative 4 would result in the loss of 26 percent of the intertidal mudflat. Alternative 5 would not meet the TMDL objective of maintaining the Unit II basin at -7 feet (-2.1 m) MSL as well as having the unavoidable significant adverse impacts on boating and air quality from dredging activities. Alternative 6 would only have the unavoidable significant impacts to land/water use and air quality.

5.4 IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED PLAN

Alternatives 4 and 6 would have the greatest overall environmental benefits. These alternatives provide the greatest trapping efficiency and would require maintenance dredging at an average interval of greater than 20 years. These alternatives would maintain the highest water quality within Newport Bay. Alternatives 4 and 6 meet RWQCB TMDL objectives for sedimentation. The modified-HEP model predicts that these alternatives would provide the greatest number of Habitat Units for the ecosystem (see Appendix A). However, because they require more dredging, these alternatives would have the greatest impact per dredging episode. When the total amount of dredging that would be required for each alternative within the next 50 years is considered, Alternative 4 would result in the greatest number of dredging days of all the alternatives. Alternative 6 would require the least number of dredging days if a clamshell dredge were used and the second least if a hydraulic dredge were used. Therefore, the total impacts of dredging for Alternative 4 are the greatest of all the alternatives. Furthermore, Alternative 4 also would result in the loss of over 25 percent of the intertidal mudflat habitat in Upper Newport Bay.

Alternative 6 would provide the second greatest benefits of the sediment control alternatives and would result in the lowest or second lowest number of days of dredging disturbance during the next 50 years. Alternative 6 has the lowest number of unavoidable significant adverse impacts of any of the alternatives. The only unavoidable significant adverse impacts of Alternative 6 would be interference with boating by the dredge and associated scows and tugboats and the air quality impact of exceedance of standards for NO_X emissions during dredging.

Alternatives 1 and 5 require the least amount of dredging per episode and therefore have the least impacts during each dredging interval. However, Alternative 1 would require frequent maintenance dredging that would result in this alternative having the second greatest number of dredging days in the next 50 years. Neither Alternative 1 nor Alternative 5 meet RWQCB TMDL objectives for sediment.

Because it provides the greatest benefits relative to impacts and because it has the fewest number of unavoidable significant adverse impacts, Alternative 6 is the Environmentally Preferred Plan. Because the hydraulic dredge is generally less impacting than the clamshell dredge the Environmentally Preferred Plan would be to implement Alternative 6 using the hydraulic dredging method.

5.5 NATIONAL ECOSYSTEM RESTORATION (NER) PLAN

The selection of a recommended plan among the alternative plans requires a combination of decision-making factors. For ecosystem restoration, the decision-making process attempts to incorporate human needs and values with our best understanding of the natural environment, recognizing a complex blend of social, economic, political and scientific information. Both quantitative and qualitative information is used including information about outputs, costs, significance, acceptability, completeness, effectiveness, partnership context, and reasonableness of costs. Policy and Guidance screening criteria are shown below.

Outputs: An ecosystem restoration proposal must be justified on the basis of its contribution to restoring the structure and/or function of a degraded ecosystem when considering the cost of the proposal. Ecosystem restoration projects are justified through determination that the monetary and non-monetary benefits of the project are greater than the costs. For Alternatives 1, 4, 5, and 6, the outputs (in HUs) are greater than the costs for the alternatives. The ranking of the alternatives is shown in the last line of the NER Table 4.8 in the main document of the Feasibility Study.

Cost Effectiveness and Incremental Cost Analysis: An ecosystem restoration plan should represent a cost effective means of addressing the restoration problem or opportunity. It should be determined that a plan's restoration outputs cannot be produced more cost effectively by another alternative plan. Cost effectiveness analysis is performed to identify least cost alternative plans for producing alternative levels of environmental outputs expressed in non-monetary terms. Incremental cost analyses identify changes in costs for increasing levels of environmental output. It is used to help assess whether it is worthwhile to incur additional costs in order to gain increased environmental outputs.

For this study, the cost effectiveness is of major concern to the Sponsor and any other groups that may contribute funding to future maintenance dredging. There is work being done to provide for an annuity fund for future dredging, but it relies on extending the maintenance dredging intervals beyond existing conditions. This is also a requirement of the sediment TMDL where an objective is to extend dredging maintenance intervals to timeframes greater than once every 10 years. Alternative 1 and Alternative 5 do not meet this objective, although Alternative 5 average maintenance interval equals once every 10 years.

Significance: An ecosystem restoration plan must make a significant contribution to addressing the specified ecosystem problems or opportunities. Decisions concerning significance would address relevant importance of the environmental resources in terms of institutional, public and/or technical importance, effects on the resources in terms of differences between estimated future without-project and with-project conditions, and other relevant information concerning duration, frequency, location, magnitude and other characteristics, such as reversibility, retrievability, and the relationships to long-term productivity.

Acceptability: Acceptability is the workability and viability of the alternative plan with respect to acceptance by state, tribal, and local entities. Public acceptance and compatibility with existing laws, regulations, and public policies are also considered as part of acceptability.

Completeness: Completeness is the extent to which a given plan provides and accounts for all necessary investments or other actions needed to ensure the realization of the planned ecosystem outputs.

Effectiveness: Effectiveness is the extent to which an alternative ecosystem restoration plan alleviates the specified problems and realizes the specified opportunities. Proposed plans must restore important ecosystem structure or function to some meaningful degree.

Partnership Context: The cooperation between the Corps and one or more non-Federal sponsors in sharing study and project costs, along with collaboration with any state, tribal and Federal resource agencies or non-governmental entities is considered as part of a decision-making process.

One of the important aspects of the selection of a recommended plan by the Corps and other Federal agencies has traditionally been the identification of the National Economic Development (NED) plan. The NED plan is the alternative with the greatest net economic benefits consistent with protecting the Nation's environment. For this study we are using the modified-HEP analysis and qualitative discussions to identify the non-monetary benefits for each alternative. Instead of using the NED account, the Corps has used the NER account for this study. The NER account displays the monetary costs and the non-monetary benefits related to each alternative plan. Thus, the plan with the greatest net ecosystem restoration benefits is the NER plan. The NER account for using the clamshell dredge is shown in Table 4.8 of the Feasibility Study.

Table 4.8 shows that for the clamshell dredging method Alternative 6 has the lowest cost per Average Annualized Habitat Units (AAHU).

5.6 THE RECOMMENDED PLAN

Alternative 1 does not provide much additional sediment control benefit over the without project condition, and does not meet the TMDL objective of maintenance dredging at intervals greater than once every

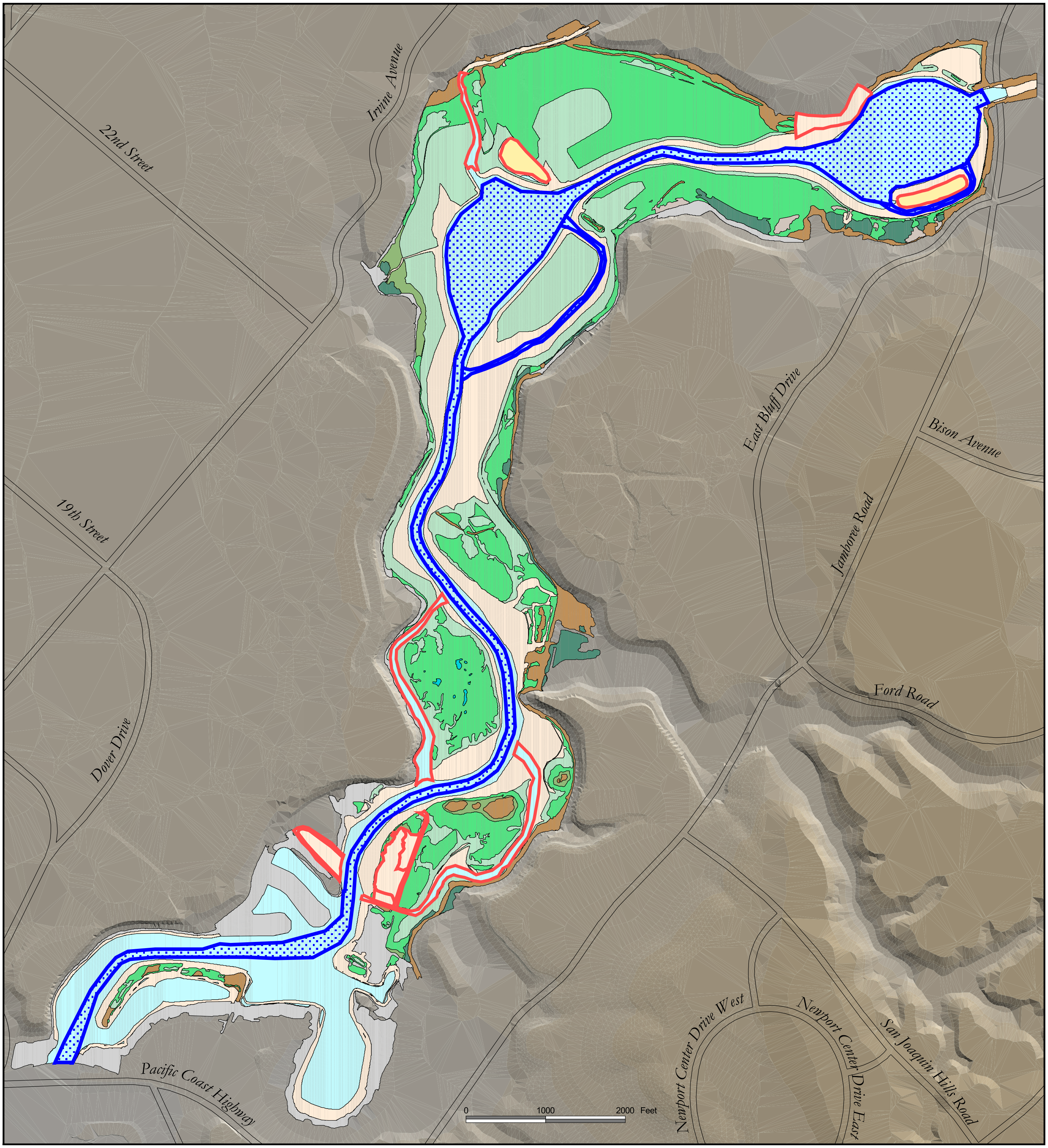
10 years. Alternative 1 also allows more material to deposit in the bay beyond the basins, so cumulative future deposition is greater than in other alternatives. Alternative 4 has the greatest increase in net average annual habitat units when compared to the without project condition. But Alternative 4 results in a significant loss of intertidal mudflat, far beyond the objective of the resource agencies (25 percent). Alternative 5 has lower net benefits than both Alternatives 4 and 6. Furthermore, Alternative 5 barely meets the TMDL objective of maintenance dredging intervals of at least once every 10 years and does not meet the TMDL objective of maintaining the Unit II basin at -7 feet (-2.1 m) MSL. Alternative 5 would require significantly more dredging below the Unit II basin to maintain the existing habitat types in future years when compared to Alternatives 4 and 6.

The alternative that best addresses the problems and opportunities and objectives and constraints for this study is Alternative 6. Alternative 6 provides a balance between sediment control and environmental restoration. Alternative 6 has the fewest number of significant unavoidable adverse impacts. NER benefits are the highest, maintenance intervals easily comply with the sediment TMDL objective, and the storage capacity of both of the basins ensure less deposition in habitat areas below the Unit II basin.

In addition to the Alternative 6 basin configuration, the recommended plan includes the following habitat restoration measures:

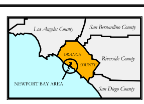
- Addition of sand to the least tern island.
- Construction of a small dendritic channel through the marsh on Shellmaker Island.
- Restoration of wetlands in filled areas at Northstar Beach, the bull-nose section of land at the lower end of the northern side of the Unit I/III basin, and in a dredge spoil area on Shellmaker Island.
- Restoration of side channels on the west side of Middle Island and the east side of Shellmaker Island.
- Restoration of eelgrass adjacent to Shellmaker Island.
- Removal of segments of the Main Salt Dike.

To reduce the net loss of intertidal mudflat, additional opportunities to restore intertidal mudflat habitat are being investigated. Furthermore, during final design of the Unit II basin, measures to reduce the loss of intertidal mudflat to the basin footprint will be implemented. Figure 5.6-1 shows the features of the recommended plan.



Habitat Classification*

Developed	Open Water
Freshwater Marsh	Salt Panne
High Salt Marsh	Sandy Upland
Intertidal Mudflat	Upland
Low Salt Marsh	Water
Middle Salt Marsh	Restoration Area
Approach Channel and Basin Limit	



**Orange County Habitat Classification System - May 1992 with Modifications by the United States Army Corps of Engineers*

Upper Newport Bay Vegetation
Alternative 6
Recommended Plan

County of Orange, California

DESIGNED AND PRODUCED BY:

Public Facilities and Resources Department
GIS Mapping Unit
Carmen Copil Oancea

DATA SOURCE:

Geomatics Land Information System Division: Survey File # HB-96/97-10
Color Infrared Aerial Photos Flown by: Lung & Associates - April 1997
Scale 1" = 270'
Vegetation Survey Field Check by M.E.C. Analytical Systems Inc. - October 1997
Model Elevations Determined by: Resources Management Associates

DATE: July 12, 2000

SECTION 6.0 - OTHER CEQA/NEPA TOPICS

This section addresses other topics required by the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) in an Environmental Impact Statement/Environmental Impact Report (EIS/EIR). These include: the relationship between local short-term uses of the environment and long-term productivity (NEPA); the identification of any irreversible and irretrievable commitments of resources (NEPA and CEQA); an analysis of growth-inducing impacts (CEQA); and a discussion of Executive Order 13045 (Environmental Health and Safety Risks to Children). Additionally, Executive Order 12898 (Environmental Justice) and Executive Order 13045 (Environmental Health and Safety Risks to Children) are addressed.

6.1 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS/EIR consider the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The dredge and disposal actions are required to maintain the quality of the ecosystem of Upper Newport Bay. Activities associated with the proposed dredging and disposal actions are short-term, and the impacts of dredging and disposal cease at the conclusion of those actions. Two of the sediment disposal alternatives, Alternative 1 and Alternative 4, would have long-term adverse impacts. Alternative 1 would result in a decrease in benthic invertebrate diversity because the frequent disturbance of maintenance dredging would be expected to prevent some species from becoming established. Alternative 4 would remove a substantial amount of the intertidal mudflat habitat in the Upper Bay.

Overall, the proposed project would result in a long-term environmental benefit to the Upper Newport Bay ecosystem. The proposed project would ensure the long-term productivity of the Upper Newport Bay ecosystem.

6.2 GROWTH-INDUCING IMPACT

Under CEQA, an EIR must discuss the ways in which the proposed action and alternatives could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the area surrounding the proposed action. The purpose of the proposed project is to maintain the health of the Upper Newport Bay ecosystem. The dredging and disposal activities would occur for a limited time and would employ a small number of workers. No additional housing would be required nor would businesses be established as a result of this project. No growth inducement will result from implementation of the proposed project.

6.3 IDENTIFICATION OF ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA and CEQA require that an EIS/EIR analyze, the extent to which the proposed projects primary and secondary effects would commit nonrenewable resources to uses that future generations would be unable to reverse. No irreversible and irretrievable commitments of resources would occur as a result of project implementation.

6.4 ENVIRONMENTAL JUSTICE

6.4.1 Executive Orders on Environmental Justice and on Environmental Health and Safety Risks to Children

Two Executive Orders are relevant to the proposed project, and are discussed below.

6.4.1.1 Executive Order 12898, Environmental Justice in Minority and Low-Income Populations

President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," on February 11, 1994. It requires, to the greatest extent practicable, each Federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

The U.S. Environmental Protection Agency's (EPA) Office of Environmental Justice offers the following definition of Environmental Justice:

> *"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."* [1]

The goal of this "fair treatment" is not to shift risks among populations, but to identify potential disproportionately high and adverse human health or environmental effects and identify alternatives that may mitigate these impacts.

6.4.1.2 Executive Order 13045, Environmental Health and Safety Risks to Children

On April 21, 1997 President Clinton signed Executive Order 13045, "Environmental Health and Safety Risks to Children." The policy of the Executive Order states that: "A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks." Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, each Federal agency:

(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and

(b) ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

This Executive Order defines "environmental health risks and safety risks" as "risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)."

6.4.2 Population Composition

The population data that are key to the analysis of Environmental Justice and Environmental Safety/Health Risks for Children issues related to sediment control measures within Upper Newport Bay include the following: race, income and age characteristics, for Orange County and for the Project Area:

- Percent of Minority population (includes: Black; American Indian, Eskimo, and Aleutian; Asian and Pacific Islander; Others; and Hispanic populations). Persons of Hispanic origin may be of any race.

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[1] U.S. Environmental Protection Agency. Draft Guidance for Incorporating Environmental Justice Concerns In EPA's NEPA Compliance Analyses, July 12, 1996.

Since some experts consider religious affiliation a component of ethnic identity, the ancestry question on the 1990 Census was used for the "Other" designation. If a religion was given as an answer to the ancestry question, it was coded as an "Other" response.

- Number and percent of population below the poverty level.
- Number and percent of population below 18 years of age.

The project site is located in Upper Newport Bay. While the majority of the residents are located within the City of Newport Beach (City), the channels and other watercourses are under the jurisdiction of the County of Orange (County).

6.4.3 1990 Race, Income, Poverty Status, and Age Distribution

The race, income, poverty status, and age distribution information presented is based upon data from the U.S. Department of Commerce, Bureau of the Census. The data used for this analysis was taken from the 1990 Census, and although the data was collected in mid- to late-1989, it is the most comprehensive set of data on population size, income, and racial composition available.

6.4.3.1 Orange County

As shown in Table 6.4-1, of the 828,849 households in the County, the majority are White (84.5 percent), followed by Hispanic (14.3 percent); Asian and Pacific Islander (7.9 percent); Other (5.4 percent); Black (1.7 percent); and American Indian, Eskimo, and Aleutian (<1.0 percent).

The mean income for the County is $57,302. Among the ethnic groups, Whites have the highest mean income ($58,915), followed by Asian and Pacific Islanders ($55,152); American Indian, Eskimo, and Aleutians ($51,733); Blacks ($45,116); Hispanics ($41,685); and Other ($39,695).

Of the 2,410,556 persons in the County, approximately 200,860 or 8.3 percent are living below poverty level. Among those persons below poverty level, the greatest percentages are of Other and Hispanic origins, at 18.4 percent and 18.1 percent, respectively.

Of the total population in the County, approximately 24.4 percent are below 18 years of age.

6.4.3.2 City of Newport Beach

As shown in Table 6.4-2, of the 30,866 households in the City of Newport Beach (City), the majority are White (96.8 percent), followed by Hispanic (3.2 percent); Asian and Pacific Islander (1.9 percent); Other (<1.0 percent); American Indian, Eskimo, and Aleutian (<1.0 percent); and Black (<1.0 percent).

The mean income for the City is $97,490, which is dramatically higher than the County's mean income of $57,302. Of all household incomes, a high percentage of households make more than $100,000. Among the ethnic groups, Asian and Pacific Islanders have the highest mean income ($119,795), followed by Whites ($97,627); Hispanics ($73,812); American Indian, Eskimo, and Aleutians ($59,814); Blacks ($58,819); and Others ($40,506).

Of the 66,643 persons in the City, only 3,731 or 5.6 percent, are living below poverty level as compared to the 8.3 percent poverty level for the County. Although the Black population represents the greatest percentage of persons below poverty level, the Black population represents <1.0 percent of the total population of Newport Beach. Additionally, the mean income for Blacks ($58,819) is higher than the County's mean income ($57,302).

Of the total population in the City, approximately 13.3 percent are below 18 years of age.

Table 6.4-1
1990 Income and Poverty Status for Orange County

Household Income in 1989	TOTAL	White	Black	American Indian, Eskimo & Aleutian	Asian & Pacific Islander	Other	Hispanic Origin *
All Households	828,849	700,126	14,000	4,556	65,129	45,038	118,814
Percent of Total		84.5	1.7	0.6	7.9	5.4	14.3%
Less than $5,000	19,477	15,219	377	156	2,515	1,210	3,591
$5,000 - 9,999	34,038	28,566	635	231	2,708	1,998	5,530
$10,000 - 14,999	39,573	32,041	672	300	3,493	3,067	7,911
$15,000 - 24,999	95,388	77,637	2,145	549	6,930	8,127	20,418
$25,000 - 34,999	110,170	90,900	2,335	592	7,809	8,534	20,570
$35,000 - 49,999	154,295	128,472	3,003	857	12,267	9,698	25,194
$50,000 - 74,999	189,108	161,499	3,005	1,012	14,951	8,641	23,210
$75,000 - 99,999	93,749	81,735	1,203	475	7,870	2,466	7,699
$100,000 +	93,051	84,157	625	384	8,586	1,299	4,691
Mean Income **	$57,302	$58,915	$45,116	$51,733	$55,152	$39,695	$41,685
Number of Persons	2,410,556	1,896,724	41,632	12,834	250,136	209,230	556,957
Persons below poverty level ***	200,860	125,528	3,842	1,092	31,823	38,575	100,990
Percent of persons below poverty level	8.3	6.6	9.2	8.5	12.7	18.4	18.1
Persons below 18 years of age	587,915	430,559	12,216	2,902	72,429	69,809	192,318
Percent of total population below 18 years of age	24.4	17.9	<1.0	<1.0	3.0	2.9	7.9

* Persons of Hispanic origin may be of any race, and are included in the other racial totals.
** Aggregate household income in 1989 divided by the total number of households.
*** Persons for whom poverty status was determined.
Totals may not equal 100 percent due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, 1990 Census, Database: C90STF3A for the County of Orange.

Table 6.4-2
1990 Income and Poverty Status for the City of Newport Beach

Household Income in 1989	TOTAL	White	Black	American Indian, Eskimo & Aleutian	Asian & Pacific Islander	Other	Hispanic Origin *
All Households	30,866	29,893	62	136	609	166	990
Percent of Total		96.8	<1.0	<1.0	1.9	<1.0	3.2
Less than $5,000	893	860	0	0	33	0	63
$5,000 - 9,999	930	906	0	6	18	0	56
$10,000 - 14,999	973	932	0	7	14	20	58
$15,000 - 24,999	2,540	2,396	25	44	40	35	106
$25,000 - 34,999	3,167	3,031	9	18	84	25	86
$35,000 - 49,999	4,282	4,130	0	22	75	55	140
$50,000 - 74,999	5,652	5,516	25	21	74	16	220
$75,000 - 99,999	3,580	3,505	0	0	68	7	63
$100,000 +	8,849	8,617	3	18	203	8	198
Mean Income **	97,490	97,627	58,819	59,814	119,795	40,506	73,812
Number of Persons	66,643	63,771	181	203	1,937	551	2,671
Persons below poverty level ***	3,731	3,440	47	14	166	64	320
Percent of persons below poverty level		5.3	25.9	6.8	8.6	11.6	11.9
Persons below 18 years of age	8,890	8,282	6	15	437	150	430
Percent of total population below 18 years of age	13.3	12.4	<1.0	<1.0	<1.0	<1.0	<1.0

* Persons of Hispanic origin may be of any race, and are included in the other racial totals.
** Aggregate household income in 1989 divided by the total number of households.
*** Persons for whom poverty status was determined.
Totals may not equal 100 percent due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, 1990 Census, Database: C90STF3A for the City of Newport Beach.

6.4.4 Impacts

The dredging will be performed 24 hours a day, 6 days a week, for approximately 1 to 3 years. The impacts associated with the dredging are considered to be temporary and will, for the most part, be contained within Upper Newport Bay.

6.4.4.1 Environmental Justice

The minority population in the project area is significantly smaller than the minority population in the County. Therefore, the dredging would not result in disproportionate impacts to minority populations.

The median household income for the project area was $97,490, substantially higher than the countywide median household income of $57,302. Similarly, the total number of persons living below the poverty level in the Project area is 5.6 percent, which is lower than the County poverty level of 8.3 percent. According to the most recent Census data, since there is not a substantial population of low-income residents in the Project area, the Project would not result in disproportionate impacts to low-income populations.

6.4.4.2 Environmental Health and Safety Risks to Children

The percentage of the population under 18 years of age for the Project area is 13.3 percent, which is lower than the countywide percentage of 24.4. Therefore, the dredging would not result in disproportionate impacts to children.

SECTION 7.0 - PREPARERS AND REVIEWERS

Name	Title	Experience	Role
Corps of Engineers, Los Angeles District			
Pam Castens	Chief, Environmental Planning Section	14 years	Quality Control
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Russell Kaiser	Environmental Manager	11 years	Project Manager, Biological Resources
Larry Smith	Biological Sciences Environmental Manager	14 years	Project Manager
Ruth Villalobos	Chief, Environmental Resources Branch	24 years	Quality Control
Richard Perry	Archaeologist	13 years	Cultural Resources
Chambers Group, Inc			
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Todd Brody	Environmental Specialist	20 years	Air Quality, Noise, Energy
Sophia Chiang	Environmental Analyst	3 years	Environmental Justice
Noel Davis, Ph.D.	Vice President	21 years	Project Manager, Water Quality, Geology, Biological Resources
Roger Mason, Ph.D.	Director of Cultural Resources	26 years	Cultural Resources
Sam Stewart	Director of Cultural Analyst	2 years	Cumulative Projects
Anne Surdzial	Senior Environmental Analyst	9 years	Executive Summary, Quality Control
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SECTION 9.0 - LIST OF ACRONYMS

AAHU	Average Annualized Habitat Units
AQMP	Air Quality Management Plan
ASTM	American Society of Testing and Materials
BACT	Best Available Control Technology
BMP	Best Management Practices
B.P.	Before Present
°C	degrees Celsius
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CCC	California Coastal Commission
CCD	Coastal Consistency Determination
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
cu m	cubic meters
cu m/hr	cubic meters per hour
CWA	Clean Water Act
cy	cubic yards
cy/hr	cubic yards per hour
CZMA	Coastal Zone Management Act
dBA	A-weighted Decibels
DTSC	State of California Department of Toxic Substances Control
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ft.	feet
ft./sec	feet per second
GIS	Geographic Information System
GPS	Geographic Positioning System
gpm	gallons per minute
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HEG	Habitat Evaluation Group
HEP	Habitat Evaluation Procedure
hp	horsepower
HQI	Habitat Quality Index
HU	Habitat Units
HWCL	Hazardous Waste Control Law
in	inches
IRWD	Irvine Ranch Water District
km	kilometers
L_{dn}	Day-night average noise level
L_{eq}	Energy equivalent noise level
L_{max}	Maximum noise level
LOS	Level of Service
LUST	Leaking Underground Storage Tank
m	meter
mg/L	milligrams per liter

µg/L	micrograms per liter
mi	mile
MLLW	Mean Lower Low Water
MPN	Maximum Probable Number
MSL	Mean Sea Level
NED	National Economic Development
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NPL	National Priority List
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
O_3	ozone
OCHCA	Orange County Health Care Agency
OCPFRD	Orange County Public Facilities and Resources Department
OCWD	Orange County Water District
OSHA	Occupational Safety and Health Administration or Act
PCH	Pacific Coast Highway
PM_{10}	particulate matter less than 10 micrometers in diameter
ppm	parts per million
ppb	parts per billion
ppt	parts per thousand
RCRA	Resource Conservation and Recovery Act
RMA	Resource Management Associates, Inc.
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SHPO	State Historic Preservation Office or Officer
SIP	State Implementation Plan
SO_x	oxides of sulfur
sq ft	square feet
sq km	square kilometer
sq m	square meters
sq mi	square miles
TAC	Toxic Air Contaminants
TAG	Technical Advisory Group
TMDL	Total Maximum Daily Load
UCI	University of California, Irvine
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds
WRDA 86	Water Resources Development Act of 1986

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APPENDIX A

MODIFIED HEP ANALYSIS

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SECTION 1.0 - INTRODUCTION

1.1 OVERVIEW

The U.S. Army Corps of Engineers (Corps), Los Angeles District, is conducting an Ecosystem Restoration Feasibility Study/Environmental Impact Statement/Report (EIS/EIR) to assess potential restoration opportunities in Upper Newport Bay, California. Newport Bay is located along the Orange County coast approximately 40 miles south of Los Angeles and 75 miles north of San Diego (Figure 1.1-1). The Bay is divided into the Lower and Upper Bay at the Pacific Coast Highway (PCH) bridge (Figure 1.1-2). The Lower Bay is the portion between the ocean and PCH. This area is a small boat harbor surrounded by residential development. The Upper Bay encompasses approximately 1,000 acres north of the PCH bridge and is characterized by a diverse mix of development in its lower reach and an undeveloped ecological reserve in its upper reach.

The Upper Newport Bay (Ecological Reserve) is one of the last remaining coastal wetlands in southern California that continues to play a significant role in providing critical habitat for a variety of migratory waterfowl, shorebirds, and endangered species of birds and plants. For this reason, Upper Newport Bay is an ecological resource of national significance.

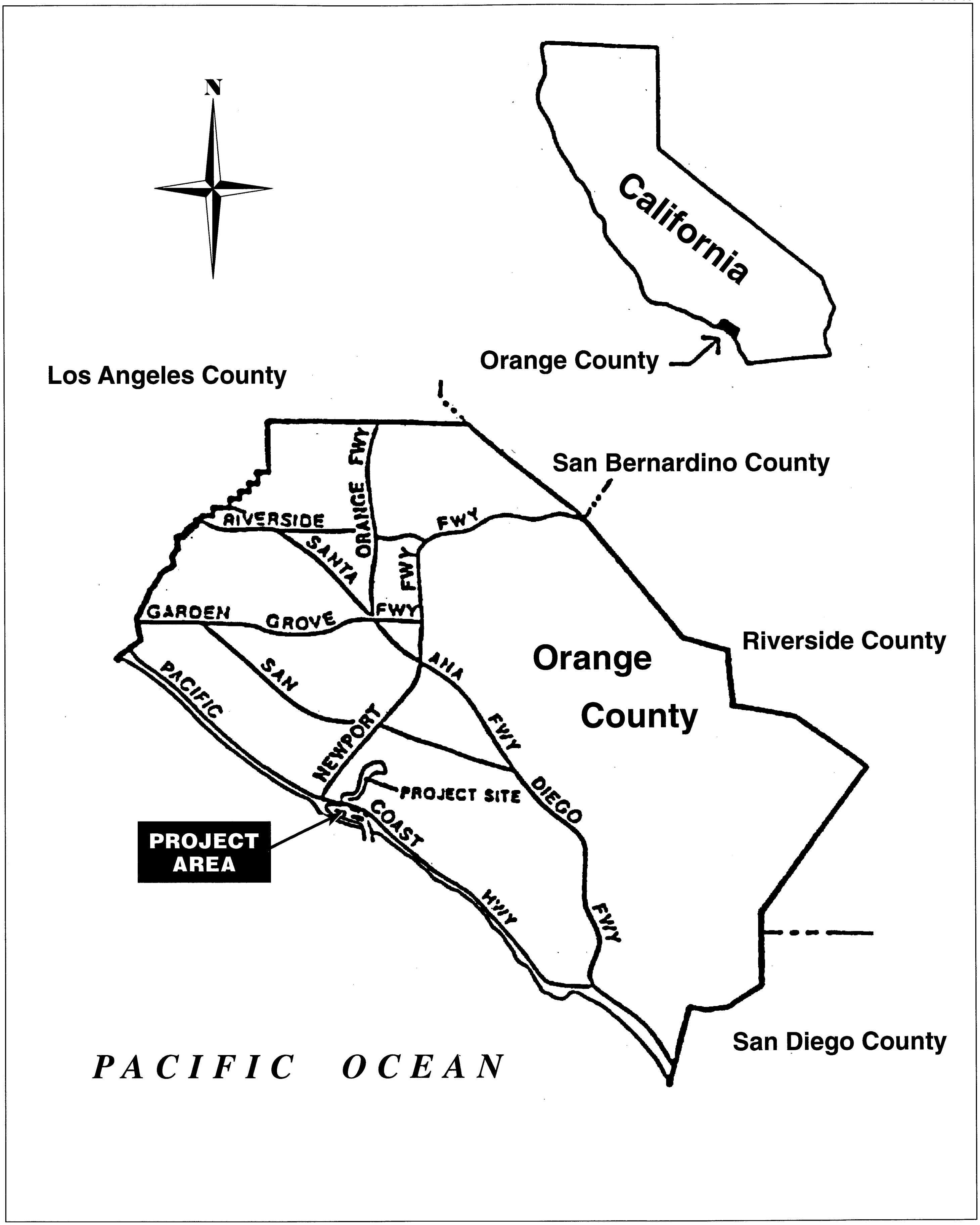
The integrity of this valuable ecological resource has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport Bay is San Diego Creek which drains approximately 85 percent of the watershed (98,500 acres). Secondary sources include urban and industrial runoff from Santa Ana-Delhi Creek, urban and residential runoff from Big Canyon Creek, and discharges from other minor point sources such as storm drains. Based on the last 25 years of stream gauge records, the average annual sediment inflow from San Diego Creek to the Bay was estimated to be 178,000 cubic yards (cy) (135,280 cubic meters [m^3]). Of the sediment that flows into the Upper Bay, approximately 129,000 cy (98,040 m^3) remains within the Upper Bay. The rest is deposited in the Lower Bay or discharged to the ocean.

Sedimentation has been identified as the biggest problem within Newport Bay. Sediment from the San Diego Creek watershed has filled open water areas within the Bay. This sedimentation has decreased the extent of tidal inundation, diminished water quality, degraded habitat for threatened and endangered species as well as migratory waterbirds and estuarine and marine fishes, and resulted in navigation problems in the Upper Bay marinas and navigation channels. If sediment deposition within the Bay were allowed to continue, open water areas would evolve into mudflats and eventually marsh or upland habitat. In 1995 and 1996, the County of Orange determined that the basins (Unit I and Unit II Basins) within the Upper Bay were essentially full and that a severe storm event could jeopardize the safety and personal property of the residents living along the Lower Bay. As a result, the County completed the appropriate environmental documentation and engineering designs to conduct a dredging project in the Upper Bay to minimize potential storm damage and improve the degraded marine environment of the Upper Bay. The Unit III project was initiated in early 1998. This dredging project was designed to deepen the uppermost part of the Unit I basin to -7 feet (-2.1 meters [m]) Mean Sea Level (MSL) and the approach channel to -14 feet (-4.2 m) MSL. The Unit III project involves the removal of 725,000 cy (551,000 m^3) of sediment from the Upper Bay.

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats and associated species. Although the emphasis of the Restoration Project is on developing a dredging program to remove sediment from Upper Bay waters, other restoration opportunities that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

Specific goals of the restoration project are:

> To restore, enhance, maximize and maintain the overall intrinsic ecological values provided in the Upper Newport Bay coastal estuarine system for fish and wildlife,

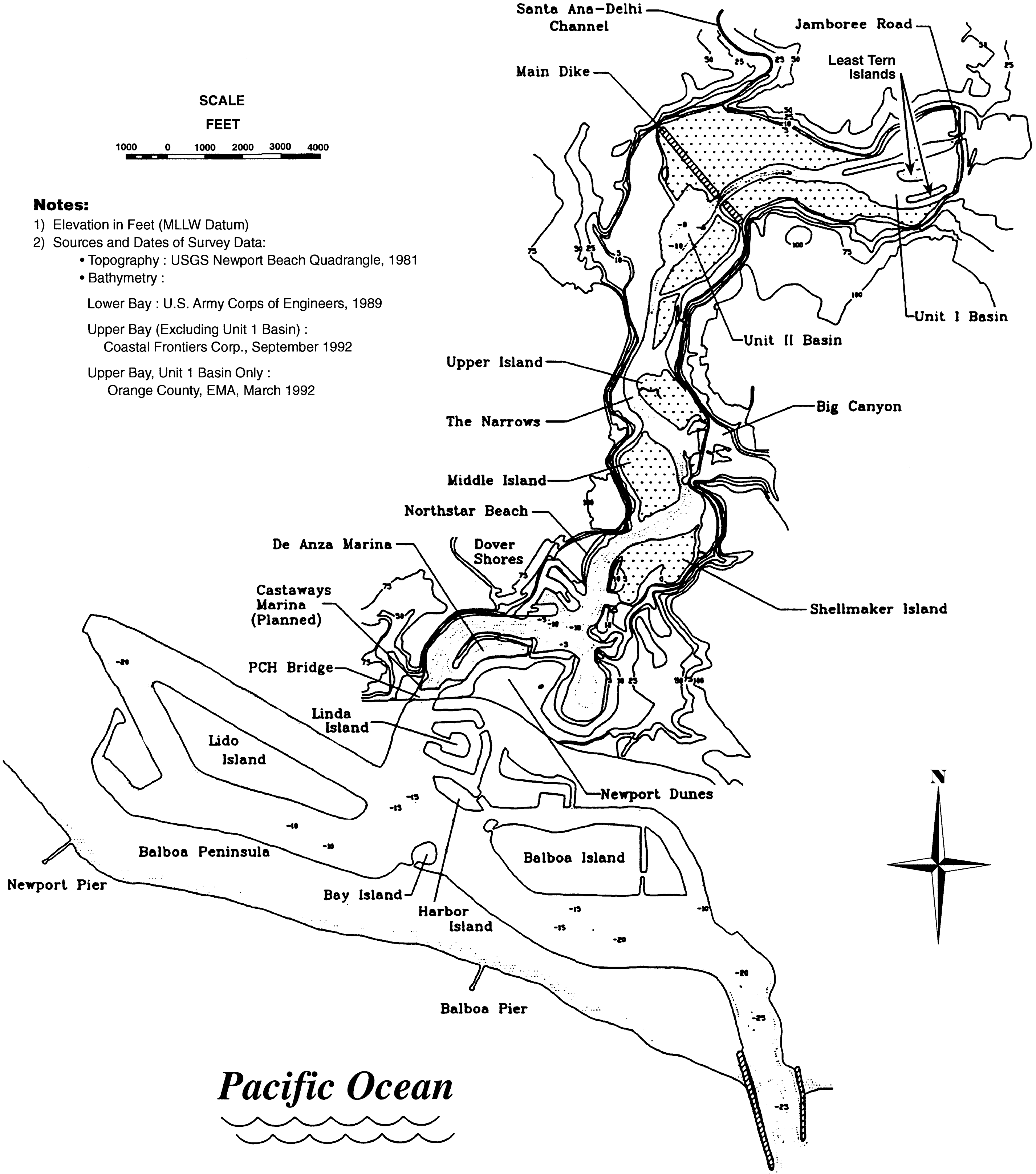


Chambers Group

SOURCE: CORPS 1998

NOT TO SCALE

PROJECT LOCATION
Figure 1.1-1



Notes:

1) Elevation in Feet (MLLW Datum)
2) Sources and Dates of Survey Data:
   - Topography : USGS Newport Beach Quadrangle, 1981
   - Bathymetry :

   Lower Bay : U.S. Army Corps of Engineers, 1989

   Upper Bay (Excluding Unit 1 Basin) :
   Coastal Frontiers Corp., September 1992

   Upper Bay, Unit 1 Basin Only :
   Orange County, EMA, March 1992

Chambers Group

Source: Corps 1993

LOCATION OF PLACES IN NEWPORT BAY
Figure 1.1-2

including sensitive communities, to provide a diversity of uses (i.e., fisheries, waterfowl, shorebirds, fish-eating birds, mammals, recreation, education, research etc.) and promote a public awareness and appreciation of the unique habitat offered in this system now and in the future.

and:

To restore, maintain and manage a mix of habitat types which shall include pickleweed dominated flats, cordgrass dominated intertidal zone, unvegetated intertidal mudflat, and subtidal seawater volume with low residence time.

1.2 THE HABITAT EVALUATION PROCESS

In order to develop the optimum restoration plan, the Upper Newport Bay ecosystem needs to be evaluated to compare its existing environmental condition and future with and without project actions based on a 50-year project life. A Habitat Evaluation Group (HEG) comprised of knowledgeable representatives and their consultants from the resource agencies, the Corps, the County of Orange, and the City of Newport Beach was formed to conduct this evaluation. This document describes the process that was developed to perform this evaluation, and presents the results of that analysis for the 50-year no-action and the project alternatives.

Section 2.0 describes in detail the habitat evaluation process that was developed for this analysis. Section 3.0 describes the results of the habitat evaluation for the 50-year no action and Section 4.0 compares the project alternatives. Section 5.0 evaluates the benefits of additional restoration measures that may be implemented to improve habitat values in Upper Newport Bay.

SECTION 2.0 - HABITAT EVALUATION PROCESS

2.1 INTRODUCTION AND PURPOSE

This chapter describes the methodology used to evaluate habitat values on the baseline, the future without project condition, and the proposed sediment control alternatives.

If sediment continues to accumulate in the Upper Bay, marine open water environment is projected to transition into mudflats, mudflats into saltmarsh, and eventually into upland. Over time, the marine characteristics of the ecosystem will be lost. Biodiversity will decrease as habitat diversity declines. Because of these predicted losses of marine habitat and resources, this study will assess environmental restoration opportunities at Upper Newport Bay. To assess environmental conditions and evaluate potential restoration opportunities, an ecological evaluation process needs to be developed to provide a quantitative framework for evaluating present and future conditions, with and without a proposed project. The key considerations for development of a habitat evaluation model as it applies to Upper Newport Bay are:

- What is the overall project goal?
- Who develops the model?
- Which ecological/habitat models are most applicable to the Upper Bay environment?
- What are the model applications and required refinements?
- How do we measure overall ecosystem functions and values?
- How do we measure habitat/guild quality suitability?
- Which habitat types do we distinguish and indicator species do we use?
- Which habitats do we restore/enhance?

2.2 BACKGROUND

On July 15, 1997, a Technical Advisory Group (TAG) meeting was conducted to develop and refine the overall project goal, to review applicability of different habitat evaluation models and select an appropriate methodology, to determine the composition of the technical team, and to formulate an array of restoration plans for this study.

To accomplish the project goal, the ecosystem needs to be evaluated based on its existing environmental condition and projected future with and without project actions based on a 50-year project life. To determine project with and without impacts, the following models were assessed for suitability, feasibility and applicability: Habitat Assessment Technique; Habitat Evaluation Procedures (HEP); Modified-HEP; Synoptic Approach for Wetlands Cumulative Effects Analysis; Wetland Evaluation Technique (WET); WET 2.0; Hydrogeomorphic Model; BEST; Bottomland Hardwood Forest Habitat Evaluation Model; Connecticut/New Hampshire Method; Habitat Evaluation System; Hollands-Magee (Normandeau) Method; Larson/Golet Method; Manual for Assessing Restored and Natural Coastal Wetlands; Minnesota Wetland Evaluation Methodology; and Pennsylvania Modified-HEP. Modified HEP methodology, which was determined the most appropriate model for the Upper Bay analysis, can be used to document quality and quantity of available habitat for selected wildlife species and/or habitat elements (e.g., community-level attributes) and provide information for two general types of wildlife comparisons: 1) the relative value of different areas at the same point in time; and 2) the relative value of the same area at future points in time. As several of the team members have experience in conducting HEPs and modified HEPs, the TAG has a high level of confidence in this methodology to predict and value future conditions. For this analysis, the HEP methodology has been modified to consider only those model variables that are relevant to Upper Newport Bay and that may be affected by project alternatives. This approach is consistent with guidance from the Corps Waterways Experimental Station on techniques to increase efficiency and reduce effort in applications of HEP (Wakeley and O'Neil 1988).

At the TAG meeting, a sub-committee, hereafter known as the HEG, was formed to develop and perform the ecological analysis for the Upper Bay environment. The HEG representatives are:

Robert Hoffman, National Marine Fisheries Service
Jack Fancher, U.S. Fish and Wildlife Service
John Anderson, California Department of Fish and Game
Erick Burres, California Department of Fish and Game
Marilyn Fluharty, California Department of Fish and Game
Tom Rossmiller, County of Orange
Dave Kiff, City of Newport Beach
Rick Ware, Consultant to City of Newport Beach
Jim Hutchison, Corps, Los Angeles District
Russell L. Kaiser, Corps, Los Angeles District
Noel Davis, Ph.D., Consultant to Corps
Karen Green, Consultant to Corps
Larry Smith, Corps, Los Angeles District

2.3 DEVELOPMENT OF THE DATABASE ON THE UPPER NEWPORT BAY ECOSYSTEM

A literature search for existing and historical information on the Upper Newport Bay ecosystem was coordinated by the Corps and conducted by Coastal Frontiers. Coastal Frontiers summarized their findings in the "Available Information Report." This report identifies resource studies that evaluate different functions of the Bay. The literature search primarily focused on identification of marine and estuarine physical, geotechnical, chemical and biological studies. In addition, the Corps requested members of the TAG, which included representatives from the Corps, Orange County Public Facilities and Resources Department (OCPFRD), City of Newport Beach (CNB), National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), California Regional Water Quality Control Board (RWQCB), Environmental Protection Agency (EPA), California Coastal Commission (CCC), California Coastal Conservancy and other interested parties, to inventory their files and identify reports available for this study. The Corps prepared a master list, then reviewed and summarized the report findings at the July 15, 1997 TAG meeting. Findings included a summary of the available reports, a review of the literature and an overview of the biological data gaps for marine and terrestrial resources. The TAG discussed the information and determined the critical data gaps. Subsequently, the Corps filled the data gaps by contract support. Prior to finalizing the contracts, the HEG sub-committee of the TAG, including the CDFG, NMFS, USFWS, OCPFRD, CNB and Corps, was provided an opportunity to review and provide comment on the efforts. Prior to conducting field work, the HEG provided input on the Sampling Analysis Plans (SAP) for fish, vegetation, insects, reptiles, amphibians, mammals and birds. The SAP included an overall strategy for filling the data gaps, and it included all procedures, methodologies and sampling stations.

Field surveys were conducted by MEC Analytical Systems in September and October 1997 to survey vegetation and census species abundance, habitat use, and distribution of several biological resources, including fishes, insects, reptiles, amphibians, mammals and birds. (Additional information on the field survey SAP, methodologies and sampling stations can be found in the *Biological Resources of Upper Newport Bay, California* [MEC 1997].) The results of the 1997 survey are used in conjunction with earlier surveys to characterize the biological resources of Upper Newport Bay and provide background information for the habitat evaluation process and the EIS/EIR.

2.4 HABITAT EVALUATION PROCEDURES

Because structural features of habitat are measurable and vegetation succession is predictable to an extent, future habitat values can be projected with some degree of confidence. The HEP analysis utilizes and extrapolates information on the ecosystem by use of wildlife species and habitat type and structure. The HEP was developed to address overall species diversity and density, and health of the existing and projected environmental conditions of a system.

The HEP analysis seeks to assess and quantify existing biological conditions ("baseline" or "existing without-project") within a study area and to project future ecological conditions under each proposed study alternative. Wildlife species are assumed to potentially occupy a given habitat if the structure of that habitat meets the feeding and reproductive requirements of the species or group. The habitat model identifies and quantifies general characteristics of the wetland habitat which are important to a wide array of wildlife. Although, in some cases, the model attempts to portray the needs of a species, it more importantly broadly depicts the needs of many species or community associations of the project area. The HEP is based on the assumption that habitat for selected wildlife species can be described by a Habitat Quality Index (HQI). Accordingly, HQI values are assigned to individual habitats based on the vegetation type, structure and the corresponding potential of that habitat to support multi-species and/or sensitive species indicative of a healthy, viable wetlands system. The habitat values calculated for the future with-project conditions are compared to the estimated habitat values for the future without-project conditions to identify and quantify the net ecological benefits and/or detriments.

The definition of habitat types and corresponding measures of habitat quality encompasses the ecosystem functions and values that are of concern. The necessary data for evaluation needs to be obtained through available sources and/or supplemented by additional field surveys. The approach suggested involves, for each of the key habitat types, determining the habitat's value to a selected species, guild, or community type (indicator species), based on knowledge of biological requirements and/or utilization of the habitat. The habitat utilization and/or other features of the habitat important to the indicator species are used as indicators of habitat quality. For each habitat type, values for multiple indicators are averaged and weighted, resulting in a composite measure or index of habitat quality based on the biological indicators of greatest interest. This index value (ranging from 0.0 to 1.0) is multiplied by the area of available habitat to obtain Habitat Units (HU), which are then used in the comparisons described above. The reliability of the HEP and the significance of HU are directly dependent on the ability of the user to assign a well-defined and accurate HQI to the selected evaluation species or habitat elements.

For this modified HEP, the assignment of HQI has been simplified to focus only on attributes of habitats that may be affected by sedimentation or control of sedimentation in Upper Newport Bay. HQI, as developed for this model, first reflects each indicator species relative use of a habitat. Because most species in the Upper Bay use more than one habitat, the importance of each habitat to each indicator species was reflected by assigning each habitat a utilization factor for each species. Total utilization of all habitats for each indicator species totals 1.0. Thus, if an indicator species primarily uses intertidal mudflat and low saltmarsh and these habitats were considered to be of equal importance to the species, intertidal mudflats and low saltmarsh would each be assigned a utilization factor of 0.5 for that indicator species. Conversely, if a species, such as a fish, primarily uses marine open water but can use intertidal mudflats when the tide is in the utilization factors might be 0.7 for the marine open water and 0.3 for intertidal mudflat. HQI will be 0 for a species for habitats it rarely uses. If the quality of a particular habitat for an indicator species is not changed by sedimentation, HQI for that habitat for the indicator species will simply be equal to the utilization factor. In cases in which habitat quality for a species changes based on variables which vary under future no-action and project alternative scenarios, HQI for a species will range between 0 and 1 and is defined by a simple model.

As described in greater detail below, the Upper Bay has been divided into three segments for the purposes of this analysis. An HQI is calculated for each species for each habitat for each segment. The total HU for the species for each habitat in a segment is determined by multiplying the HQI for the habitat by the total number of acres of that habitat in that segment. The total HU for the species for the habitat in Upper Newport Bay is calculated by summing the HU for the three segments. The total HU for a habitat then is the sum of the HU for all the species that use the habitat. Because the number of indicator species selected for each habitat is not equal, the total HU for each habitat is standardized by dividing by the number of indicator species.

2.5 ECOLOGICAL EVALUATION

The Upper Bay is a unique and sensitive resource. It is one of the few large coastal wetland systems that has high ecological importance and functional value remaining in southern California. This ecosystem supports several different habitats and provides foraging and breeding opportunities for several hundred species of marine and terrestrial organisms. Because of the importance of the biological resources in the Upper Bay, ecological models have been developed to evaluate the Upper Bay ecosystem, analyze potential restoration opportunities in the Upper Bay and document the recommended findings. More specifically, an ecosystem approach has been developed to inventory the resources occurring in each of the different habitats; define the habitat boundaries; determine the guilds that use the habitats, identify representative indicator species for each guild; and model each species' relationship in the Upper Bay ecosystem. Based on the modeled results, the value of the ecosystem is determined for the baseline, the future without project conditions, and for project alternatives.

Based on the TAG recommendations, the habitats of high importance for the Upper Bay were established for this study, and include the marine open water, the intertidal mudflats, and the saltmarsh. The marine open water and saltmarsh communities were further defined by their respective sub-habitats. The marine open water environment includes the benthic and the pelagic zones. The saltmarsh was further defined by the low (cordgrass), mid (pickleweed), and high (saltgrass, jaumea, salt wort and pickleweed) zones. Habitat boundaries were mapped on the basemap established from 1997 biological field surveys and 1998 bathymetric data.

To identify the different guilds and associated interactions in the system, a comprehensive list of the known guilds existing in the Upper Bay was developed by the TAG. From the list, the use of each habitat by each guild was assessed. Table 2.5-1 presents the guilds of Upper Newport Bay and the structural layout of each guild with respect to (sub) habitat use.

To identify representative indicator species for each guild, and determine the relationship in the guild and in the ecosystem, the baseline data (i.e., existing field reconnaissance and site specific surveys and other relevant literature) were used to determine the most representative species. Based on selection criteria identified below, indicator species were selected from the representative species for each habitat. These indicator species are used to define the habitat quality of each habitat and the overall function of the ecosystem.

2.6 ECOSYSTEM MODEL ASSUMPTIONS

To evaluate the environmental conditions of the ecosystem and each representative habitat, the ecological analysis for this environmental restoration project has been developed to assess and quantify existing and future biological values associated with the project no action and the proposed restoration alternatives for the Upper Bay. To assess environmental conditions, a species-guild analysis has been conducted to determine the representative species in the system. Species selected for use in the models may use one or more habitats in multiple ways. Therefore, each habitat is weighted by its use by each indicator species. Uses may include, for example, nesting/breeding/spawning, foraging, and loafing/resting activities.

Data which can be determined for the existing condition and projected for the future condition are correlated by formula to represent life requirements of the indicator species or guild. In most cases existing values are determined by field data and future projections by modeling if possible or, if not predictable by a model, by best professional judgement of the HEG. These data are plotted then against indicator guild/species habitat suitability criteria to determine habitat quality indices. These indices are used in the multi-species models to calculate ecological values for the different habitats. To develop indicator guild/species formulas, the following assumptions are presented for the model development process:

Table 2.5-1
Upper Bay Habitat and Associated Guilds

<table>
<tr><th>HABITAT</th><th colspan="3">OPEN WATER</th><th>INTERTIDAL</th><th colspan="3">SALTMARSH</th></tr>
<tr><th>SUB HABITAT</th><th>benthic zone</th><th colspan="2">Pelagic zone</th><th rowspan="2">Intertidal Species</th><th rowspan="2">Low Marsh Species</th><th rowspan="2">Mid Marsh Species</th><th rowspan="2">High Marsh Species</th></tr>
<tr><th>ORGANISMS</th><th>In- & Epi-fauna</th><th>Mid Column Species</th><th>Surface & Shallow Water Species</th></tr>
<tr><td rowspan="2">FORAGE BASE</td><td colspan="5">Benthic Invertebrates</td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Planktonic Species</td><td colspan="4">Insects</td></tr>
<tr><td rowspan="12">UPPER BAY GUILD STRUCTURE</td><td>Demersal Fishes</td><td colspan="2">Pelagic Fishes</td><td>General (Demersal & Pelagic) Fishes</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Seabirds: Deep Water Divers</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Diving Ducks</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Seabirds: Shallow Water Divers</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Dabbling Ducks</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Large Wetland Waders</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">Migratory Shorebirds</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Marshbirds</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Passerines</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="2">Reptiles</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="2">Mammals</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="2">Domestic & Non-Native Species</td></tr>
</table>

- Variables have been developed to model the quality of each habitat to the indicator species to show functional changes in the ecosystem. Formula variables are based on life requisites that are limiting and can be measured or reasonably predicted for the existing and future conditions.

- The objective is to develop a standardized way of assigning a HQI between 0 and 1 to indicate the quality of each habitat for each indicator species. Because habitat quality may vary within Upper Newport Bay, the Upper Bay was divided into three segments for this analysis. Segment 1 is the uppermost segment of the Bay above the Salt Work dike. Segment 2 is between the Salt Work dike and Middle Island. Segment 3 is the lowest portion of the Upper Bay between Middle Island and PCH. The HQI will be multiplied by the number of acres in each habitat in each of the three segments of Upper Newport Bay to determine HU for each indicator species. The total HU for each habitat will be standardized by dividing by the number of indicator species. Losses and gains in HU for each indicator species in each segment will be summed to determine the total HU for the future without project and project alternative scenarios. Total losses and gains in Habitat Units for each habitat will then be totaled and used to compare alternatives.

- For this analysis, the assignment of HQI for each indicator species for each habitat was made as simple as possible to focus on attributes of habitat quality that are relevant to sedimentation in the Upper Bay and project alternatives to control that sedimentation. Variables that were not relevant to the various sediment control alternatives for this project were not included in the HQIs for a habitat. Variables that are not limiting to a species within Upper Newport Bay were eliminated even though those variables may be important for an indicator species in other habitats and for other projects. Variables were also eliminated that may be relevant but that cannot be quantified or estimated based on the existing data and the modeling tools available.

- For this analysis, each indicator species use of each habitat was assessed. Relative use was assigned to each habitat so that the total use of all habitats by the species added up to 1.0. For some habitats for some species, the quality of the habitat will change based on variables that are important to the species. In those cases a simple model was developed to define HQI.

- Only native species that were once common and still exist today or are common now in the Upper Bay environment are used as indicator species. Characteristic and representative indicator species are assumed to represent the guild.

- If representative guild species are ranked similarly for a habitat and a USFWS model is available and can be modified to represent the Upper Bay environment, then that species was chosen as the indicator species and variables in the USFWS model are used for the evaluation.

- Because the invertebrate forage base is spatially patchy and seasonally variable in distribution, with variable tolerances for environmental change, the forage base (e.g., the plankton or benthic invertebrates) was not used as an indicator species or group for this analysis. Because foraging is a major habitat use that is evaluated for each indicator species, HQI for higher trophic level indicator species will be indicative of the status of the forage base. It is assumed the forage base will be indirectly measured by foraging activities of the indicator species. Like the forage base, the vegetation and/or habitat is assumed to be measured indirectly by the community use by an indicator species. Therefore, vegetation types are not modeled as indicator species either.

- Generalist species typically have a high tolerance level for environmental change and easily adapt to different environmental stresses. Because of this lower sensitivity to environmental variables, these species are not good indicator species of environmental change and are not proposed as indicators for this study.

- Mammals and reptiles were not used as indicator species for this analysis because they are primarily associated with upland habitat. This analysis focuses on aquatic and wetlands habitats.

➢ If a species with special protection under the Endangered Species Act (ESA) is selected as an indicator species for this study, the HQIs are designed only to assess habitat quality, not mitigation requirements. The modified HEP model is not proposed to address mitigation for impacts to endangered species.

2.7 INDICATOR SPECIES AND GUILD FORMULAS

Ideally, indicator species chosen to represent or characterize the guilds identified in Table 2.5-1 should be natives, have high abundance and/or occurrence, use the system for foraging, breeding/nesting and/or loafing/resting, be sensitive to environmental change, and be of social interest.

The following sections present a review of the guilds present in the Upper Bay, and the analysis and findings used to support recommended indicator species to represent each of the different guilds for the development of the ecological modeling efforts. Recommended species are based on a number of considerations: species occurrence in and use of the habitat, residency in the system, available data and critical data gaps, food web structure, environmental tolerance, and other ecological/political considerations. Environmental tolerance assesses the species adaptability within the habitat and how it responds to environmental change. The goal is to select indicator species that are sensitive to environmental change. Other ecological and social considerations may include an assessment of the overall importance of the species. For example, evaluation of importance considers whether any of the proposed species are important for recreation and/or commercial purposes, and/or are listed by the local entity, state or federal government as of special concern (and thereby have special protection status). Finally, if there is an existing USFWS model available that can be modified to represent the Upper Newport Bay environment, then that species is used over the other species ranked similarly without developed models.

Table 2.7-1 summarizes the indicator species and the HQIs used in this analysis. Selection of the indicator species and development of HQIs are discussed in the following section.

2.7.1 Marine Open Water: Benthic Fish

The most common marine benthic fishes included the California halibut, diamond turbot and arrow goby. These species are considered to characterize the marine benthic fish guild. Although species characteristics and habitat requirements are similar, the halibut was selected over the turbot because halibut may be somewhat more sensitive to environmental change (i.e., water quality fluctuations) and because it is more important from a recreation/commercial fisheries basis. The halibut was selected over the arrow goby because it is believed that the halibut is more sensitive to environmental change than the arrow goby. For example, in a four season study of Bolsa Chica, arrow gobies were collected in the back portion of Bolsa Bay which receives only very muted tidal influence, but California halibut were never collected there (Corps and City of Huntington Beach 1992). Because the California halibut may be the most environmentally sensitive species of the three identified above and is ranked of high importance to the commercial and recreation fisheries, the California halibut is the selected indicator species to represent marine benthic fishes. Table 2.7-2 presents a summary of the findings used to rank the different marine benthic fish species.

California Halibut - MEC (1997) summarized the life history and local distribution of California halibut. California halibut is an important commercial species that uses shallow bays and lagoons as nursery grounds for the development of their early life stages (Emmett et al. 1991; Zedler 1982; Kramer 1990). Spawning occurs from February to July, peaking in May (Emmett et al. 1991). Halibut tend to stay in wetland habitats for 2 to 3 years and then emigrate to the open ocean (Haaker 1975; Kramer 1990). Larvae, juveniles, and adults are carnivorous and feed on or above the sediment surface. Small juveniles feed on mysids and small gobies, and larger halibut feed on fish such as anchovies and sardines. All halibut collected during the September 1997 surveys were juveniles, including both young-of-the year and second year fish. Young-of-the-year fish are < 80 mm, and second year fish range from

Table 2.7-1
HQI for Indicator Species

Species	MOW	IMF	LSM	MSM	HSM
halibut	0.7 FWI	0.3 FWI	0	0	0
anchovy	0.7 ([WDA + FWI]/2)	0.3 FWI	0	0	0
western grebe	0.7 ([2 WDG+HDW]/3)	0.3	0	0	0
lesser scaup	0.7 ([2WDS+2FWI+HDW]/5)	0.3([WDS+FWI]/2)	0	0	0
least tern	0.7 FWI	0.3 FWI	0	0	0
pintail	0.1 ([2WDP+HDW]/3)	0.9 WDP	0	0	0
great egret	0	0.4	0.4	0.1	0.1
avocet	0	0.5	0	0	0.5
clapper rail	0	0	0.5	0.3	0.2
shorebirds	0	0.8 FWI	0.2 FWI	0	0
Belding's savannah sparrow	0	0	0.2	0.5	0.3

FWI = Freshwater influence. Freshwater influence is defined by salinity characteristics under low flow conditions. The following scores are used to define FWI

- 0 = salinity usually below 10 ppt
- 0.2 = salinity usually between 10 ppt and 20 ppt
- 0.4 = salinity fluctuates daily with tides and oscillations are 10 ppt or greater
- 0.6 = salinity fluctuates daily with the tides but oscillations are between 5 and 10 ppt
- 0.8 = salinity fluctuates daily with the tides but variations are below 5 ppt
- 1.0 = salinity stable near seawater

WDG = The percentage of a habitat that is at the preferred water depth for the western grebe. The preferred water depth for the western grebe is greater than 1 foot (-4 ft MSL).

WDS = The percentage of a habitat that is at the lesser scaup's preferred depth which is between -3 and - 10 feet MSL.

WDP = The percentage of MOW that is -6 ft. MSL or shallower and the percentage of IMF that is at the northern pintail's preferred water depth of - 2 feet or less.

HDW = Human disturbance by water. Human disturbance by various kinds of boats is greatest in the main channel below the salt dike. Therefore this variable is the percentage of marine open water below the salt dike that is outside the main channel. This variable is weighted as half that of preferred water depth because water birds will still be able to use these areas during periods when boat traffic is light.

WDA = Water depth for the deepbody anchovy. Because they use the whole water column, within Upper Newport Bay, habitat quality will improve with increased water depth. WDA is 0.5 for depths shallower than -6 feet MSL, 0.6 for depths between -6 and -7 ft MSL, 0.7 for depths between -7 and -8 ft MSL, 0.8 for depths between -8 and -9 ft. MSL, 0.9 for depths between -9 and -10 feet MSL and 1.0 for depths greater than -10 feet.

Table 2.7-2
Upper Bay Open Water: Benthic Environment and Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence[1]	Resident Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base[4]	Environmental Tolerance[5]	Importance[6]	Guild Indicator
Benthic Invertebrates	Fresh/Brackish Polychaetes, Ostracods, Isopods, Amphipods, Decapods, Gastropods.	Limiting	A	Resident	Forage Base	Plankton Detritus Algae Invertebrates	Variable	--	No
Demersal Fishes	CA halibut	Not Limiting	C	Resident	All	Molluscs. Crustaceans: shrimp. Fish: topsmelt, striped mullet, CA killifish, gobies, anchovies, yellow fin croaker.	Sensitive-Moderate	Commercial Recreation	Yes
	Diamond Turbot	Not Limiting	C	Resident	All	Benthic Invertebrates	Sensitive-Moderate	Recreation	No
	Arrow Goby	Not Limiting	C	Resident	All	Benthic Micro-Invertebrates	Moderate	--	No
Seabirds: Deep Water Divers	Grebes	Not Limiting	U	Winter Migrant Occur Fall to Spring	Forage	Crustaceans. Fish: cyprinids, topsmelt, mullet	Sensitive-Moderate	--	Yes[7]
	Pelicans	Not Limiting	I	Coast Resident	Forage[3]	Fish: anchovies, flatfish.	Moderate	Listed Species	No
	Cormorants	Not Limiting	I	Coast Resident	Forage[3]	Fish: anchovies, flatfish.	Moderate	--	No

Notes: (1) A = Abundant; C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting.
(3) Forage primarily in ocean and secondarily in bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Environmental tolerance presented in text.
(6) Importance: Federal/State listed species; Commercial and/or Recreational significance. (7) U.S. Fish and Wildlife Service Model Available.

about 80 to 160 mm (Allen 1988). California halibut males mature at about 200 mm, and females mature at about 375 mm (Haaker 1975). In the 1997 baseline survey, they were taken in all areas of the Upper Bay, but the fewest were caught in the uppermost basin. Another recent survey (MBC1997) also collected the fewest halibut in the uppermost basin of Upper Newport Bay.

Development of HQI for California Halibut in Upper Newport Bay

The primary habitats for California halibut within Upper Newport Bay are marine open water (MOW) and when the tide is in, intertidal mudflat. Because it is the primary habitat of California halibut in Upper Newport Bay, MOW was given a utilization weight of 0.7 for halibut. Halibut will also use the portions of intertidal mudflat covered by water. Because halibut cannot use mudflat when it is exposed, intertidal mudflat was given a utilization weight of 0.3 for California halibut.

The low numbers of halibut found in the Unit I/III basin compared to the lower basins within Upper Newport Bay suggests that the quality of all marine open water and intertidal mudflat habitat within the Upper Bay is not equal for halibut throughout the Upper Bay. There are a number of variables which may affect the distribution of California halibut within a bay. These include depth, salinity, temperature, distance from the ocean, dissolved oxygen, and residence time. Juvenile California halibut prefer shallow water. Water depth in Upper Newport Bay is never beyond the preferred depth limits for juvenile halibut. Therefore, water depth is not considered to be limiting to halibut in Upper Newport Bay. The Upper Bay is well flushed by tidal movements and residence times are short. As was considered true of depth, residence time is unlikely to be a limiting factor to the distribution of halibut in Upper Newport Bay. Distance from the ocean may be one reason that halibut densities are lower in the Unit I/III basin compared to the other parts of Upper Newport Bay. However, the recent fish sampling data (MEC 1997, MBC 1997) do not show a gradient of decreasing density of halibut with distance from the PCH Bridge. For example, MBC caught over 3 times as many halibut in the Narrows than they caught near Northstar Beach, lower in the Bay. Although distance from the ocean cannot be ruled out as a factor that influences halibut distribution in Upper Newport Bay, there is no clear evidence to suggest that distance is what keeps juvenile halibut density low in the Unit I/III basin. Dissolved oxygen levels in Upper Newport Bay are generally above the 5 ppm considered adequate to support aquatic life (EPA 1986). However, in November of 1996 and March 1997 the Irvine Ranch Water District (IRWD) reported dissolved oxygen concentrations of 3.6 ppm and 3.8 ppm respectively in the UnitI/III basin. Therefore, low dissolved oxygen may be a factor in limiting the distribution of halibut in Upper Newport Bay. Temperature also may have some effect on halibut distribution. The mean temperature in all segments of the Upper Bay are well within the tolerance limits for halibut. However, water temperatures in the Unit I/III Basin have been measured to occasionally exceed the 25°C upper tolerance limit of halibut. MBC (1997) found less halibut in the Unit I/III Basin in April of 1997 when water temperatures are low which suggests that a variable other than temperature must be limiting the distribution of halibut in the Unit I/III basin. Water column measurements show that this upper basin consistently has a lower salinity than the lower basins, usually even during the summer (IRWD 1996, MBC and SCCWRP 1980, Allen 1988). Therefore, it is suggested that within Upper Newport Bay, salinity is the variable that most affects the distribution of halibut. This hypothesis is consistent with research on the biology of California halibut. Under experimental conditions Baczkowski (1992) found that California halibut were stressed at low salinities and exhibited a clear preference for water with a salinity near seawater. She found that young halibut died with prolonged exposure to 8 ppt (parts per thousand) salinity. At exposure to water with a salinity of 17 ppt, halibut exhibited increased respiration and weight loss. When exposed to a salinity gradient, halibut exhibited a preference for salinities above 28 ppt. Therefore, most halibut will probably avoid areas of the Upper Bay with reduced salinity. Allen (1988) found that the abundance of California halibut in Upper Newport Bay is positively correlated with salinity. Allen (1994) has suggested that the dearth of halibut in the Unit I/III basin area is related to the lowered salinity regime because of the freshwater influx from San Diego Creek. An analysis of Allen's 1988 data indicates that halibut are most frequently collected in areas where the salinity is above 20 ppt.

All these data suggest that within Upper Newport Bay, salinity is the most important variable controlling the distribution of halibut. The exact relationship between halibut and salinity is not understood. For example, it is not known whether halibut follow a salinity gradient to select areas of higher salinity or whether they simply avoid areas when salinity declines below a certain threshold. It seems clear, however, that, within Upper Newport Bay, areas with less freshwater influence will have higher habitat quality for halibut.

Therefore, freshwater influence (FWI) was selected as the variable most critical to habitat quality for California halibut in Upper Newport Bay.

Salinity under future conditions can be predicted by wet and dry weather salinity modeling (Corps 1998). The wet weather simulation shows that during storm flows the entire Upper Bay goes nearly fresh for a number of hours and that this condition is similar both for the Year 0 (post Unit III Project) and year 50 without-project condition. Significant storms are relatively rare in southern California; dry weather is the norm. The dry weather salinity simulations show that salinity is fairly stable at Year 0 but undergoes considerable fluctuation on a daily basis at year 50. This fluctuation reflects the reduced tidal volume and the fact that, because of the loss of the subtidal basin due to sedimentation, during outgoing tides, freshwater from San Diego Creek will intrude into much of the Upper Bay. Therefore, the salinity characteristics of each segment of the Bay modeled by RMA (Corps 1998) during low flow conditions was selected to represent freshwater influence on California halibut. The FWI variable is defined as follows:

0 = salinity usually below 10 ppt
0.2 = salinity usually between 10 ppt and 20 ppt
0.4 = salinity fluctuates daily with tides and oscillations are 10 ppt or greater
0.6 = salinity fluctuates daily with the tides but oscillations are between 5 and 10 ppt
0.8 = salinity fluctuates daily with the tides but variations are below 5 ppt
1.0 = salinity stable near seawater

No information is available to predict other water quality variables, such as dissolved oxygen and temperature, that may affect the distribution of halibut in the Upper Bay. However, it is likely that these variables would respond in a similar fashion to salinity to lower the quality of the habitat for halibut. In other words, as the size of the subtidal habitat and the associated tidal volume decreases, salinity, oxygen and temperature undergo greater fluctuations with more frequent occurrence of levels beyond the preferred tolerance limits for California halibut. In addition, a greater influence of water from San Diego Creek would be expected to expose halibut to higher levels of contaminants that may be present in urban runoff discharged to the creek. Thus the FWI variable is intended to be a surrogate for water quality, in general, and the most important factor affecting habitat quality for halibut in Upper Newport Bay.

For halibut, then, for Marine Open Water,

HU = 0.7 FWI_{seg1}(acres MOW in segment 1)+0.7 FWI_{seg2}(acres MOW in Segment 2)+ 0.7 FWI_{seg3}(acres MOW in Segment 3)

For Intertidal Mudflat

HU = 0.3 FWI_{seg1}(acres IMF in segment 1)+0.3 FWI_{seg2}(acres IMF in Segment 2)+ 0.3 FWI_{seg3}(acres IMF in Segment 3)

2.7.2 Marine Open Water: Pelagic Fish

The most common marine pelagic fishes in Upper Newport Bay are the topsmelt, California killifish, deepbody anchovy, slough anchovy, striped mullet, and striped bass. These species are considered to characterize the marine pelagic fish guild, with topsmelt and California killifish representing surface and shallow water species, and the others, mid-column species.

The deepbody anchovy, slough anchovy, striped mullet, and striped bass were considered as potential indicator species for this guild. Recent surveys indicate that the most common mid column pelagic species is the deepbody anchovy. This species has a high occurrence in the system, is a resident, uses the Bay for its whole life cycle, and is reliant on the zooplankton for forage material. In addition, deepbody anchovies are a component of the food web for larger piscivorous fishes and water associated birds. Finally, deepbody anchovy is relatively sensitive to environmental change. Because the other species were much lower in abundance and less sensitive to environmental change, the deepbody anchovy is recommended as the pelagic fish indicator species. The most common surface/shallow water pelagic species was the topsmelt, then California killifish. These species ranked similar to the deepbody anchovy in occurrence. However, these species tolerate extreme environmental conditions and they are less sensitive indicators of habitat quality than the deepbody anchovy.

Upon review of the data, it appears generally that mid-column fishes and surface column fishes have similar life requisites. Therefore, only one indicator species will be required for the model evaluation. Tables 2.7-3 and 2.7-4 present a summary of the findings used to rank the different marine pelagic fishes. The deepbody anchovy, a mid-column species, and the topsmelt and the California killifish, both surface fishes, are recommended as indicators. Although all of these species are of extreme importance in the food web and there are data available to determine the life requirements, the topsmelt and the California killifish tolerate extreme conditions well. Because these species have adapted well to life with extreme conditions and high environmental change, these species are not recommended to represent the marine pelagic fish guild as indicators of habitat quality. Because the deepbody anchovy is moderately sensitive to environmental change, this species is selected as the indicator species for pelagic fish.

Deepbody Anchovy - MEC (1997) summarized the life history and local distribution information for deepbody anchovy. Deepbody anchovy commonly inhabit bays and estuaries, or sometimes the open coast. They are usually in small schools (Eschmeyer et al. 1983). Anchovies are planktivorous and search the entire water column for prey, which are primarily small crustaceans. Juveniles (25 to 70 millimeters [mm]) and adults (>70 mm) are pelagic, and the eggs and larvae are planktonic (Emmett et al. 1991). Anchovies represent important prey for larger fishes and marine birds, including terns, skimmers, and pelicans. Deepbody anchovies, in 1997, were most abundant below the dike (MEC 1997). Anchovies were least abundant in the Unit I/III basin. In contrast, Allen (1988) found deepbody anchovy to be most abundant in the Unit I/III basin after the 1985 dredging project. Most of the deepbody anchovies collected at Upper Newport Bay were juveniles smaller than 70 mm. Allen (1988) found that deepbody anchovy is a resident throughout all life stages in Upper Newport Bay. Adults may exhibit movements related to spawning by moving to upper portions of bays during their spawning season, which runs from March to August, and then moving to lower portions of bays after spawning (Emmett et al. 1991). Juveniles will reside in the upper portions of bays until late fall and winter. The results of the 1997 MEC study suggests that deepbody anchovy follow this pattern in Upper Newport Bay.

Development of HQI for Deepbody Anchovy in Upper Newport Bay

The primary habitat for deepbody anchovy in Upper Newport Bay is marine open water. Because they use the entire water column, greater numbers of deepbody anchovy tend to be found in portions of the Bay where water depth is at least 3 feet deep (K. Green, personal communication). The deepbody anchovy was assigned a use factor of 0.7 for marine open water. The intertidal mudflat is covered by at least 3 feet of water half the time. Therefore, the intertidal mudflat habitat was assigned a utilization factor of 0.3 for deepbody anchovy. The fact that much fewer anchovy were caught in the Unit I/III basin compared to the lower portions of Upper Newport Bay in the 1997 surveys (MEC 1997, MBC 1997) suggests that the quality of the habitat varies for deepbody anchovy within Upper Newport Bay. Variables that might affect habitat quality for deepbody anchovy include salinity, temperature, depth, dissolved oxygen and residence time. Residence times are relatively short throughout Upper Newport Bay (3 to 4 days according to MBC and SCCWRP 1980) and are unlikely to be limiting in this system

Table 2.7-3
Upper Bay Open Water: Pelagic (Mid Column) Environment and Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence[1]	Resident Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base[4]	Environmental Tolerance	Importance[5]	Guild Indicator
Plankton	Phytoplankton/ Zoolankton	Limiting	A	Resident	Forage Base	Micro-Plankton	Variable	--	No
Pelagic Fishes	Deepbody Anchovy	Not Limiting	H	Resident	All	Zooplankton	Sensitive-Moderate	For Larger fishes and marine birds.	Yes
	Slough Anchovy	Not Limiting	L	Resident	All	Zooplankton	Sensitive-Moderate	--	No
	Striped Mullet	Not Limiting	L	Resident	All	Macroalgae, diatom mat, Detritus.	Extreme	--	No
	Striped Bass	Not Limiting	L	Resident	All	Gobies, striped mullet, topsmelt, CA killifish, yellow fin croaker, Diamond turbot, L-jaw mudsucker, Staghorn sculpin.	Moderate	Recreation	No
Diving Ducks	Lesser Scaup	Not Limiting	C	Fall to Spring Migrant	Forage	Molluscs	Sensitive-Moderate	--	Yes[6]
	Canvasback	Not Limiting	U	Fall to Spring Migrant	Forage	Vegetation/Seeds.	Sensitive-Moderate	--	No
	Bufflehead	Not Limiting	C	Winter Migrant	Forage	Insects; Crustaceans, Molluscs.	Sensitive-Moderate	--	No
	Ruddy Duck	Not Limiting	A	Fall to Spring	Forage	Insects; Molluscs, Crustaceans	Moderate-Extreme	--	No

Notes: (1) H = High; L = Low; A = Abundant; C = Common; U = Uncommon. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean Environment. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

Table 2.7-4
Upper Bay Open Water: Pelagic (Surface Column and Shallow Water) Environment and Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence[1]	Resident Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base[4]	Environmental Tolerance	Importance[5]	Guild Indicator
Benth Inverts	Fresh/Brackish Sp. (See Table 2.7-2).								No
Plankton	Phyto/Zoo Plankton (See Table 2.7-3).								No
Pelagic Fishes	Topsmelt	Not Limiting	C	Resident	All	Macroalgae Diatom mat, Detritus	Extreme	Commercial Recreation	No
	CA killifish	Not Limiting	C	Resident	All	Benthic Invertebrates	Extreme	Recreation	No
Diving Ducks	Lesser Scaup (See Table 2.7-3)				Loaf	--	Sensitive-Moderate	--	Yes[6]
Seabirds: Shallow Water Divers	CA Least Tern	Not Limiting	C	Summer Migrant	Forage	Fish: cyprinids, topsmelt, striped mullet, anchovies	Sensitive	Federal/State Listing	Yes
	Black Skimmer	Not Limiting	C	Summer/Winter Migrant	Forage	Fish: anchovies, flatfish.	Sensitive-Moderate	State Listing	No
Dabbling Ducks	Northern Pintail	Not Limiting	C	Winter Migrant	Forage Loaf	Vegetation. Molluscs.	Low-Moderate	--	Yes[6]
	Cinnamon Teal	Not Limiting	C	Winter Migrant	Forage Loaf	Vegetation	Moderate	--	No
	Mallard	Not Limiting	C	Summer-Winter Migrant	Forage Loaf	Vegetation	Extreme	--	No

Notes: (1) C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

although long residence times may well limit anchovy distribution in other systems. Allen (1982), in his intensive study of the fishes of Upper Newport Bay, found that the distribution of deepbody anchovy in Upper Newport Bay was positively correlated with temperature, dissolved oxygen, depth, and salinity. In his more recent study (Allen 1988), Allen found the distribution of deepbody anchovy in Upper Newport Bay to be most strongly correlated with temperature. The strong positive relationship observed between deepbody anchovy and temperature in Upper Newport Bay appears to reflect the much greater abundance of this species in the Upper Bay during the warm late spring and summer months when deepbody anchovy move into the Upper Bay to spawn. Late spring and summer are the months of high productivity in the Upper Bay when photosynthesis by seasonal blooms of benthic algae and phytoplankton raise the daytime dissolved oxygen levels. Therefore, the positive relationship between deepbody anchovy and temperature and dissolved oxygen is most likely a seasonal phenomenon related to high Bay productivity and not necessarily a preference for higher temperatures and dissolved oxygen concentrations as variables. It is unlikely that if project alternatives raised the water temperature or dissolved oxygen of a segment of the Upper Bay compared to existing conditions, that habitat quality would increase for deepbody anchovy. On the other hand, because they use the entire water column, greater water depth and hence volume of water might be expected to improve habitat quality for anchovy. Allen (1988) found deepbody anchovy to be most abundant in the Unit I/III basin following the deepening of that basin by the 1985 dredging project. In 1997, when the Unit I basin had been filled by sediment, deepbody anchovy were less abundant there than in the lower portions of the Upper Bay (MEC 1997, MBC 1997). Allen (1994) predicted that the abundance of deepbody anchovy in the Unit I/III basin would increase after the Unit III dredging because of the greater water depth. Therefore, water depth is suggested as a variable that is important to deepbody anchovy. The depth variable for anchovy (WDA) is most simply expressed as a direct relationship between water depth and habitat quality with habitat quality increasing with deeper water in a linear fashion and water depths greater than -10 feet (-3 m) MSL water representing optimal depth. Although, there may be other systems in which habitat quality does not continue to increase with increasing water depth for deepbody anchovy (because of lower temperatures, lower productivity and decreased dissolved oxygen) because Upper Newport Bay is a shallow system, excessive water depths will never be reached. Therefore to express WDA for deepbody anchovy in Upper Newport Bay,

> WDA = 0.5 for depths shallower than -6 feet MSL, 0.6 for depths between -6 and -7 feet MSL, 0.7 for depths between -7 and -8 feet MSL, 0.8 for depths between -8 and -9 feet MSL, 0.9 for depths between -9 and -10 feet MSL and 1.0 for depths greater than -10 feet MSL.

To calculate WDA for a segment of the Bay, the percentage of each water depth within the segment is multiplied by WDA for that water depth. The products are added to obtain an average WDA for the segment.

The data also suggest that deepbody anchovy prefer areas of the Bay with higher salinity. Therefore areas of the Bay with greater freshwater influence would be expect to have a lower habitat quality for deepbody anchovy than areas with salinity closer to seawater. For Upper Newport Bay, then, habitat quality of marine open water for deepbody anchovy is most related to water depth and salinity.

For deepbody anchovy for marine open water habitat,

$$HQI = 0.7\ ([WDA+FWI]/2)$$

where FWI is predicted by the RMA model (Corps 1998) for low flow conditions and measured on the scale presented in Section 2.7.1 for California halibut.

To calculate Habitat Units for deepbody anchovy for marine open water,

$$HU = 0.7\ ([WDA_{seg1}+FWI_{seg1}]/2)\ (\text{acres MOW in segment 1})+0.7\ ([WDA_{seg2}+FWI_{seg2}]/2)\ (\text{acres MOW in Segment 2})+0.7\ ([WDA_{seg3}+FWI_{seg3}]/2)\ (\text{acres MOW in Segment 3})$$

As discussed previously, deepbody anchovy are assigned a use of 0.5 for intertidal mudflat because the intertidal mudflat is covered by at least 3 feet of water half the time. Because deepbody anchovy prefer water with higher salinity, habitat quality of intertidal mudflat will be lower in areas with greater freshwater influence.

To calculate Habitat Units for deepbody anchovy for intertidal mudflat,

$HU = 0.3\ FWI_{seg1}$(acres IMF in segment 1)+0.3 FWI_{seg2}(acres IMF in Segment 2)+0.3 FWI_{seg3}(acres IMF in Segment 3)

2.7.3 Marine Open Water: Deep Water Divers

Western grebes, pelicans, and cormorants were proposed as potential indicator species for this guild. The western grebe forages in the Upper Bay and is an abundant winter visitor to Upper Newport Bay. Although the pelicans and cormorants forage also in the Upper Bay; they have limited habitat for loafing and preening and are more characteristic of Lower Newport Bay. Therefore, the western grebe was recommended as an indicator species based on greater use of Upper Newport Bay.

Western Grebe - During migrating and overwintering, western grebes are found along sheltered seacoasts. A USFWS model is available for the western grebe. Although the USFWS Western Grebe Habitat Suitability Index Model (1984) is focused on nesting habitat and the project area is not an active breeding area, the project area provides important seasonal foraging and loafing opportunities for grebes and other diving birds. Western grebes forage primarily on small fish, which are not considered a limiting resource for this species. Western grebes prefer to forage in waters deeper than 1 foot (0.3 m) (USFWS 1984) and less than 35 feet (10 m) (Dailey, Reisch and Anderson 1996). Western grebes loaf on the surface waters. USFWS (1984) indicates that optimum cover is 30 percent. However, cover is important to breeding grebes to provide hidden nest sites. Cover was not considered a critical variable for wintering grebes in Upper Newport Bay. USFWS (1984) indicates grebes prefer areas of low human disturbance/impact. Important factors for modeling habitat quality for western grebes on Upper Newport Bay, therefore, are considered to be water depth and human disturbance.

Development of HQI for Western Grebe in Upper Newport Bay

Western grebes can forage in water depths between -4 and -33 feet MSL. Therefore, they will be able to use all of the marine open water habitat. The utilization factor for marine open water for western grebe was considered to be 0.7. Because they can forage in water depths as shallow as 1 foot, western grebes will also be able to use intertidal mudflat habitat that is covered by at least 1 foot of water. Intertidal mudflat was given a utilization weight of 0.3 for western grebes because grebes cannot use intertidal mudflat when it is exposed. Western grebes and other waterfowl are very disturbed by boaters (USFWS 1984, E. Burres 1984). Therefore, human disturbance by boat was considered to be an important variable that may affect habitat quality for western grebes in Upper Newport Bay. Most boating activity in the Upper Bay occurs in the main channel below the salt dike. It is important for the grebes to have refuge areas outside the main channels used frequently by boaters.

Two variables are proposed to define habitat quality for western grebes. These variables are water depth (WDG) and human disturbance by water (HDW).

For the Marine Open Water habitat for western grebe,

WDG = % MOW between -4 foot and -33 feet MSL

In Upper Newport Bay, all MOW is within the preferred depth limits for western grebe. Therefore, WDG will always be 1.

The human disturbance by water variable, HDW, is defined as the percentage of the marine open water habitat which is not within the main channel below the salt dike. If these channel areas are within their preferred foraging depth, western grebes will still be able to use these areas, particularly during periods of low human use. Therefore, HDW was weighted less than WDG.

For MOW for western grebe then,

$$HQI = ([2WDG+HDW]/3)\ 0.7$$

HQI may be different for each of the three segments depending on how much of the marine open water habitat is outside the channels used heavily by boaters and greater than 50 m from the human access points.

$$HU = 0.7\ ([2WDG_{seg1}+HDW_{seg1}]/3)\ (\text{acres MOW in segment 1})+(2WDG_{seg2}+HDW_{seg2}]/3)\ (\text{acres MOW in segment 2})+([2WDG_{seg3}+HDW_{seg3}]/3)\ (\text{acres MOW in segment 3})$$

For Intertidal Mudflat,

Western grebes will be able to use the intertidal mudflats approximately half the time when the tide is in. Because boaters generally avoid these shallow areas, human disturbance by water is not a critical factor for western grebes in the mudflats. For intertidal mudflats for western grebes, the HQI is equal to 0.3.

$$HU = 0.3\ (\text{acres IMF in segment 1})+0.3\ (\text{acres of IMF in segment 2})+0.3\ (\text{acres IMF in segment 3})$$

2.7.4 Marine Open Water: Diving Ducks

Diving ducks float on the water's surface and then submerge completely in pursuit of prey or vegetable matter. Abundant diving ducks in Upper Newport Bay include lesser scaup, bufflehead, and ruddy duck. Of these species, only the ruddy duck breeds in Orange County, but primarily in urban parks not in Upper Newport Bay (Gallagher 1996). The lesser scaup was chosen as an indicator species because large numbers winter in Upper Newport Bay, a USFWS HEP model was available for it (Mulholland 1985), and the lesser scaup was considered to be more sensitive to its environment than the urban-adapted ruddy duck.

Lesser Scaup - During migrating and overwintering, the lesser scaup's primary habitat is the pelagic zone of estuaries and bays; this zone supports both foraging and loafing opportunities. This species does not nest in the local area. The USFWS Lesser Scaup Habitat Suitability Index Model (Mulholland 1985) is focused on wintering habitat located in the southeast. This model is based on availability of forage material, depth of water column, cover (emergent vegetation along shoreline) and disturbance impacts. Based on these modeling parameters, the model variables were modified to reflect conditions in the project area. In this region, lesser scaup forage primarily on molluscs (Dailey, Reisch and Anderson 1993). Lesser scaup prefer to forage in waters between -3 to -10 feet (-1 to -3 m) MSL (Mulholland 1985). Waters deeper than 35 feet (10 m) are not suitable for foraging or loafing (Mulholland 1985).

Lesser scaup loaf on surface waters. The USFWS model (Mulholland 1985) indicates that optimum cover of emergent vegetation is 5 percent or less. USFWS (Mulholland 1985) indicates lesser scaup prefer areas of low disturbance/impact. Important variables for modeling are forage material, water and cover requirements, and disturbance impacts.

Development of HQI for Lesser Scaup in Upper Newport Bay

Variables to determine habitat quality for lesser scaup in the USFWS model (Mulholland 1985) are the percentage of the area supporting pelecypods, the percentage of the area supporting emergent vegetation, water depth and human disturbance. Marine open water is the primary habitat of lesser scaup in Upper Newport Bay. Marine open water, thus, was assigned a utilization weight of 0.7. Lesser scaup only use the portion of intertidal mudflat habitat covered with water. Therefore, intertidal mudflat was given a weight of 0.3 for lesser scaup. Fewer pelecypods, the preferred prey of lesser scaup, have been found in the Unit I/III basin than at stations lower in the Bay (MBC and SCCWRP 1980). Pelecypods are probably responding negatively to the low salinity of San Diego Creek and possibly to other water quality variables associated with creek discharge. Therefore, freshwater influence most likely reduces the forage base for lesser scaup. FWI as defined for California halibut was included as a relevant vairable for lesser scaup. Lesser scaup prefer areas of open water with minimal emergent vegetation. Because Upper Newport Bay provides large expanses of open water fringed by mudflats, open water free of emergent vegetation was not considered to be a limiting variable in Upper Newport Bay. The variables considered to be important to lesser scaup in Upper Newport Bay are water depth (WDS), HDW, and FWI.

For the MOW habitat for lesser scaup,

WDS = % MOW between -3 and -10 feet MSL

The human disturbance variable, HDW is defined the same as for western grebe.

HDW = percentage of MOW below the salt dike outside the main channel

FWI = Freshwater influence as defined for California halibut

As was true of western grebe, HDW was weighted less than water depth, because lesser scaup will be able to forage at times in water of preferred depth even if it is within the main channel used by boaters. Similarly, HDW was weighted less than FWI.

Therefore, for MOW for lesser scaup,

HQI = 0.7 ([2WDG+2FWI+HDW]/5)

HQI for lesser scaup may be different for each of the three segments of the Upper Bay depending on the water depths, the amount of marine open water habitat outside the channels used heavily by boaters, and the amount of habitat greater than 50 m from human access points. Habitat Units will be calculated separately for each segment and added to derive total HU for lesser scaup.

$HU = 0.7 ([2WDS_{seg1}+2FWI_{seg1}+HDW_{seg1}]/5)$ (acres MOW in segment 1)+ $0.7 ([2WDS_{seg2}+2FWI_{seg2}+HDW_{seg2}]/5)$ (acres MOW in segment 2)+$0.7 ([2WDG_{seg3}+ 2WFI_{seg3}+HDW_{seg3}]/5)$ (acres MOW in segment 3)

For Intertidal Mudflat for lesser scaup,

WDS and FWI will be important variables for lesser scaup in intertidal mudflat habitat. Human disturbance by water is not an important variable in intertidal mudflat habitat because boaters generally remain inside the deeper channels. Because lesser scaup do not use the exposed portion of intertidal mudflats, intertidal mudflats was given a weight factor of 0.3.

HQI = 0.3 ([WDS+FWI]/2)

and

$HU = 0.3 [([WDS_{seg1}+FWI_{seg1}]/2)$ (acres IMF in segment 1)+$0.3 ([WDS_{seg2}+FWI_{seg2}]/2)$ (acres of IMF in segment 2)+$0.3 ([WDS_{seg3}+FWI_{seg3}]/2)$ (acres IMF in segment 3)

2.7.5 Seabirds (Pelagic - Shallow Water Surface Divers)

The shallow water surface divers use the surface zone for foraging, upland barren sandy areas for nesting, and intertidal areas for loafing/preening. Common shallow divers in the project area include terns and skimmers which nest on the two man-made nesting islands in the Unit I/III basin. The California least tern, which is on both the state and federal Endangered lists, was chosen as the indicator species for this guild because of the importance of the Upper Bay to its recovery. It should be emphasized that the least tern is used as an indicator of habitat quality by HEP. HEP will not be used to determine impacts and mitigation that must be assessed independently under the Endangered Species Act.

California Least Tern - During migrating and overwintering, the California least tern's primary nesting and loafing habitat include areas supporting large, isolated, undisturbed, sandy areas with minimal vegetation and wrack. (Potential nest sites include the remote upper islands located in the Upper Bay.) Secondary loafing may occur on the mudflats. Foraging occurs in waters generally less than 33 feet (10 m) in depth, with a sandy substrate, and less than 1.8 miles (3 kilometers [km]) from the nest site. Terns forage on small pelagic surface fish.

Development of HQI for California Least Tern in Upper Newport Bay

Within Upper Newport Bay, California least terns forage throughout the marine open water habitat and in the intertidal mudflat habitat when the mudflats are covered with water. All of the Upper Bay is within the preferred foraging radius of the least tern nest sites and small forage fish are abundant throughout the Upper Bay. Therefore, marine open water within Upper Newport Bay is assigned a utilization value of 0.7 for California least terns and intertidal mudflats are assigned a utilization weight of 0.3.

Foraging terns in Upper Newport Bay are not disturbed significantly by boaters. Therefore, human disturbance by water is not considered an indication of habitat quality for least terns. The primary factor affecting habitat quality for least terns in Upper Newport Bay is probably the availability of small forage fish. The most abundant small forage fish in the Bay system are topsmelt and deepbody anchovy. The abundance of both of these species have been found to have a positive correlation to salinity (Allen 1982, 1988), and both were found to be least abundant in the Unit I/III basin in the 1997 survey (MEC 1997). Therefore, the forage base for least terns is likely to be reduced in areas with a stronger freshwater influence. The FWI, as defined for halibut was considered to be important in defining habitat quality for least terns in Upper Newport Bay.

For MOW for California least terns,

> HU = 0.7 FWI (acres MOW in segment 1)+0.7 FWI (acres of MOW in segment 2)+
> 0.7 FWI (acres of MOW in segment 3)

For Intertidal Mudflat for California least terns,

> HU = 0.3 FWI (acres of intertidal mudflats in segment 1)+0.3 FWI (acres of intertidal
> mudflats in segment 2)+0.3 FWI (acres of intertidal mudflats in segment 3)

2.7.6 Intertidal Mudflat/Marine Open Water: Dabbling Ducks

Dabbling ducks use the shallow water of the intertidal mudflats and the shallowest portions of the marine open water for foraging and loafing/preening (Tables 2.7-4 and 2.7-5). Also known as puddle ducks, they tip tail-up to forage. Common dabbling ducks in the project area include mallards, northern pintail, and cinnamon teal. Although the mallard is a local resident of the Bay, it also is very tolerant of stressful environmental conditions. Because of its ability to adapt to extreme conditions, it is not recommended as an indicator species. Life requirements for both the Cinnamon Teal and the Northern Pintail are similar. The Cinnamon Teal is a common breeder in Orange County while the Northern Pintail is a rare breeder (Gallagher 1996). Both, are common winter migrants to the area. Both species forage on

Table 2.7-5
Upper Bay Intertidal Mudflat Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence	Resident/ Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base[4]	Environmental Tolerance	Importance[5]	Guild Indicator
Benth Inverts	Fresh/Brackish Sp. (See Table 2.7-2).								No
Shallow Divers	CA Least Tern (See Table 2.7-3).		U-C	Summer Migrant	Forage - Loaf	--	Sensitive	Fed/State Listing	Yes
Dabbling Ducks	Northern Pintail	See Table 2.7-4.			Forage - Loaf	--	Low-Moderate	--	Yes[6]
Large Wetland Waders	Great Egret Great Blue Heron Snowy Egret			Resident	Forage Loaf	Inverts. Amphib. Reptile Sm. Rodents.	Moderate Moderate Moderate	--	Yes[6] No No
Shorebirds	General	Not Limiting	C-A	Fall to Spring Migrant	Forage Loaf	Invertebrates: Polychaetes, Ostracods, Isopods, Amphipods, Decapods, Gastropods. Fish.	Moderate	--	Yes
	Avocets/ Stilts	Not Limiting	U-C	Resident	Forage Loaf	Invertebrates, (Insects & Crustaceans) Vegetation	Sensitive	--	Yes

Notes: (1) A - Abundant, C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

invertebrates, and will loaf and preen in the shallows. Because the USFWS has developed a Habitat Suitability Index model for the Northern Pintail, this model will be used, and modified as necessary, to evaluate environmental conditions for dabbling ducks.

Northern Pintail - During migrating and overwintering, the Northern Pintail's primary habitat is the intertidal mudflats and the shallow portions of the open marine, pelagic zone. These areas are used both for foraging and loafing. The USFWS northern pintail habitat suitability model is focused on wintering habitat on the Gulf Coast (Howard and Kantrud 1986). This model is based on availability of forage material, depth of water column, and cover (emergent vegetation along shoreline). A local model was developed in 1988 by the Corps to evaluate habitat at Bolsa Chica wetlands, which is located roughly 20 miles north of the project area. The local model indicated human disturbance impacts should be considered as an indication of habitat quality for northern pintail. Based on these modeling parameters, the model variables were modified to reflect conditions in the project area. In this region, the pintail forages primarily on invertebrates and vegetation (Dailey, Reisch and Anderson 1993). Northern pintail prefers to forage in waters between 0 and 2 feet in depth (Howard and Kantrud 1986). USFWS (1986) indicates that optimum cover of emergent vegetation is 5 percent or less. Corps (1988) indicates the pintail prefers areas of low disturbance/impact. Important factors for modeling habitat quality for northern pintail in Upper Newport Bay are forage material, water depth, vegetation, and disturbance impacts.

Development of HQI for Northern Pintail in Upper Newport Bay

Northern pintails forage in water depths of 2 feet or less and loaf either on the water's surface or out of the water on the mudflats at low tide. Therefore, northern pintails will be able to use some portion of the intertidal mudflat habitat most of the time. The utilization factor for intertidal mudflat was considered to be 0.9. Northern pintails will only use the shallowest portions of the marine open water habitat. Because marine open water is defined as having an elevation below -4 MSL, northern pintails will only be able to forage in this habitat when tides are 1 foot or less MLLW, and they will only be able to forage in portions of the marine open water habitat with a depth of -6 feet MSL or less. Because tides are 1 foot or less approximately 20 percent of the time, marine open water habitat was assigned a utilization factor of 0.1 for northern pintail.

According to the USFWS model (Howard and Kantrud 1986) variables important to northern pintail are water depth, open water relatively free of vegetation, and food. In developing a habitat model for the northern pintail at Bolsa Chica the Corps (1988) modified the USFWS model to include human disturbance. Food and open water are not limiting for northern pintails at Upper Newport Bay. Therefore, the relevant variables are water depth and human disturbance.

For the MOW habitat for northern pintail,

WDP = % MOW with a depth less than -6 feet MSL

The human disturbance variable, HDW, is defined the same as for western grebe and lesser scaup.

HDW = percentage of marine open water below the salt dike outside the main channel

As was true of western grebe and lesser scaup, HDW was weighted less than water depth, because northern pintail will be able to forage at times in water of preferred depth even if it is within the main channel used by boaters.

HQI = 0.1 ([2WDP+HDW]/3)

HQI for northern pintail may be different for each of the three segments of the Upper Bay depending on the water depths, and the amount of marine open water habitat outside the channels used heavily by boaters. HU will be calculated separately for each segment and added to derive total HU for northern pintail.

$HU = 0.1 ([2WDP_{seg1}+HDW_{seg1}]/3)$ (acres MOW in segment 1)+ $0.1 ([2WDP_{seg2}+HDW_{seg2}]/3)$ (acres MOW in segment 2)+ $0.1 ([2WDP_{seg3}+HDW_{seg3}]/3)$ (acres MOW in segment 3)

For Intertidal Mudflat for northern pintail,

Water depth (WDP) is the important variable for northern pintail in intertidal mudflat habitat. Human disturbance by water is not an important variable in intertidal mudflat habitat because boaters generally remain inside the deeper channels.

$HQI = 0.9\ WDP$

and

$HU = 0.9\ WDP_{seg1}$(acres IMF in segment 1)+$0.9\ WDP_{seg2}$(acres of IMF in segment 2)+ $0.9\ WDP_{seg3}$ (acres IMF in segment 3)

2.7.7 Intertidal Mudflat: Wading Birds

Common large wading birds in Upper Newport Bay include the great egrets, great blue heron, and snowy egret (Table 2.7-5). Because the three species have similar habitat requirements, the great egret was chosen to represent the guild.

Great Egret - During migrating and overwintering, the great egret uses most environments within the Upper Bay ecosystem. Although the Bay is not use for nesting, it is used for foraging and loafing. The egret forages in the shallow water environment and on the intertidal mudflats, and loafs primarily in the low and mid marsh, but also forages and loafs in the high marsh. Great egrets feed primarily on fish, but also eat insects, crustaceans, frogs, snakes, small birds, snails, small mammals, and plant seed (Chapman and Howard 1984). Great egrets forage in water that is 0.3 to 0.8 feet (.09 to .24 m) deep. An USFWS Habitat Suitability Index Model is available for the great egret (Chapman and Howard 1984). This model was modified for the west coast by Roberts (1986).

Development of HQI for Great Egret in Upper Newport Bay

The marine open water habitat will be too deep for foraging by these wading birds most of the time. Therefore, marine open water was given a utilization weight of 0 for great egret. Great egrets will intertidal mudflat, low saltmarsh, mid saltmarsh, and high saltmarsh. All of the intertidal mudflat habitat available to great egrets at Mean Lower Low Water and mudflats are an important foraging habitat for this species. However, during high tides the lower portions of the intertidal will be unavailable for great egrets. Therefore, intertidal mudflat was assigned a utilization factor of 0.4 for great egret. Lower saltmarsh will be covered by water, providing opportunities for great egrets to forage on their preferred fish prey, approximately half of the time. When the lower saltmarsh habitat is exposed by the tide, great egrets can still forage there on tidal invertebrates and small birds. However, the dense plant cover in this habitat would make prey less vulnerable to egrets. Chapman and Howard (1984) state that great egrets prefer to forage in areas in which vegetative cover is less than 60 percent. MEC found that total plant cover in low saltmarsh in Upper Newport Bay was 70.1 percent (MEC 1997). Therefore, low saltmarsh in Upper Newport Bay was too densely vegetated to provide optimal foraging habitat for great egret. Therefore, low saltmarsh was assigned a utilization factor of 0.4 for great egret. Middle saltmarsh is only covered by water on higher high tides. Therefore, middle saltmarsh will not often provide opportunities for great egrets to forage on their preferred fish prey. However, they can forage on insects and other invertebrates as well as small birds and mammals in this habitat and can use it for loafing. Mid saltmarsh was assigned a utilization factor of 0.3 for great egret because it provides less foraging opportunity than intertidal mudflat and low saltmarsh. Finally, great egrets will loaf in high saltmarsh and forage to a certain extent on insects, small birds and small mammals. Of the Upper Newport Bay wetlands habitats, high saltmarsh is used the least by great egrets. It was assigned a utilization factor of 0.2.

According to the USFWS model (Chapman and Howard 1984) and the west coast model (Roberts 1986), important variables for great egrets include water depth, percent vegetation cover, nesting habitat, and human disturbance. Great egrets do not nest in Upper Newport Bay. Changes in the percentage of vegetation cover cannot be predicted by the modeling tools used for the alternatives analysis. Therefore, the relevant variables for the HEP models for this evaluation were considered to be water depth and human disturbance. Water depth is limited to very shallow water for these wading birds and was considered in assigning the habitat utilization factor for each of the wetlands habitats for the great egret. Therefore, the HQI for great egrets in Upper Newport Bay was considered to be equivalent to the static utilization factor. Because they do not forage within the main channels used by boaters, human disturbance by water was not considered important for great egrets in Upper Newport Bay.

For Intertidal Mudflat for great egret,

HQI = 0.4

and

HU = 0.4 (acres IMF in segment 1)+0.4 (acres IMF in segment 2)+0.4 (acres of IMF in segment 3)

Similarly, for Low Saltmarsh,

HQI = 0.4

and

HU = 0.4 (acres LSM in segment 1)+0.4 (acres LSM in segment 2)+04 (acres of LSM in segment 3)

For Mid Saltmarsh

HQI = 0.3

and

HU = 0.3 (acres MSM in segment 1)+0.3 (acres MSM in segment 2) +0.3 (acres of MSM in segment 3)

Finally, for High Saltmarsh

HQI = 0.2

and

HU = 0.2 (acres HSM in segment 1)+0.2 (acres HSM in segment 2) +0.2 (acres of HSM in segment 3)

2.7.8 Intertidal Mudflat: Stilts and Avocets

The American avocet and black-necked stilt are closely related, long-legged shorebirds that breed in Upper Newport Bay (Gallagher 1997). The American avocet outnumbers the black-necked stilt at Upper Newport Bay but is less widespread as a breeder throughout Orange County. Because it is more common at Upper Newport Bay and because it may be somewhat more restricted than the stilt in its habitat requirements, the American avocet was chosen as the indicator species for the stilt and avocet guild. In addition, an American avocet model was previously developed by the Corps for the Bolsa Chica wetlands (Corps 1988).

American Avocet - American avocets forage on mudflats by probing in the mud, sweeping their long bills through water, or by tipping-up like dabbling ducks (Zeiner et al. 1990). Preferred foods include aquatic insects, crustaceans, snails, worms and occasionally seeds of aquatic plants. American avocets nest in barren portions of the high saltmarsh habitat (Gallagher 1997). Their nest is a simple scrape in the sand (Zeiner et al. 1990).

Development of HQI for American Avocets in Upper Newport Bay

The marine open water habitat is almost always covered by water too deep for American avocets to forage. Therefore, it was given a utilization factor of 0 for avocets. American avocets can use all of the intertidal mudflat habitat for foraging during some period of the tidal cycle. Therefore, intertidal mudflats were given a utilization factor of 0.5 for avocets. Because avocets prefer to forage in unvegetated areas, low and mid saltmarsh were given a utilization factor of 0 for avocets. Because avocets nest in high saltmarsh, high saltmarsh was given a utilization factor of 0.5 for American avocets.

The habitat suitability index model developed for American avocets for Bolsa Chica (Corps 1988), included water depth and human disturbance as variables considered to be important in defining habitat quality for American avocets at Bolsa Chica. Water depth has already been considered in assigning the utilization factor for each habitat at Upper Newport Bay. Human disturbance by water is generally restricted to the open water channels and does not affect open water habitat. Human disturbance by land is not related to sedimentation impacts. Reducing human disturbance by land will be considered as a separate restoration measure.

For Intertidal Mudflat for American avocet,

> HU = 0.5 (acres IMF in segment 1)+0.5 (acres IMF in segment 2)+0.5 (acres of IMF in segment 3)

Similarly for High Saltmarsh,

> HU = 0.5 (acres HSM in segment 1)+ 0.5 (acres HSM in segment 2)+0.5 (acres of HSM in segment 3)

2.7.9 Intertidal Mudflat: Wintering Shorebirds

The intertidal mudflat habitat of Upper Newport Bay provides critical foraging and loafing area for a variety of shorebirds. Shorebirds commonly found using this habitat include American avocets, black-necked stilts, black-bellied plover, killdeer, willet, marbled godwit, western and least sandpiper, dunlin and long- and short-billed dowitcher. With the exception of the avocets, black-necked stilts and the killdeer, the shorebirds do not breed locally. However, great numbers are present in migration and many winter in the Upper Bay.

Wintering Snowbirds - Shorebirds feed on a variety of benthic invertebrates. Because of their different foraging strategies and associated variety of bill sizes and shapes, a diversity of shorebirds are able to forage in the intertidal without competing directly for the same resources. Because it was considered important that Upper Newport Bay continue to support a full array of wintering shorebird species, wintering shorebirds were modeled as a guild rather than selecting a single indicator species.

Development of HQI for Wintering Shorebirds in Upper Newport Bay

Shorebirds forage primarily in the intertidal when the substrate is exposed. Because the marine open water habitat is always covered by water, the use of this habitat by shorebirds is negligible. Marine open water was assigned a utilization factor of 0 for wintering shorebirds. Shorebirds forage and loaf primarily on intertidal mudflats. This habitat was assigned a utilization factor of 0.8. Shorebirds will also loaf in open areas in low saltmarsh during higher tides when intertidal mudflats are covered with water. In addition, shorebirds forage at the interface between low saltmarsh and intertidal mudflat. The percentage of time when water is above 1 foot MSL and all of the intertidal mudflat habitat is covered is about 20 percent. Because loafing habitat in low saltmarsh is important to shorebirds during low tides and because they will forage in a small percentage of the habitat during lower tides, low saltmarsh was assigned a utilization factor of 0.2 for wintering shorebirds. Although a minor amount of foraging and loafing by shorebirds occurs in mid and high saltmarsh, these habitats are not critical for shorebirds and were assigned a utilization factor of 0.

The important variables for wintering shorebirds in Upper Newport Bay was considered to be the availability of food to support a full diversity of species. MBC and SCCWRP (1980) sampled benthic invertebrates throughout Upper Newport Bay in 1979 and 1980. The stations closest to the mouth of San Diego Creek had the lowest density and diversity of benthic invertebrates. Stations in the uppermost portions of the Bay supported only one species of bivalve compared to between 10 and 36 species at stations lower in the Bay. The most important variables affecting the infaunal community appeared to be sediment characteristics and salinity. Therefore, freshwater influence is likely to reduce the foraging opportunities for wintering shorebirds by reducing the variety and abundance of prey resources. For the purposes of comparing freshwater influence in the three segments of the Bay under different project alternatives, FWI as defined for California halibut will be used.

For Intertidal Mudflat for wintering shorebirds then,

$$HQI = 0.8\ FWI$$

and

$$HU = 0.8\ FWI_{seg1}(\text{acres intertidal mudflats in segment 1}) + 0.8\ FWI_{seg2}(\text{acres intertidal mudflats in segment 2}) + 0.8\ FWI_{seg3}(\text{acres intertidal mudflats in segment 3})$$

For Low Saltmarsh for wintering shorebirds freshwater influence will be important as for Intertidal Mudflat but the utilization factor is only 0.2. Therefore,

$$HQI = 0.2\ FWI$$

and

$$HU = 0.2\ FWI_{seg1}(\text{acres intertidal mudflats in segment 1}) + 0.2\ FWI_{seg2}(\text{acres intertidal mudflats in segment 2}) + 0.3\ FWI_{seg3}(\text{acres intertidal mudflats in segment 3})$$

2.7.10 Low Saltmarsh: Marshbirds

The federal and state endangered light-footed clapper rail forages and nests in low saltmarsh. Other rail species that use this habitat include sora, Virginia rail and black rail (Table 2.7-6). Upper Newport Bay has consistently supported the highest numbers of light-footed clapper rails of any southern California wetland and is believed to be the only viable subpopulation remaining in the United States. Because the low saltmarsh habitat of Upper Newport Bay is critical to the light-footed clapper rail, the clapper rail was selected as the indicator species for rails that use the low saltmarsh habitat.

Light-Footed Clapper Rail - low saltmarsh dominated by cordgrass is the light-footed clapper rail's preferred habitat. They also sometimes nest in pickleweed in mid and high saltmarsh. Clapper rails forage for aquatic invertebrates such as crabs and snails (Zeiner et al. 1990). They also occasionally eat small fishes. Clapper rails forage amongst the cordgrass in the low saltmarsh and also at the interface between low saltmarsh and intertidal mudflat. They use the mid saltmarsh and high saltmarsh as refuge from the rising water during high tides.

Table 2.7-6
Upper Bay Saltmarsh: Low Marsh Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence	Resident/Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base	Environmental Tolerance	Importance[5]	Guild Indicator
Insects	--	Limiting	Patchy Distribution	Residents	Forage Base		Extreme	--	No
Dabbling Ducks	Northern Pintail (See Table 2.7-5)		U-C	Winter Migrant	Loaf	--	Low-Moderate	--	Yes[6]
Large Wetland Waders	Great Egret (See Table 2.7-5.)				Forage Loaf	Sm. Rodents.	Moderate	--	Yes[6]
Shorebirds	See Table 2.7-5.		U-C	Fall to Spring Migrants	Loaf	--	Moderate	--	Yes
Marshbirds	Clapper Rail	Not Limiting	C	Resident	Forage Loaf Nest	Decapods, Molluscs Insects.	Sensitive	Federal Listing	Yes
Passerines	Belding's Savannah Sparrow	Not Limiting	A	Resident	Forage Loaf	Insects	Sensitive	State Listing	Yes

Notes: (1) A = Abundant; C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

Development of HQI for Light-footed Clapper Rail at Upper Newport Bay

Light-footed clapper rails do not use the marine open water habitat. Therefore, marine open water was assigned a utilization factor of 0 for clapper rails. Clapper rails do not nest in intertidal mudflats, but they forage along the interface between intertidal mudflat and low saltmarsh. Because this interface represents about 10 percent of the intertidal mudflat habitat, intertidal mudflat was assigned a utilization factor of 0 for clapper rails. The clapper rail's primary habitat is the low saltmarsh which was assigned a utilization factor of 0.5. Clapper rails also frequently nest in the pickleweed of the mid saltmarsh and use this habitat as a refuge when low saltmarsh is flooded. Because low saltmarsh is important for all life functions of clapper rails but is less preferred than low saltmarsh, it was assigned a utilization factor of 0.3. High saltmarsh is also used as a refuge for clapper rails during very high tides and some nesting occurs there. High saltmarsh was assigned a utilization factor of 0.2 for clapper rails.

Although the height and density of cordgrass may be important in defining habitat quality for light-footed clapper rails in low saltmarsh, this variable cannot be predicted by the model for project alternatives. The other important variable to clapper rails is the intensity of human disturbance. Human disturbance by land is not related to sedimentation and, thus, is not included in the modified HEP model. Human disturbance by land is addressed in Section 5.0, Habitat Evaluation Procedures Analysis of Habitat Restoration Alternatives. Reducing human disturbance to sensitive habitat is addressed as a separate restoration measure.

For Low Saltmarsh for light-footed clapper rail,

HU = 0.5_{seg1}(acres LSM in segment 1)+0.5_{seg2}(acres LSM in segment 2)+0.5_{seg3}(acres of LSM in segment 3)

For Mid Saltmarsh for light-footed clapper rail,

HQI = 0.3

and

HU = 0.3 (acres MSM in segment 1)+0.3 (acres MSM in segment 2)+0.3 (acres of MSM in segment 3)

For High Saltmarsh for light-footed clapper rail,

HU = 0.2 (acres HSM in segment 1)+0.2 (acres HSM in segment 2)+0.2 (acres of HSM in segment 3)

2.7.11 <u>Mid Marsh: Belding's Savannah Sparrow</u>

The Belding's savannah sparrow is the species most characteristic of mid saltmarsh (Table 2.7-7). This state-listed endangered species breeds primarily in pickleweed. This subspecies of savannah sparrow nests in pickleweed, uses pickleweed twigs as nesting material, eats the tips of pickleweed branches, and sings from atop the plants (Gallagher 1997). It also forages on insects and other invertebrates. Upper Newport Bay is one of the most highly productive marshes for Belding's savannah sparrow. Because it is so highly dependent on pickleweed habitat, Belding's savannah sparrow was selected as the indicator species for mid saltmarsh. Belding's savannah sparrows also nest and forage in low saltmarsh and forage on intertidal mudflat.

Development of HQI for Belding's Savannah Sparrow in Upper Newport Bay

Belding's savannah sparrow does not use marine open water and the utilization factor for savannah sparrow for this habitat would, thus, be 0. Savannah sparrows use intertidal mudflat for foraging but not for nesting and they can only use intertidal mudflats when the mudflats are completely exposed.

Table 2.7-7
Upper Bay Saltmarsh: Mid Marsh Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence[1]	Resident/ Migrant (Non) Native	Use2 F N/B L/P/R	Forage Base[4]	Environmental Tolerance	Importance[5]	Guild Indicator
Insects	--	Limiting	Patchy Distribution	Residents	Forage Base	--	Extreme	--	No
Large Wetland Waders	Great Egret (See Table 2.7-5).				Forage Loaf	Sm. Rodents.	Moderate	--	Yes[6]
Marshbirds	Clapper Rail (See Table 2.7-6).				Forage Loaf	--	Sensitive	Federal Listing	Yes
Passerines	Belding's Savannah Sparrow (See Table 2.7-6).				Forage Loaf/Nest	Insects	Sensitive	State Listing	Yes
Reptiles	Snakes, Lizards	Limiting	U-C	Residents	Forage	Vegetation, Insects	Moderate	--	No
Mammals	Rabbits, Squirrel, Sm. Rodents	Not Limiting	C	Roamers	Forage	Vegetation, Insects	Extreme	--	No
Domestics	Dogs/Cats	Not Limiting	C	Roamers	Forage	All Above	Extreme	Nuisance	No

Notes: (1) C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

Table 2.7-8
Upper Bay Saltmarsh: High Marsh Associated Guilds

ASSOCIATED GUILDS	Representative Species	Data Avail. Critical Gaps	Occurrence[1]	Resident/ Migrant (Non) Native	Use[2] F N/B L/P/R	Forage Base[4]	Environmental Tolerance	Importance[5]	Guild Indicator
Insects	--	Limiting	Patchy Distribution	Residents	Forage Base	--	Extreme	--	No
Large Wetland Waders	Great Egret (See Table 2.7-5).				Forage Loaf	Sm. Rodents	Moderate	--	Yes[6]
Shorebirds	Avocets/Stilts	Not Limiting	C	Residents	Nest Loaf	--	Sensitive	--	Yes[6]
Marshbirds	Clapper Rail (See Table 2.7-6).				Forage Loaf	--	Sensitive	Federal Listing	Yes
Passerines	Belding's Savannah Sparrow	Not Limiting	A	Resident	Forage Loaf	Insects	Sensitive	State Listing	Yes
Mammals	Rabbits, Squirrels, Sm. Rodents	Not Limiting	C	Migrant	Forage	Vegetation, Nuts, Insects	Extreme	--	No
Domestics	Dogs/Cats	Not Limiting	C-A	Non-Native	Forage	All	Extreme	--	No

Notes (1) A = Abundant; C = Common; U = Uncommon; I = Incidental. (2) Use: F = Forage; N = Nesting; B = Breeding; L = Loafing; P = Preening; R = Roosting. (3) Primary Foraging in Ocean. Secondary/Incidental Foraging in Bay. (4) Forage Base Source: Dailey, Reish & Anderson, 1993. (5) Importance: Federal/State listed species; Commercial and/or Recreational significance. (6) U.S. Fish and Wildlife Service Model Available.

Although mudflats are used by Belding's savannah sparrows, they are used much less than marsh habitats. Therefore, because sparrows forage but do not nest on mudflats and because they can only use mudflats when they are exposed by low tide, intertidal mudflats were given a utilization factor of 0 for Belding's savannah sparrow. Belding's savannah sparrows do nest in low saltmarsh but this habitat is less preferred than the pickleweed-dominated mid and high saltmarsh habitats. Therefore, low saltmarsh was assigned a utilization factor of 0.2 for Belding's savannah sparrow. Mid saltmarsh and high saltmarsh are both dominated by pickleweed. Mid saltmarsh has the densest and most vigorous pickleweed and was assigned a utilization factor of 0.5 for savannah sparrows. High saltmarsh also supports pickleweed, but because the Belding's savannah sparrows' preferred plant is less dense in high saltmarsh, high saltmarsh was assigned a utilization factor of 0.3.

Habitat quality for Belding's savannah sparrow is related to the vigor of the pickleweed. Density and height of pickleweed cannot be reasonably predicted for project alternatives. Therefore, for the purpose of this analysis, HQI for Belding's savannah sparrow was considered to be equal to the utilization factor.

For Low Saltmarsh for Belding's savannah sparrow,

HU = 0.2 (acres LSM in segment 1)+0.2 (acres LSM in segment 2)+0.2 (acres of LSM in segment 3)

For Mid Saltmarsh for Belding's savannah sparrow,

HU = 0.5 (acres MSM in segment 1)+ 0.5 (acres MSM in segment 2)+0.5 (acres of MSM in segment 3)

Similarly, for High Saltmarsh for Belding's savannah sparrow,

HU = 0.3 (acres HSM in segment 1)+0.3 (acres HSM in segment 2)+0.3 (acres of HSM in segment 3)

SUMMARY

Table 2.7-9 presents the recommended indicator species/guild by community.

Table 2.7-9
Upper Bay Environment and Associated Indicator Guilds and Species

ENVIRONMENT	OPEN WATER		MUDFLATS	SALTMARSH		
SUB COMMUNITY	Benthic Zone	Pelagic Zone	Intertidal	Low Marsh Species	Mid Marsh Species	High Marsh Species
UPPER BAY GUILD STRUCTURE & INDICATOR SPECIES	Demersal Fish CA Halibut	Pelagic Fish Deepbody Anchovy				
	Seabird: Deep Water Diver Western Grebe					
	Diving Duck Lesser Scaup					
		Seabird: Shallow Water Diver CA Least Tern				
		Dabbling Duck: Northern Pintail				
			Large Wetland Wader: Great Egret			
			Shorebird: Wintering and Avocets/Stilts			
			Marshbird: Light-Footed Clapper Rail Passerine: Belding's Savannah Sparrow			

2.8 CALCULATION OF TOTAL HABITAT UNITS

The total HU for each habitat are calculated by summing the total HU for each of the indicator species that use the habitat and standardizing by dividing the total HU by the number of indicator species selected to represent the habitat.

SECTION 3.0 - HABITAT EVALUATION MODEL OUTPUTS FOR THE FUTURE 50-YEAR WITHOUT PROJECT

3.1 INTRODUCTION

This section describes the results of the modified HEP analysis for the future 20-year and 50-year conditions in Upper Newport Bay if no action is taken in the future to remove sediment from the Bay. The changes in acres of each habitat were based on the RMA (1998) sediment transport/hydrodynamic models. This section describes the results of the modified-HEP analysis developed as described in Section 2.0. The changes in Habitat Quality Indices (HQIs) for the indicator species are calculated. The future HQIs for each indicator species are multiplied by the number of acres of each habitat to predict gains and loses of Habitat Units (HU) from the Year 0 condition. Year 0 is the condition of the Upper Bay at completion of the Unit III dredging project.

3.2 CHANGES IN INPUT VARIABLES, HABITAT QUALITY INDICES, AND HABITAT UNITS

Table 3.2-1 shows the predicted values of the model input variables and the calculated HQIs for each of the indicator species in each habitat in Segment I, the Unit I/III basin above the salt dike, for Year 0, Year 20, and Year 50.

In Segment 1 in Year 0, following the Unit III dredging project, FWI (freshwater influence) as predicted by the salinity model will be 0.8. The salinity model (Corps 1998) shows that salinity drops slightly on the outgoing tide and then recovers when the tide changes but that the oscillations are small. By Year 50, according to the salinity model, salinity will drop about 10 parts per thousand on the outgoing tide and then recover on the incoming tide. Therefore FWI was given a score of 0.4 for the 50-year no-project condition in Segment 1. Salinity was not modeled for the 20 year without project but was assumed to be in between the Year 0 and Year 20 for a FWI score of 0.6.

Water depth anchovy (WDA) decreases in the 20-year and 50-year without project condition because water depth gets progressively shallower. WDG, water depth grebe, does not change with future no project conditions, because western grebes can use water between 1 foot (0.3 m) and 33 feet (10 m) deep. HDW, human disturbance by water, does not change with future no project conditions in Segment 1 because boaters rarely go above the salt dike. WDS, water depth scaup, in the marine open water habitat increases with increased sedimentation under the future no-action scenarios because the percentage of marine open water between -3 feet (-1 m) and -10 feet (-3 m) MSL increases with increased sedimentation. However, under Year 0 and future conditions, almost all the intertidal mudflat habitat will be too shallow for lesser scaup. Therefore, WDS for intertidal mudflat is 0 for Years 0, 20, and 50. Northern pintails prefer shallow water. Therefore, WDP, water depth pintail, increases with the increasing sedimentation under the no-project future conditions.

Based upon these changes in input variables, which define habitat quality for the indicator species, HQI for halibut decreases under the future no-project conditions because of the increased FWI and poorer overall water quality. HQI also decreases for deepbody anchovy because of the increased freshwater influence and the shallower water depths. HQI for western grebes does not change because they can use a wide range of water depths, and disturbance by boaters is negligible in Segment 1. HQI for lesser scaup increases in the future in Segment 1 because the percentage of marine open water within their preferred depth increases even though their prey base would be reduced by the increased freshwater influence. The increased freshwater influence does decrease HQI in intertidal mudflats for lesser scaup because WDS in intertidal mudflat does not change. HQI for the California least tern is predicted to decrease under the future no-project condition, because the increased freshwater influence is predicted to lead to a reduction in the prey base of forage fish in Segment 1. HQI for northern pintail increases under the future no-project in Segment 1 because of the increased shallow water depths. HQI for great egrets, avocets, clapper rails, and Belding's savannah sparrow do not change under the future no-project condition because habitat quality for these species is not expected to be affected significantly by sedimentation.

HQI is based on the utilization of each habitat by these indicator species. Finally, HQI for shorebirds decreases under the future no-project conditions because the increased freshwater influence is expected to reduce the diversity of their prey base.

Table 3.2-2 shows the change in HU predicted by the modified HEP model in Segment 1. The loss of acres of marine open water habitat coupled with a decrease in HQI for most of the indicator species results in a significant decrease in HU for marine open water indicator species. HU for intertidal mudflat increases for indicator species in Year 20 because of the large increase in acres of intertidal mudflat. However, intertidal mudflat HU decreases in Year 50 as increased sedimentation in Segment 1 converts intertidal mudflat to low and mid saltmarsh. Similarly, HU for low and mid saltmarsh species changes little between Year 0 and Year 20 but increases in Year 50 with the increased acres of saltmarsh habitat.

Table 3.2-3 shows the input variables and HQI for Segment 2, between the dike and Middle Island. The salinity model predicts that the low flow salinity conditions will change from a condition of small tidal changes in salinity (FWI = 0.8) in Year 0 to a condition of tidal oscillations in salinity of between 5 and 10 ppt (FWI = 0.6) in Year 50. Between Year 0 and Year 20, open water habitat in Segment 2 changes from a basin to a channel. The channel configuration remains in Year 50. Therefore, FWI is predicted to be similar for Year 20 and Year 50. WDA, water depth anchovy, stays the same in Year 20. However, by Year 50 sedimentation is shoaling the channel and WDA decreases. As was true in Segment 1, WDG does not change under future conditions. HDW decreases in Segment 2 under the future no-project conditions, because the loss of the shallow basins to sedimentation means that most of the marine open water habitat will be in the main channel where boaters will disturb waterfowl. WDS and WDP initially decrease in Year 20 with the loss of the shallow basin, but increase in Year 50 as the main channel becomes shallower.

HQI for California halibut and deepbody anchovy in Segment 2 is expected to decrease under the future no-project condition because of the increased freshwater influence. For western grebes, HQI for marine open water in Segment 2 decreases under the future no-project condition because of the increased disturbance by boaters. HQI for intertidal mudflat habitat for western grebe is not predicted to change. HQI for marine open water for lesser scaup in Segment 2 is predicted to decrease in Year 20 because of the loss of the shallow basin, increased freshwater influence, and the increased disturbance by boaters. The shoaling of the channel by Year 50 will increase the amount of marine open water habitat at the lesser scaup's preferred depth and HQI will increase for lesser scaup between Year 20 and Year 50. HQI for the least tern in Segment 2 will decrease under the future no-project conditions because the increased freshwater influence is expected to reduce the prey base of forage fish. HQI for the northern pintail does not change. HQIs for great egret, avocet, clapper rail, and Belding's Savannah sparrow will not change. HQI for shorebirds will decrease under the future no-project condition because increased FWI will reduce the diversity of their prey base.

Table 3.2-4 shows the changes in HU in Segment 2 predicted under the future no-project condition by the modified HEP model. All the marine open water indicator species suffer a significant loss of HU in Segment 2. Intertidal mudflat indicator species gain HU between Year 0 and Year 20 as marine open water is converted to saltmarsh. However, between Year 20 and Year 50 intertidal mudflat indicator species lose HU as mudflat is converted to marsh. As was true in Segment 1, saltmarsh indicator species show little change in HU between Year 0 and Year 20 but gain by Year 50 as intertidal mudflat is lost to marsh.

Table 3.2-5 shows the input variables and HQIs for Segment 3, below Middle Island. The salinity model shows only a small change in FWI for this segment. Salinity under low flow conditions is expected to remain stable in Year 0 and Year 20 and undergo small tidal oscillations by Year 50. WDA will decrease slightly by Year 20. WDG will not change under future no-project conditions. HDW will decrease as marine open water areas outside the boating channel are converted to intertidal mudflat. WDS for marine open water will increase in Year 50 as deeper areas shoal. WDS for intertidal mudflat will increase with the shoaling of the intertidal areas in Year 20, but will decrease by Year 50 as higher intertidal is converted to saltmarsh. WDP will increase with increased shoaling of marine open water and intertidal mudflat habitat in Year 20, but will decrease for marine open water by Year 50 as the shallowest open water becomes mudflat.

HQI for California halibut and deepbody anchovy will change little in Segment 3 under the future no-project condition. The slight increase in freshwater influence in Year 50 will result in a slight decrease (1.0 to 0.9) in HQI for halibut. HQI for western grebe decreases in Year 50 because of the large decrease in HDW as undisturbed marine open water habitat is converted to mudflat. HQI for western grebe in Segment 3 will not change for intertidal mudflat under the future no-project condition. HQI will decrease for lesser scaup in Year 50 with increased freshwater influence and boating disturbance. HQI for least tern in Segment 3 is not expected to change between Year 0 and Year 20 but will decrease slightly with the increased freshwater influence in Year 50. HQI for northern pintail will increase with the increased shoaling under the future no-project condition. HQI for great egret, avocet, clapper rail, and Belding's savannah sparrow is not expected to change under the future no-project condition. HQI for shorebirds will decrease slightly by Year 50 because of the slightly increased freshwater influence.

Table 3.2-6 shows the changes in HU predicted in Segment 3 for the future no-project condition. By Year 50, all of the marine open water indicator species will have a significant loss of HU primarily because of the large conversion of marine open water habitat to intertidal mudflat. Changes in HQI for these indicator species were relatively small in Segment 3. Intertidal mudflat indicator species will show a correspondingly large gain in HU because of the substantial gain in acres of intertidal mudflat habitat. No change is predicted in the acres of saltmarsh habitat in Segment 3, and, therefore, little change would be expected in the HU for saltmarsh indicator species.

3.3 CHANGES IN TOTAL HU BY HABITAT

Table 3.3-1 show the changes in total HU by habitat for the future no-project condition. When the total HU for each habitat are adjusted by dividing the total HU for each habitat by the number of indicator species for that habitat, marine open water shows a loss in 50 years of 92 HU, intertidal mudflat gains 35 HU, low saltmarsh gains 7 HU, mid saltmarsh gains 13 HU and high saltmarsh gains 7 HU. The total change in HU for the system is a loss of 40.

Table 3.3-2 and Figure 3.3-1 summarizes the total changes in HU for the indicator species. All of the species dependent on marine open water habitat show a substantial loss in HU for the no-project condition. Indicator species dependent on intertidal mudflat or saltmarsh habitat on the other turn gain HU because of the gain in acres of these habitats.

3.4 CONCLUSIONS

The modified HEP analysis demonstrated that under the future no-project conditions, there would be a net loss in Habitat Units for the Upper Newport Bay ecosystem. The net loss in HU is primarily the result in a loss both in acres and in quality of marine open water habitat. The loss in volume of open water and increased freshwater influence and degradation of water quality will decrease the benthic and water column fish populations that the Upper Bay will support. The increased freshwater influence is also predicted to lower the diversity of the benthic invertebrate community. The reduced invertebrate and forage fish populations will reduce the food base for waterfowl and diving birds. In the lower segments of the Bay, conversion of shallow marine open water habitat outside the main channel to intertidal mudflat will increase the disturbance of boaters to waterfowl. Overall if no action is taken, the diversity of the habitat mix in the Upper Bay will be reduced and there will be a corresponding loss in species richness.

Table 3.2-1
Input Variables and HQI for Segment 1

Year 0							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	47.9	0.8	0.9	1.0	1.0	0.3	0.1
IMF	51.9	0.8	na	0.5	na	0.1	0.8
LSM	32.2	0.8	na	na	na	na	na
MSM	99.2	na	na	na	na	na	na
HSM	0.0	na	na	na	na	na	na
Year 20							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	14.6	0.6	0.6	1.0	1.0	0.8	0.3
IMF	81.3	0.6	na	0.5	na	0.0	0.9
LSM	35.6	0.6	na	na	na	na	na
MSM	99.8	na	na	na	na	na	na
HSM	0.0	na	na	na	na	na	na
Year 50							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	0.7	0.4	0.4	1.0	1.0	1.0	1.0
IMF	55.5	0.4	na	0.5	na	0.0	0.9
LSM	48.5	0.4	na	na	na	na	na
MSM	102.8	na	na	na	na	na	na
HSM	23.2	na	na	na	na	na	na

HQI Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.2	0.0	0.0	0.0
anchovy	0.6	0.2	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.1	0.0	0.0	0.0
least tern	0.6	0.2	0.0	0.0	0.0
pintail	0.0	0.7	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.6	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	0.4	0.2	0.0	0.0	0.0
anchovy	0.4	0.2	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.4	0.2	0.0	0.0	0.0
pintail	0.1	0.8	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.5	0.1	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 3.2-1 (Continued)
Input Variables and HQI for Segment 1

HQI Year 50					
	MOW	IMF	LSM	MSM	HSM
halibut	0.3	0.1	0.0	0.0	0.0
anchovy	0.3	0.1	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.4	0.2	0.0	0.0	0.0
pintail	0.1	0.8	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.3	0.1	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 3.2-2
Total HU by Indicator Species for Segment 1

HU Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	27	12	0	0	0
anchovy	29	12	0	0	0
western grebe	34	16	0	0	0
lesser scaup	21	7	0	0	0
least tern	27	12	0	0	0
pintail	2	37	0	0	0
great egret	0	21	13	10	0
avocet	0	26	0	0	0
clapper rail	0	0	16	30	0
shorebirds	0	33	5	0	0
Belding's savannah sparrow	0	0	6	50	0
Total	**139**	**177**	**41**	**89**	**0**
HU Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	6	15	0	0	0
anchovy	6	15	0	0	0
western grebe	10	24	0	0	0
lesser scaup	8	8	0	0	0
least tern	6	15	0	0	0
pintail	1	66	0	0	0
great egret	0	33	14	10	0
avocet	0	41	0	0	0
clapper rail	0	0	18	30	0
shorebirds	0	39	2	0	0
Belding's savannah sparrow	0	0	7	50	0
Total	**37**	**254**	**41**	**90**	**0**
HU Year 50					
	MOW	IMF	LSM	MSM	HSM
halibut	0	7	0	0	0
anchovy	0	7	0	0	0
western grebe	0	17	0	0	0
lesser scaup	0	3	0	0	0
least tern	0	11	0	0	0
pintail	0	45	0	0	0
great egret	0	22	19	10	2
avocet	0	28	0	0	12
clapper rail	0	0	24	31	5
shorebirds	0	18	4	0	0
Belding's savannah sparrow	0	0	10	51	7
Total	**2**	**157**	**57**	**93**	**26**

Table 3.2-3
Input Variables and HQI for Segment 2

Year 0							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	45.5	0.8	0.8	1.0	0.7	0.6	0.2
IMF	89.0	0.8	na	0.5	na	0.1	0.9
LSM	83.6	0.8	na	na	na	na	na
MSM	30.1	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na
Year 20							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	22.1	0.6	0.8	1.0	0.4	0.6	0.1
IMF	112.3	0.6	na	0.5	na	0.0	0.9
LSM	83.1	0.6	na	na	na	na	na
MSM	31.0	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na
Year 50							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	7.2	0.6	0.6	1.0	0.1	1.0	0.6
IMF	101.4	0.6	na	0.5	na	0.0	0.9
LSM	96.3	0.6	na	na	na	na	na
MSM	37.8	na	na	na	na	na	na
HSM	10.3	na	na	na	na	na	na

HQI Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.2	0.0	0.0	0.0
anchovy	0.6	0.2	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.6	0.2	0.0	0.0	0.0
pintail	0.0	0.8	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.6	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	0.4	0.2	0.0	0.0	0.0
anchovy	0.5	0.2	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.1	0.0	0.0	0.0
least tern	0.4	0.2	0.0	0.0	0.0
pintail	0.0	0.8	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5

Table 3.2-3 (Continued)
Input Variables and HQI for Segment 2

HQI Year 20					
	MOW	IMF	LSM	MSM	HSM
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.5	0.1	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Year 50					
	MOW	IMF	LSM	MSM	HSM
halibut	0.4	0.2	0.0	0.0	0.0
anchovy	0.4	0.2	0.0	0.0	0.0
western grebe	0.5	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.4	0.2	0.0	0.0	0.0
pintail	0.0	0.8	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.5	0.1	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 3.2-4
Total HU by Indicator Species for Segment 2

HU Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	25	21	0	0	0
anchovy	25	21	0	0	0
western grebe	29	27	0	0	0
lesser scaup	23	12	0	0	0
least tern	25	21	0	0	0
pintail	2	72	0	0	0
great egret	0	36	33	3	0
avocet	0	45	0	0	2
clapper rail	0	0	42	9	1
shorebirds	0	57	13	0	0
Belding's savannah sparrow	0	0	17	15	1
Total	**130**	**312**	**105**	**27**	**5**
HU Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	9	20	0	0	0
anchovy	11	20	0	0	0
western grebe	12	34	0	0	0
lesser scaup	9	11	0	0	0
least tern	9	20	0	0	0
pintail	0	91	0	0	0
great egret	0	45	33	3	0
avocet	0	56	0	0	2
clapper rail	0	0	42	9	1
shorebirds	0	54	10	0	0
Belding's savannah sparrow	0	0	17	16	1
Total	**51**	**351**	**101**	**28**	**5**
HU					
	MOW	IMF	LSM	MSM	HSM
halibut	3	18	0	0	0
anchovy	3	18	0	0	0
western grebe	4	30	0	0	0
lesser scaup	3	9	0	0	0
least tern	3	18	0	0	0
pintail	0	78	0	0	0
great egret	0	41	39	4	1
avocet	0	51	0	0	5
clapper rail	0	0	48	11	2
shorebirds	0	49	12	0	0
Belding's savannah sparrow	0	0	19	19	3
Total	**16**	**313**	**117**	**34**	**11**

Table 3.2-5
Input Variables and HQI for Segment 3

Year 0							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	123.0	1.0	0.8	1.0	0.7	0.7	0.2
IMF	76.3	1.0	na	0.5	na	0.1	0.4
LSM	25.9	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na
Year 20							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	98.5	1.0	0.7	1.0	0.6	0.7	0.4
IMF	101.1	1.0	na	0.5	na	0.2	0.7
LSM	25.7	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na
Year 50							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	34.6	0.9	0.7	1.0	0.3	0.8	0.3
IMF	164.1	0.9	na	0.5	na	0.0	0.8
LSM	26.5	0.9	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na

HQI Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.6	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5

Table 3.2-5 (Continued)
Input Variables and HQI for Segment 3

HQI Year 20					
	MOW	IMF	LSM	MSM	HSM
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Year 50					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.5	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.6	0.3	0.0	0.0	0.0
pintail	0.0	0.7	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.7	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 3.2-6
Total HU by Indicator Species for Segment 3

HU Year 0					
	MOW	IMF	LSM	MSM	HSM
halibut	86	23	0	0	0
anchovy	77	23	0	0	0
western grebe	78	23	0	0	0
lesser scaup	71	13	0	0	0
least tern	86	23	0	0	0
pintail	5	27	0	0	0
great egret	0	31	10	5	0
avocet	0	38	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	61	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**403**	**261**	**34**	**48**	**5**
HU Year 20					
	MOW	IMF	LSM	MSM	HSM
halibut	69	30	0	0	0
anchovy	59	30	0	0	0
western grebe	60	30	0	0	0
lesser scaup	55	18	0	0	0
least tern	69	30	0	0	0
pintail	5	64	0	0	0
great egret	0	40	10	5	0
avocet	0	51	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	81	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**316**	**375**	**33**	**48**	**5**
HU Year 50					
	MOW	IMF	LSM	MSM	HSM
halibut	22	44	0	0	0
anchovy	19	44	0	0	0
western grebe	19	49	0	0	0
lesser scaup	18	22	0	0	0
least tern	22	44	0	0	0
pintail	1	118	0	0	0
great egret	0	66	11	5	0
avocet	0	82	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	118	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**101**	**588**	**34**	**48**	**5**

Table 3.3-1
Total HU by Habitat

Habitat	Segment 1	Segment 2	Segment 3	Total HU	# Species	Adjusted HU for # Species
Year 0						
MOW	139	130	403	**672**	6	112
IMF	177	312	261	**751**	9	83
LSM	41	105	34	**180**	4	45
MSM	89	27	48	**164**	3	55
HSM	0	5	5	**10**	4	3
Total	**446**	**579**	**751**	**1,776**		**298**
Year 20						
Habitat	**Segment 1**	**Segment 2**	**Segment 3**	**Total HU**	**# Species**	**Adjusted HU for # Species**
MOW	37	51	316	**404**	6	67
IMF	254	351	375	**980**	9	109
LSM	41	101	33	**176**	4	44
MSM	90	28	48	**166**	3	55
HSM	0	5	5	**10**	4	3
Total	**422**	**536**	**778**	**1,736**		**278**
Year 50						
Habitat	**Segment 1**	**Segment 2**	**Segment 3**	**Total HU**	**# Species**	**Adjusted HU for # Species**
MOW	2	16	101	**118**	6	20
IMF	157	313	588	**1,058**	9	118
LSM	57	117	34	**209**	4	52
MSM	93	34	48	**175**	3	58
HSM	26	11	5	**42**	4	10
Total	**334**	**492**	**776**	**1,602**		**258**

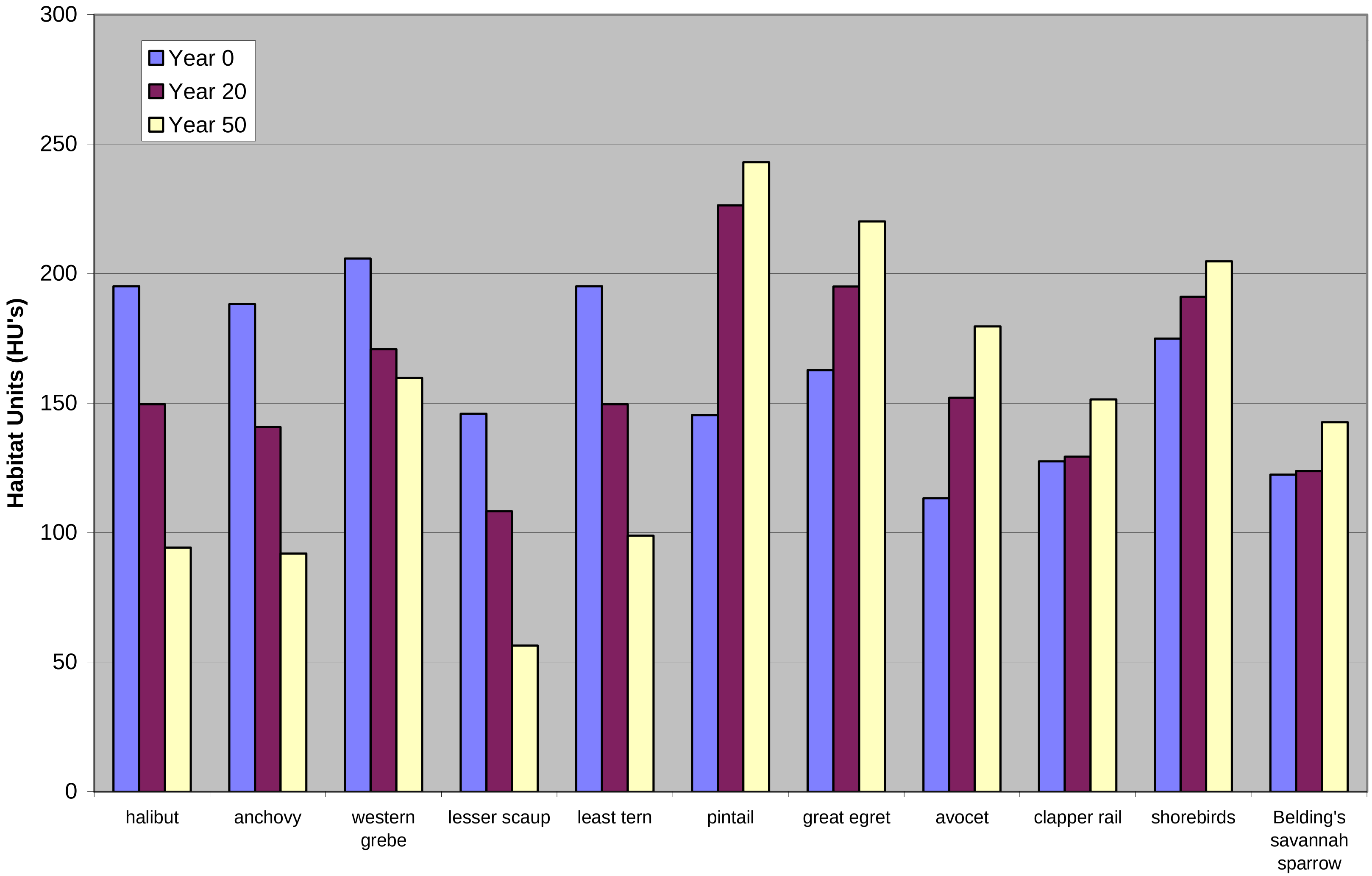
Table 3.3-2
Total HU by Indicator Species for Entire Bay

Year 0							
	MOW	IMF	LSM	MSM	HSM	Total	
halibut	138	57	0	0	0	**195**	
anchovy	131	57	0	0	0	**188**	
western grebe	141	65	0	0	0	**206**	
lesser scaup	114	32	0	0	0	**146**	
least tern	138	57	0	0	0	**195**	
pintail	8	137	0	0	0	**145**	
great egret	0	87	57	18	1	**163**	
avocet	0	109	0	0	5	**113**	
clapper rail	0	0	71	55	2	**127**	
shorebirds	0	151	24	0	0	**175**	
Belding's savannah sparrow	0	0	28	91	3	**122**	
	672	751	180	164	10	**1,776**	
Year 20							
	MOW	IMF	LSM	MSM	HSM	Total	HU Change
halibut	84	65	0	0	0	**150**	-45
anchovy	76	65	0	0	0	**141**	-47
western grebe	82	88	0	0	0	**171**	-35
lesser scaup	72	37	0	0	0	**108**	-38
least tern	84	65	0	0	0	**150**	-46
pintail	6	221	0	0	0	**226**	81
great egret	0	118	58	18	1	**195**	32
avocet	0	147	0	0	5	**152**	39
clapper rail	0	0	72	55	2	**129**	2
shorebirds	0	174	17	0	0	**191**	16
Belding's savannah sparrow	0	0	29	92	3	**124**	1
	404	980	176	166	10	**1,736**	
Year 50							
	MOW	IMF	LSM	MSM	HSM	Total	HU Change
halibut	25	69	0	0	0	**94**	-101
anchovy	23	69	0	0	0	**92**	-96
western grebe	23	96	0	0	0	**119**	-87
lesser scaup	22	35	0	0	0	**56**	-90
least tern	25	74	0	0	0	**99**	-96
pintail	1	242	0	0	0	**243**	98
great egret	0	128	69	19	4	**220**	57
avocet	0	161	0	0	19	**180**	67
clapper rail	0	0	86	58	8	**151**	24
shorebirds	0	185	20	0	0	**205**	30
Belding's savannah sparrow	0	0	34	97	11	**143**	20
	118	1,058	209	175	42	**1,602**	

Total Habitat Units for Indicator Species

0, 20, & 50 Year "No Project" Conditions

(no adjustments)



SECTION 4.0 - HABITAT EVALUATION MODEL OUTPUTS FOR THE PROJECT ALTERNATIVES

4.1 INTRODUCTION

Section 3.0 of this appendix presented the results of the modified HEP model for the without-project condition. The model predicted that within 50 years the Upper Newport Bay ecosystem would lose 40 HU because sediment would shoal marine open water habitat and degrade the quality of the Bay. Species, such as halibut, anchovy and western grebe, dependent on open water would suffer a severe loss of HU.

To address the loss of habitat values in Upper Newport Bay from sedimentation, alternative sediment control plans for the maintenance of basins in the Upper Bay were developed. Four of those alternative sediment management plans were carried forward for detailed analysis in the EIS/EIR. Each of those four alternatives was analyzed using the modified-HEP model to compare the habitat benefits of the plans. This section describes the results of the HEP analysis of sediment control alternatives.

Alternative 1 (Figure 2.3-2 in the main EIS/EIR) would maintain the Unit III basin at its current depth and configuration and would restore the Unit II basin to its original configuration. Alternative 4 (Figure 2.3-3 in the main EIS/EIR) would deepen the Unit III basin to -20 feet (-6 m) and would expand its footprint. The Unit II basin footprint would be deepened to -20 feet (-6m) and expanded to the west and south. The northerly ("kidney shaped") tern island would be relocated from the Unit III basin to the Unit II basin near the Main Dike. Alternative 5 (Figure 2.3-4 in the main EIS/EIR) would maintain the Unit III basin at its current -14 feet (-4.2 m) depth but would expand its footprint. The only dredging in the Unit II basin would be the maintenance of the main channel through the basin. The northerly least tern island would be relocated from the Unit III basin to the Unit II basin near the Main Dike. Finally, Alternative 6 (Figure 2.3-5 in the main EIS/EIR) would deepen the Unit III basin to -20 feet (-6 m) and would expand its footprint. However, the mudflats in the northeast corner would be maintained. The Unit II basin would be deepened to -20 feet (-6 m) and expanded to the west. The northerly tern island would be relocated to the Unit II basin near the Main Dike.

4.2 COMPARISON OF INPUT VARIABLES, HABITAT QUALITY INDICES AND HABITAT UNITS FOR PROJECT ALTERNATIVES

Table 4.2-1 compares the Segment 1 input variables for the four project alternatives. Salinity was modeled for Year 0, the condition following the dredging of the Unit III basin. With the Unit III basin at a depth of -14 feet (-4.2 m), the model showed that there were small daily fluctuations in salinity with decreases of about 3 ppt on an ebbing tide. This condition was estimated to be a 0.8 on the FWI scale (see Table 2.7-1). Alternative 1 restores the initial condition in the Unit III basin and thus would be the same as the model Year 0. The other alternatives feature an expanded Unit III basin. Because of the fact that San Diego Creek discharges into the Unit III basin, it is predicted that there would be a slight freshwater influence during low tides even with an expanded basin but that it would be somewhat less than for the smaller basin in Alternative 1. Therefore, FWI was estimated to be 0.9 for Alternatives 4, 5, and 6. WDA, water depth anchovy, was 0.9 for Alternatives 1 and 6 and 1.0 for Alternatives 4 and 5. The larger basin footprint of Alternatives 4 and 5 provided a greater percentage of open water habitat at greater depths. HDG, water depth grebe was 1.0 for all alternatives. HDW was also 1.0 because little boating disturbance occurs in Segment 1. WDS, water depth scaup, was greatest for Alternative 1 because the smaller Unit III basin footprint provided more open water habitat at the relatively shallow depth preferred by scaups. Alternative 1 intertidal mudflat had a higher percentage of mudflat at the scaup's preferred water depth of -3 feet (-0.9 m) than the other three alternatives. Thus, WDS for Alternative 1 was higher than Alternatives 4, 5, and 6 for both marine open water (0.5 compared to 0.1) and intertidal mudflat (0.4 compared to 0.1). WDP, water depth pintail, was highest for Alternative 1 (0.2 compared to 0.1 for Alternatives 4, 5, and 6) because the smaller basin footprint provided more areas of the pintails preferred shallow water. The shallower basin configuration in Alternatives 1 and 5 provided more preferred shallow intertidal for pintails and these alternatives were rated 0.4 for WDS for intertidal mudflat compared to 0.3 for the deeper basin alternatives, Alternatives 4 and 6.

Table 4.2-2 shows HQI for indicator species for each alternative for Segment 1. HQI for California halibut and California least tern is predicted to be slightly lower for Alternative 1 compared to Alternatives 4, 5, and 6 because habitat quality for these species is related to freshwater influence and FWI was predicted to be lower for Alternative 1. Because all HQI values were rounded to the nearest 0.1, the lower value of HQI for Alternative 1 is not apparent for marine open water. HQI for anchovies for marine open water was slightly higher for Alternatives 4 and 5 (0.7) than Alternatives 1 and 6 (0.6) because the greater basin footprint of Alternatives 4 and 5 provided a higher percentage of marine open water habitat at deeper depths than Alternatives 1 and 6. HQI for western grebe was the same for all alternatives because the variables, WDG and HDW, that determine habitat quality for grebes were the same for all alternatives. HQI for lesser scaup for marine open water was slightly higher for Alternative 1 (0.5 compared to 0.4 for Alternatives 4, 5, and 6) because of the higher WDS for Alternative 1. HQI for lesser scaup for intertidal mudflat was the same for all alternatives because the higher value for WDS for Alternative 1 was offset by a lower FWI. HQI for northern pintail for marine open water was less than 0.05 (rounds to 0.0) for all alternatives because all alternatives provided negligible marine open water habitat shallow enough to support pintail foraging. HQI for intertidal mudflat for northern pintail was higher for Alternatives 1 and 5 (0.4) than alternatives 4 and 6 (0.3) because of the higher WDS for the alternatives with a shallower basin footprint. HQI for intertidal mudflat for shorebirds was higher for Alternatives 4, 5, and 6 (0.7) than Alternative 1 (0.6) because of the higher FWI for the alternatives with a larger basin. HQI for great egret, avocet, light-footed clapper rail and Belding's savannah sparrow is the same for all alternatives because HQI for these species is related to habitat utilization and not variables affected by different basin configurations.

Table 4.2-3 shows the total HU for indicator species for each of the alternatives for Segment 1. Alternative 4 with the largest, deepest basin footprint had the highest total HU for marine open water (224). Conversely, Alternative 4 had the lowest total HU for intertidal mudflat (103). Alternative 5 with a large basin configuration similar to Alternative 4 but with a shallower depth had the second highest HU for marine open water (220) and the second lowest HU for intertidal mudflat (106). Alternative 6 ranked third in HU for marine open water (207) and second for intertidal mudflat (112). Alternative 1 had the lowest HU for marine open water (142) but the highest HU for intertidal mudflat (161).

Table 4.2-4 shows the input variables that were used for each alternative for Segment 2. FWI, freshwater influence, for Alternative 5 was assumed to be similar to the modeled Year 0 condition because the only dredging that will be done in Segment 2 under Alternative 5 is maintenance of the existing channel. Salinity in the Unit II basin under the Year 0 condition fluctuated daily with a drop of 2 to 3 ppt during ebbing tides. This condition was equivalent to 0.8 on the salinity scale (see Table 2.7-1). FWI is predicted to improve in Segment 2 with the larger basins under Alternatives 1, 4, and 6. FWI was estimated to be 0.9 for Alternative 1 because a slight drop in salinity may occur during ebbing tides. For the large Unit II basins in Alternatives 4 and 6, salinity would vary little and FWI was assumed to be 1.0. WDA, water depth anchovy, was lowest for Alternative 5 (0.8) because a greater percentage of the marine open water habitat is at shallower depths under this alternative. For Alternatives 1, 5, and 6 WDA was calculated to be 0.9. WDG, water depth grebe, is 1.0 for all alternatives. HDW, human disturbance by water, was highest for Alternatives 4 and 6 (0.8) because the larger Unit II basin configuration under these alternatives provided a greater percentage of marine open water habitat outside the main boating channel. HDW was 0.7 for Alternatives 1 and 5. WDS, water depth scaup, was highest for Alternative 5 (0.6) because scaups prefer relatively shallow water. WDS was 0.3 for Alternative 1, which restored a small, shallow basin, and lowest (0.2) for Alternatives 4 and 6, which would create a basin of -20 feet (-6 m) MSL depth. For intertidal mudflat, WDS was essentially 0 for Alternative 1 because most of the intertidal mudflat habitat under this alternative was too shallow for scaup. WDS was 0.1 under the other alternatives. WDP, water depth pintail, was highest for Alternative 5 (0.3) for marine open water because this alternative had the highest percentage of shallow open water habitat. WDP was 0.1 for marine open water for the other alternatives. For intertidal mudflat, WDP was 0.4 for all alternatives except Alternative 4. WDP for Alternative 4 was 0.3 because Alternative 4 had a higher percentage of interidal mudflat habitat that was greater than -3 feet (-0.9 m) MSL.

Table 4.2-5 shows HQI for indicator species for Segment 2 for the project alternatives. HQI for California halibut, deepbody anchovy, and California least tern was 0.6 for marine open water for Alternatives 1 and 5, and 0.7 for Alternatives 4 and 6. HQI for western grebe for marine open water was higher for Alternatives 4 and 6 (0.7 compared to 0.6 for Alternatives 1 and 5) because the larger basin footprint (and correspondingly larger percentage of marine open water habitat outside the main boating channel) for these alternatives resulted in a higher HDW. HQI for intertidal mudflat for western grebe was the same for all alternatives. HQI for lesser scaup for marine open water was highest for Alternative 5 (0.5 compared to 0.4 for Alternatives 1, 4, and 6) because the shallower depths resulted in a higher WDS. HQI for lesser scaup for intertidal mudflat was highest for Alternatives 4 and 6 (0.2) because these alternatives had the higest WDS and FWI. HQI for intertidal mudflat for lesser scaup was 0.1 for Alternative 1 because this alternative had very little intertidal mudflat at the lesser scaup's preferred depth of -3 feet (-0.9 m) MSL or greater. Alternative 5 had a lower HQI (0.1) for lesser scaup for intertidal mudlflat because this alternative had a lower FWI than the other alternatives. All alternatives had an HQI of less than 0.05 (rounded to 0.0) for northern pintail. HQI for intertidal mudflat for northern pintail was lowest for Alternative 4 (0.3 compared to 0.4 for Alternatives 1, 5, and 6) because of the lower WDP for this alternative. HQI for shorebirds was lowest for Alternative 5 for intertidal mudflat. HQI for shorebirds for Alternative 5 mudflat habitat was 0.6 compared to 0.7 for Alternative 1, and 0.8 for Alternatives 4 and 6 because of the lower FWI for Alternative 5. HQI for great egret, avocet, light-footed clapper rail and Belding's savannah sparrow is the same for all alternatives because HQI for these species is related to habitat utilization and not variables affected by different basin configurations.

Table 4.2-6 shows the total HU for indicator species for Segment 2. Alternative 4 with the largest deepest basin had the highest total HU for marine open water (275) but the lowest toal HU for intertidal mudflat (171). Alternative 6, with the second largest basin, had the second highest HU for marine open water (217) but the second lowest HU for intertidal mudflat (239). Alternative 1 had the third highest HU for marine open water (167) and the second highest HU for intertidal mudflat (256). Alternative 5, which would entail minimal dredging, had the lowest total HU for marine open water (129) and the highest HU for intertidal mudflat (276). There were slight differences in total HU for the marsh habitats between alternatives.

Tables 4.2-7, 4.2-8, and 4.2-9 show input variables, HQI and HU for each of the alternatives for Segment 3. Because the only dredging that will occur in Segment 3 under all alternatives is maintenance of the main channel input variables, HQI and HU are identical for all project alternatives for Segment 3.

4.3 COMPARISON OF HU FOR ALTERNATIVES

Table 4.3-1 compares the Total HU by habitat for each alternative. When the total HU are adjusted by dividing by the number of indicator species for each habitat, Alternative 4 has the highest total HU for marine open water with 150, followed by Alternative 6 with 138, Alternative 5 with 125, and Alternative 1 with 119. The ranking of total HU for intertidal mudflat for alternatives is the opposite of the ranking for marine open water. Alternative 1 has the highest number of HU for intertidal mudflat with 75 followed by Alternative 5 with 71. Alternative 6 is third with 68 HU, and Alternative 4 with 59 HU is last. When HU are summed for all habitats for each alternative, Alternative 4 has the highest total HU with 312 followed by Alternative 6 with 309. Alternative 5 is third with 298, and Alternative 1 has the lowest total HU with 296.

Table 4.3-2 shows the total HU for indicator species. HU for all marine open water indicator species are highest for Alternative 4. Alternative 1 has the highest total HU for intertidal mudflat species. Total HU for species with saltmarsh as their primary habitat vary little between alternative because no alternative would dredge saltmarsh.

4.4 ADDITIONAL BENEFITS OF PROJECT ALTERNATIVES

4.4.1 Components of Alternatives that have Additional Benefits

Certain of the components of some alternatives will have habitat benefits that were not considered in the overall HEP analysis. Specifically, replacing the northerly tern island in the Unit III basin with a new tern island in the Unit II basin under Alternatives 4, 5, and 6 will provide clean sand for the new island. Both existing tern islands have become overgrown with vegetation and lost much of their value as nesting sites. Restoring the side channel around the southerly island in Alternatives 4, 5, and 6 will increase protection of the nesting terns from terrestrial predators. Restoring the side channel by New Island under Alternatives 1, 4, and 6 would increase protection from terrestrial predators. The additional Habitat Units gained by these project components are calculated below.

4.4.2 Replacing the Existing Vegetated Northerly Tern Island with a New Island with Clean Sand

Least terns need unvegetated sand for nesting. Important variables for least tern nesting habitat include: (1) clean, unvegetated sand (S), (2) protection from predators (P), and (3) a nearby source of small forage fish (FF). Because the terns will not nest if the islands have too much vegetation, the average of the other variables will be multiplied by the value for sand.

S = 1 - percentage of island covered by vegetation

P = 1 if island is completely protected from predators, 0.8 if island has a low rate of predation, 0.6 if island has a low to moderate rate of avian predation and is protected from terrestrial predators and human intrusion, 0.4 if island has a high rate of avian predation but is moderately accessible to terrestrial predators and human intrusion, 0.2 if island is highly vulnerable to avian and terrestrial predators as well as human disturbance and 0 if all chicks are eaten by predators every year

FF = 1 if forage fish are not limiting, 0.6 if forage fish are limiting only in rare years, 0.4 if fish are available but terns must fly a considerable distance from their nests to get enough food and 0 if food is inadequate in most years

HQI = [(P+ FF)/2]S

The nesting islands in Upper Newport Bay have degraded as nesting habitat because sand has eroded and vegetation has invaded. In 1999, the islands had degraded to the point that no nesting occurred. For the northerly island in its present state, P = 0.4 because it is susceptible to avian predation and moderately accessible to terrestrial predators. FF is 1.0 because forage fish are probably not limiting. Because the island is currently about 90 percent covered with sand, S + .1. Therefore, HQI for the island that will be removed is:

$$HQI = [(.4+1.0)/2].1 = 0.07 \text{ and } HU = 0.07(4.1 \text{ acres}) = 0.3$$

For the newly created tern island in the Unit II basin, P would equal 0.4, FF would equal 1.0, but S would equal 1.0. Therefore,

$$HQI = ([(0.4+1.0/2)1 = 0.7 \text{ and } HU = 0.7(4.1 \text{ acres}) = 2.87$$

The gain in HU for least terns from replacing the existing vegetated island with a new island with clean sand is 2.57.

Because the least tern is the only Marine Open Water indicator species that will benefit from the replacement of an overgrown island by an island with clean sand, the total gain to Marine Open Water habitat should be divided by the 6 indicator species. Therefore, the gain to Marine Open Water from the tern island replacement for Alternatives 4, 5, and 6 would be 0.4 HU.

4.4.3 Restoring the Side Channel around the Southerly Tern Island

Alternatives 4, 5, and 6 would restore the side channel between the southerly tern island and shore. Restoration of the side channel would help to protect the island from terrestrial predators and human disturbance. Because it is so close to land and the channel has filled in, the southerly island has a P of 0.2 because it is highly vulnerable to terrestrial predators and human disturbance. The present HQI for the southerly tern island is:

HQI = ([0.2+1]/2)0.1 = .06
HU = .06(3.1) = .19

Restoration of the side channel would raise P from 0.2 to 0.6, the island would have a low to moderate rate of avian predation and would be protected from terrestrial predators and human disturbance. Therefore, HQI from restoration of the side channel would be:

HQI = ([0.6+1]/2)0.1 = .08
HU = .08(3.1) = .25

The gain in HU for the tern island would be .06. Because only one of the six indicator species for Marine Open Water habitat would gain by this measure, the net gain in Marine Open Water would be .01.

Clearly there is a little value in restoring the channel between the southerly tern island and shore because the island is currently about 90 percent covered with vegetation and, hence, little used by least tern. The benefits of excavating the side channel would be greatly increased if clean sand were placed on the island (see Section 5.2). With clean sand and no vegetation the HQI and HU for the southerly tern island would be:

HQI = ([0.2+1]/2)1.0 = 0.6
HU = 0.6(3.1) = 1.86

Restoration of the side channel would raise P from 0.2 to 0.6 and HQI and HU for the tern island with clean sand and a side channel would be:

HQI = ([0.6+1]/2)1.0 = 0.8
HU = 0.8(3.1) = 2.48

The gain in HU for a tern island with clean sand and a side channel would be 0.62. Divided by the six indicator species for Marine Open Water, the net gain in HU would be 0.1.

4.4.4 Restoration of Side Channel around New Island

Alternatives 1, 4, and 6 would restore the side channel between New Island and shore. Restoration of the side channel would protect birds on the island from terrestrial predators and human predation.

It is assumed that creation of the side channel would change P for mudflat and marsh habitat on New Island from 0.2 highly vulnerable to 0.6 protected from terrestrial predators but still vulnerable to avian predators. Table 4.4-1 shows the gain in intertidal mudflat from the increased protection from predation The gain in HU from the protection afforded about 6 acres of mudflat would be 0.8..

About 10 acres of low saltmarsh would gain protection from restoration of the side channel. The gain in HU for increased protection of New Island low saltmarsh from terrestrial predators would be 1.5 (Table 4.4-2).

Therefore, the net gain in HU for the New Island Side Channel component of Alternatives 1, 4, and 6 would be 2.3.

4.5 FINAL HU

Table 4.5-1 shows the Final HU for each of the project alternatives when the additional HU for project components are included. Because the net gain in HU for creating the new tern island and restoring the side channel between the southerly island and shore are less than 0.5 HU, they do not increase the total HU of any of the alternatives. However, restoring the side channel at New Island added 3 HU to Alternatives 1, 4 and 6 (1 HU to intertidal mudflat and 2 HU to low saltmarsh). With the addition of HU for this component, Alternative 4 had the highest final HU followed by Alternative 6. Alternative 5, which would not restore the side channel at New Island, dropped to the lowest Final HU.

4.6 CONCLUSIONS

All project alternatives would result in a net gain in HU compared to the 20- and 50-year without project condition. Alternative 4 would have somewhat greater habitat benefits than the other alternatives.

Table 4.2.1
Segment 1 Input Variables for Alternatives

Alternative 1							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
Marine Open Water	47.9	0.8	0.9	1.0	1.0	0.5	0.2
Intertidal Mudflat	51.9	0.8	na	1.0	na	0.4	0.4
Low Saltmarsh	32.2	0.8	na	na	na	na	na
Middle Saltmarsh	99.2	na	na	na	na	na	na
High Saltmarsh	0.0	na	na	na	na	na	na
Alternative 4							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
Marine Open Water	71.6	0.9	1.0	1.0	1.0	0.1	0.1
Intertidal Mudflat	32.3	0.9	na	6.0	na	0.1	0.3
Low Saltmarsh	31.0	0.9	na	na	na	na	na
Middle Saltmarsh	99.7	na	na	na	na	na	na
High Saltmarsh	0.0	na	na	na	na	na	na
Alternative 5							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
Marine Open Water	71.2	0.9	1.0	1.0	1.0	0.1	0.1
Intertidal Mudflat	32.6	0.9	na	1.0	na	0.1	0.4
Low Saltmarsh	31.4	0.9	na	na	na	na	na
Middle Saltmarsh	98.9	na	na	na	na	na	na
High Saltmarsh	0.0	na	na	na	na	na	na
Alternative 6							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
Marine Open Water	67.8	0.9	0.9	1.0	1.0	0.1	0.1
Intertidal Mudflat	34.6	0.9	na	1.0	na	0.1	0.3
Low Saltmarsh	32.3	0.9	na	na	na	na	na
Middle Saltmarsh	99.8	na	na	na	na	na	na
High Saltmarsh	0.0	na	na	na	na	na	na

Table 4.2-2
HQI for Indicator Species for Segment 1

HQI Alternative 1					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.2	0.0	0.0	0.0
anchovy	0.6	0.2	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.2	0.0	0.0	0.0
least tern	0.6	0.2	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.6	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.3	0.0	0.0	0.0
anchovy	0.7	0.3	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.2	0.0	0.0	0.0
least tern	0.6	0.3	0.0	0.0	0.0
pintail	0.1	0.3	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.7	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.3	0.0	0.0	0.0
anchovy	0.7	0.3	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.2	0.0	0.0	0.0
least tern	0.6	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.7	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-2 (Continued)
HQI for Indicator Species for Segment 1

HQI Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.2	0.0	0.0	0.0
least tern	0.6	0.3	0.0	0.0	0.0
pintail	0.0	0.3	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.7	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-3
Total HU for Indicator Species for Segment 1

Alternative1					
	MOW	IMF	LSM	MSM	HSM
halibut	27	12	0	0	0
anchovy	29	12	0	0	0
western grebe	34	16	0	0	0
lesser scaup	24	9	0	0	0
least tern	27	12	0	0	0
pintail	2	19	0	0	0
great egret	0	21	13	10	0
avocet	0	26	0	0	0
clapper rail	0	0	16	30	0
shorebirds	0	33	5	0	0
Belding's savannah sparrow	0	0	6	50	0
Total	**142**	**161**	**41**	**89**	**0**
Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	45	9	0	0	0
anchovy	48	9	0	0	0
western grebe	50	10	0	0	0
lesser scaup	30	5	0	0	0
least tern	45	9	0	0	0
pintail	6	10	0	0	0
great egret	0	13	12	10	0
avocet	0	16	0	0	0
clapper rail	0	0	16	30	0
shorebirds	0	23	6	0	0
Belding's savannah sparrow	0	0	6	50	0
Total	**224**	**103**	**40**	**90**	**0**
Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	45	9	0	0	0
anchovy	47	9	0	0	0
western grebe	50	10	0	0	0
lesser scaup	30	5	0	0	0
least tern	45	9	0	0	0
pintail	3	12	0	0	0
great egret	0	13	13	10	0
avocet	0	16	0	0	0
clapper rail	0	0	16	30	0
shorebirds	0	23	6	0	0
Belding's savannah sparrow	0	0	6	49	0
Total	**220**	**106**	**40**	**89**	**0**

Table 4.2-3 (Continued)
Total HU for Indicator Species for Segment 1

Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	43	9	0	0	0
anchovy	43	9	0	0	0
western grebe	47	10	0	0	0
lesser scaup	28	5	0	0	0
least tern	43	9	0	0	0
pintail	3	9	0	0	0
great egret	0	14	13	10	0
avocet	0	17	0	0	0
clapper rail	0	0	16	30	0
shorebirds	0	25	6	0	0
Belding's savannah sparrow	0	0	6	50	0
Total	**207**	**107**	**41**	**90**	**0**

Table 4.2-4
Segment 2 Input Variables for Alternatives

Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
Alternative 1							
MOW	55.8	0.9	0.9	1.0	0.7	0.3	0.1
IMF	79.4	0.9	na	0.5	na	0.0	0.4
LSM	82.2	0.9	na	na	na	na	na
MSM	31.0	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na
Alternative 4							
Habitat	**Acres**	**FWI**	**WDA**	**WDG**	**HDW**	**WDS**	**WDP**
MOW	86.0	1.0	0.9	1.0	0.8	0.2	0.1
IMF	51.3	1.0	na	0.5	na	0.1	0.3
LSM	79.3	1.0	na	na	na	na	na
MSM	32.6	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na
Alternative 5							
Habitat	**Acres**	**FWI**	**WDA**	**WDG**	**HDW**	**WDS**	**WDP**
MOW	45.5	0.8	0.8	1.0	0.7	0.6	0.3
IMF	90.2	0.8	na	0.5	na	0.1	0.4
LSM	81.6	0.8	na	na	na	na	na
MSM	31.0	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na
Alternative 6							
Habitat	**Acres**	**FWI**	**WDA**	**WDG**	**HDW**	**WDS**	**WDP**
MOW	67.7	1.0	0.9	1.0	0.8	0.2	0.1
IMF	69.7	1.0	na	0.5	na	0.1	0.4
LSM	79.0	1.0	na	na	na	na	na
MSM	32.7	na	na	na	na	na	na
HSM	4.7	na	na	na	na	na	na

Table 4.2-5
HQI for Indicator Species for Segment 2

HQI Alternative 1					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.1	0.0	0.0	0.0
least tern	0.6	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.7	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.7	0.3	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.3	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	0.6	0.2	0.0	0.0	0.0
anchovy	0.6	0.2	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.5	0.1	0.0	0.0	0.0
least tern	0.6	0.2	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.6	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-5 (Continued)
HQI for Indicator Species for Segment 2

HQI Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.7	0.3	0.0	0.0	0.0
western grebe	0.7	0.3	0.0	0.0	0.0
lesser scaup	0.4	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-6
Total HU for Indicator Species for Segment 2

Alternative 1					
	MOW	IMF	LSM	MSM	HSM
halibut	35	21	0	0	0
anchovy	35	21	0	0	0
western grebe	35	24	0	0	0
lesser scaup	24	11	0	0	0
least tern	35	21	0	0	0
pintail	2	29	0	0	0
great egret	0	32	33	3	0
avocet	0	40	0	0	2
clapper rail	0	0	41	9	1
shorebirds	0	57	15	0	0
Belding's savannah sparrow	0	0	16	16	1
Total	**167**	**256**	**105**	**28**	**5**
Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	60	15	0	0	0
anchovy	57	15	0	0	0
western grebe	56	15	0	0	0
lesser scaup	39	8	0	0	0
least tern	60	15	0	0	0
pintail	3	14	0	0	0
great egret	0	21	32	3	0
avocet	0	26	0	0	2
clapper rail	0	0	40	10	1
shorebirds	0	41	16	0	0
Belding's savannah sparrow	0	0	16	16	1
Total	**275**	**171**	**103**	**29**	**5**
Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	25	22	0	0	0
anchovy	25	22	0	0	0
western grebe	29	27	0	0	0
lesser scaup	22	12	0	0	0
least tern	25	22	0	0	0
pintail	2	32	0	0	0
great egret	0	36	33	3	0
avocet	0	45	0	0	2
clapper rail	0	0	41	9	1
shorebirds	0	58	13	0	0
Belding's savannah sparrow	0	0	16	16	1
Total	**129**	**276**	**103**	**28**	**5**

Table 4.2-6 (Continued)
Total HU for Indicator Species for Segment 2

Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	47	21	0	0	0
anchovy	45	21	0	0	0
western grebe	44	21	0	0	0
lesser scaup	30	12	0	0	0
least tern	47	21	0	0	0
pintail	2	25	0	0	0
great egret	0	28	32	3	0
avocet	0	35	0	0	2
clapper rail	0	0	40	10	1
shorebirds	0	56	16	0	0
Belding's savannah sparrow	0	0	16	16	1
Total	**217**	**239**	**103**	**29**	**5**

Table 4.2-7
Segment 3 Input Variables for Alternatives

Alternative 1							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	123.0	1.0	0.8	1.0	0.7	0.7	0.2
IMF	76.3	1.0	na	1.0	na	0.1	0.4
LSM	25.9	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na
Alternative 4							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	123.0	1.0	0.8	1.0	0.7	0.7	0.2
IMF	76.3	1.0	na	1.0	na	0.1	0.4
LSM	25.9	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na
Alternative 5							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	123.0	1.0	0.8	1.0	0.7	0.7	0.2
IMF	76.3	1.0	na	1.0	na	0.1	0.4
LSM	25.9	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na
Alternative 6							
Habitat	Acres	FWI	WDA	WDG	HDW	WDS	WDP
MOW	123.0	1.0	0.8	1.0	0.7	0.7	0.2
IMF	76.3	1.0	na	1.0	na	0.1	0.4
LSM	25.9	1.0	na	na	na	na	na
MSM	53.3	na	na	na	na	na	na
HSM	4.6	na	na	na	na	na	na

Table 4.2-8
HQI for Indicator Species for Segment 3

HQI Alternative 1					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3
HQI Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-8 (Continued)
HQI for Indicator Species for Segment 3

HQI Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	0.7	0.3	0.0	0.0	0.0
anchovy	0.6	0.3	0.0	0.0	0.0
western grebe	0.6	0.3	0.0	0.0	0.0
lesser scaup	0.6	0.2	0.0	0.0	0.0
least tern	0.7	0.3	0.0	0.0	0.0
pintail	0.0	0.4	0.0	0.0	0.0
great egret	0.0	0.4	0.4	0.1	0.1
avocet	0.0	0.5	0.0	0.0	0.5
clapper rail	0.0	0.0	0.5	0.3	0.2
shorebirds	0.0	0.8	0.2	0.0	0.0
Belding's savannah sparrow	0.0	0.0	0.2	0.5	0.3

Table 4.2-9
Total HU for Indicator Species for Segment 3

Alternative 1					
	MOW	IMF	LSM	MSM	HSM
halibut	86	23	0	0	0
anchovy	77	23	0	0	0
western grebe	78	23	0	0	0
lesser scaup	71	13	0	0	0
least tern	86	23	0	0	0
pintail	5	27	0	0	0
great egret	0	31	10	5	0
avocet	0	38	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	61	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**403**	**261**	**34**	**48**	**5**
Alternative 4					
	MOW	IMF	LSM	MSM	HSM
halibut	86	23	0	0	0
anchovy	77	23	0	0	0
western grebe	78	23	0	0	0
lesser scaup	71	13	0	0	0
least tern	86	23	0	0	0
pintail	5	27	0	0	0
great egret	0	31	10	5	0
avocet	0	38	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	61	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**403**	**261**	**34**	**48**	**5**
Alternative 5					
	MOW	IMF	LSM	MSM	HSM
halibut	86	23	0	0	0
anchovy	77	23	0	0	0
western grebe	78	23	0	0	0
lesser scaup	71	13	0	0	0
least tern	86	23	0	0	0
pintail	5	27	0	0	0
great egret	0	31	10	5	0
avocet	0	38	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	61	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**403**	**277**	**34**	**48**	**5**

Table 4.2-9 (Continued)
Total HU for Indicator Species for Segment 3

Alternative 6					
	MOW	IMF	LSM	MSM	HSM
halibut	86	23	0	0	0
anchovy	77	23	0	0	0
western grebe	78	23	0	0	0
lesser scaup	71	13	0	0	0
least tern	86	23	0	0	0
pintail	5	27	0	0	0
great egret	0	31	10	5	0
avocet	0	38	0	0	2
clapper rail	0	0	13	16	1
shorebirds	0	61	5	0	0
Belding's savannah sparrow	0	0	5	27	1
Total	**403**	**261**	**34**	**48**	**5**

Table 4.3-1
Total HU by Habitat Area for Project Alternatives

Alternative 1						Divided by	Divided by	Divided by	Total Adjusted
Habitat	Segment 1	Segment 2	Segment 3	Total HU	# Species	# Species Seg 1	# Species Seg 2	# Species Seg 3	HU's
Marine Open Water	142	167	403	**712**	6	24	28	67	**119**
Intertidal Mudflat	161	256	261	**678**	9	18	28	29	**75**
Low Saltmarsh	41	105	34	**179**	4	10	26	8	**44**
Middle Saltmarsh	89	28	48	**165**	3	30	9	16	**55**
High Saltmarsh	0	5	5	**10**	4	0	1	1	**3**
Total	**433**	**561**	**751**	**1,745**		**81**	**93**	**122**	**296**
Alternative 4						Divided by	Divided by	Divided by	Total Adjusted
Habitat	Segment 1	Segment 2	Segment 3	Total HU	# Species	# Species Seg 1	# Species Seg 2	# Species Seg 3	HU's
Marine Open Water	224	275	403	**902**	6	37	46	67	**150**
Intertidal Mudflat	103	171	261	**535**	9	11	19	29	**59**
Low Saltmarsh	40	103	34	**176**	4	10	26	8	**44**
Middle Saltmarsh	90	29	48	**167**	3	30	10	16	**56**
High Saltmarsh	0	5	5	**10**	4	0	1	1	**3**
Total	**456**	**584**	**751**	**1,791**		**89**	**102**	**122**	**312**
Alternative 5						Divided by	Divided by	Divided by	Total Adjusted
Habitat	Segment 1	Segment 2	Segment 3	Total HU	# Species	# Species Seg 1	# Species Seg 2	# Species Seg 3	HU's
Marine Open Water	220	129	403	**752**	6	37	22	67	**125**
Intertidal Mudflat	106	276	261	**643**	9	12	31	29	**71**
Low Saltmarsh	40	103	34	**177**	4	10	26	8	**44**
Middle Saltmarsh	89	28	48	**165**	3	30	9	16	**55**
High Saltmarsh	0	5	5	**10**	4	0	1	1	**3**
Total	**454**	**541**	**751**	**1,747**		**88**	**88**	**122**	**298**
Alternative 6						Divided by	Divided by	Divided by	Total Adjusted
Habitat	Segment 1	Segment 2	Segment 3	Total HU	# Species	# Species Seg 1	# Species Seg 2	# Species Seg 3	HU's
Marine Open Water	207	217	403	**827**	6	34	36	67	**138**
Intertidal Mudflat	112	239	261	**613**	9	12	27	29	**68**
Low Saltmarsh	41	103	34	**178**	4	10	26	8	**44**
Middle Saltmarsh	90	29	48	**167**	3	30	10	16	**56**
High Saltmarsh	0	5	5	**10**	4	0	1	1	**3**
Total	**450**	**593**	**751**	**1,794**		**87**	**99**	**122**	**309**

Table 4.3-2
Total HU by Indicator Species for Entire Bay

Alternative 1						
	MOW	IMF	LSM	MSM	HSM	Total
halibut	148	57	0	0	0	**205**
anchovy	141	57	0	0	0	**198**
western grebe	147	62	0	0	0	**209**
lesser scaup	119	33	0	0	0	**152**
least tern	148	57	0	0	0	**205**
pintail	9	75	0	0	0	**83**
great egret	0	83	56	18	1	**158**
avocet	0	104	0	0	5	**108**
clapper rail	0	0	70	55	2	**127**
shorebirds	0	151	25	0	0	**177**
Belding's savannah sparrow	0	0	28	92	3	**123**
	712	678	179	165	10	**1,745**
Alternative 4						
	MOW	IMF	LSM	MSM	HSM	Total
halibut	191	47	0	0	0	**238**
anchovy	182	47	0	0	0	**229**
western grebe	184	48	0	0	0	**232**
lesser scaup	140	26	0	0	0	**165**
least tern	191	47	0	0	0	**238**
pintail	13	51	0	0	0	**64**
great egret	0	64	54	19	1	**138**
avocet	0	80	0	0	5	**85**
clapper rail	0	0	68	56	2	**126**
shorebirds	0	125	27	0	0	**152**
Belding's savannah sparrow	0	0	27	93	3	**123**
	902	535	176	167	10	**1,791**
Alternative 5						
	MOW	IMF	LSM	MSM	HSM	Total
halibut	156	53	0	0	0	**210**
anchovy	150	53	0	0	0	**204**
western grebe	157	60	0	0	0	**216**
lesser scaup	123	30	0	0	0	**153**
least tern	156	53	0	0	0	**210**
pintail	9	72	0	0	0	**81**
great egret	0	80	56	18	1	**154**
avocet	0	100	0	0	5	**104**
clapper rail	0	0	69	55	2	**126**
shorebirds	0	142	24	0	0	**166**
Belding's savannah sparrow	0	0	28	92	3	**122**
	752	643	177	165	10	**1,747**

Table 4.3-2 (Continued)
Total HU by Indicator Species for Entire Bay

Alternative 6						
	MOW	IMF	LSM	MSM	HSM	Total
halibut	176	53	0	0	0	229
anchovy	165	53	0	0	0	218
western grebe	170	54	0	0	0	224
lesser scaup	130	33	0	0	0	162
least tern	176	53	0	0	0	229
pintail	10	62	0	0	0	71
great egret	0	72	55	19	1	147
avocet	0	90	0	0	5	95
clapper rail	0	0	69	56	2	126
shorebirds	0	142	27	0	0	169
Belding's savannah sparrow	0	0	27	93	3	123
	827	613	178	167	10	1,794

Table 4.4-1
HU for Intertidal Mudflat from Protection from Channel at New Island

Species	HQI Formula	FWI	WDS	WDP	P w/Channel	P w/o Channel	HQI w/Channel	HU w/Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/#of Species
grebe	0.3P	1			0.6	0.2	0.18	1.08	0.06	0.36	0.72	
scaup	0.3([WDS+FWI+P]/3)	1	0		0.6	0.2	0.16	0.96	0.12	0.72	0.24	
least tern	0.3([FWI+P]/2)	1			0.6	0.2	0.24	1.44	0.18	1.08	0.36	
pintail	(WDP+P)/2*.9	1		1	0.6	0.2	0.72	4.32	0.54	3.24	1.08	
great egret	.4*P	1			0.6	0.2	0.24	1.44	0.08	0.48	0.96	
avocet	.5P	1			0.6	0.2	0.3	1.8	0.1	0.6	1.2	
shorebirds	(FWI+P)/2*.8	1			0.6	0.2	0.64	3.84	0.48	2.88	0.96	
											5.52	0.788571

Table 4.4-2
HU for Low Saltmarsh from Side Channel at New Island

Species	HQI Formula	FWI	P w/Channel	HQI w/Channel	HU w/Channel	P w/o Channel	HQI w/o Channel	HU w/o Channel	HU Gain	HU/#of spp.
egret	0.4P	1	0.6	0.24	2.4	0.2	0.08	0.8	1.6	
clapper rail	0.5P	1	0.6	0.3	3	0.2	0.1	1	2	
shorebirds	0.8(FWI+P)/2	1	0.6	0.64	6.4	0.2	0.48	4.8	1.6	
sparrow	0.2P	1	0.6	0.12	1.2	0.2	0.04	0.4	0.8	
									6	1.5

Table 4.5-1
HU for Project Alternatives with Benefits of New Island Side Channel

Habitat	Alternative 1	Alternative 4	Alternative5	Alternative 6
Marine Open Water	119	150	125	138
Intertidal Mudflat	76	60	71	69
Low Saltmarsh	46	46	44	46
Mid Saltmarsh	55	56	55	56
High Saltmarsh	3	3	3	3
TOTAL	**299**	**315**	**298**	**312**

SECTION 5.0 - HABITAT EVALUATION PROCEDURES ANALYSIS OF HABITAT RESTORATION ALTERNATIVES

5.1 INTRODUCTION

The modified-HEP developed for the sediment restoration alternatives was focused specifically on habitat variables that may be affected by sedimentation from San Diego Creek. In addition to the sediment control alternatives, 7 additional restoration measures were identified to improve habitat quality in Upper Newport Bay. A simple modified-HEP was developed for each of these alternatives to quantify the benefits of each alternative restoration measure.

5.2 ADDITION OF SAND TO LEAST TERN ISLANDS

Least terns need unvegetated sand for nesting. The nesting islands in Upper Newport Bay have degraded as nesting habitat because sand has eroded and vegetation has invaded. In 1999, the islands had degraded to the point that no nesting occurred. Important variables for least tern nesting habitat include: 1) clean, unvegetated sand (S), 2) protection from predators (P), and 3) a nearby source of small forage fish (FF). Because the terns will not nest if the islands have too much vegetation, the average of the other variables will be multiplied by the value for sand.

S = 1 percentage of island covered by vegetation

P = 1 if island is completely protected from predators, 0.8 if island has a low rate of predation, 0.6 if island has a low to moderate rate of avian predation and is protected from terrestrial predators and human disturbance, 0.4 if island has a high rate of avian predation but is moderately accessible to terrestrial predators and human disturbance, 0.2 if island is highly vulnerable to avian and terrestrial predators and human disturbance, and 0 if all chicks are eaten by predators every year

FF = 1 if forage fish are not limiting, 0.6 if forage fish are limiting only in rare years, 0.4 if fish are available but terns must fly a considerable distance from their nests to get enough food and 0 if food is inadequate in most years

HQI = ([P+ FF]/2)S

Sediment control alternative 1 will not dredge a channel between the southerly island and the mainland but would dredge a channel between the northerly island and the mainland. Therefore, for Alternative 1, P would be 0.2 for the southerly island because that island would be exposed to mammalian and avian predation but 0.6 for the northerly island which would still be exposed to avian predation but which would be protected from mammalian predation. Sediment control Alternatives 4,5, and 6 will dredge a channel around the southerly island to protect the terns from predators but the colony would still be subjected to a moderate rate of avian predation. Therefore P = 0.6 for Alternatives 4,5 and 6. Forage fish do not appear to be limiting in Upper Newport Bay. Therefore FF = 1 for all alternatives. The tern islands are currently about 90 percent covered by vegetation. Therefore, the without project value for S is 0.1. The proposed habitat restoration alternative of restoring sand to the tern islands would change S to 1.

Therefore for Alternative 1, the HQI of the tern islands without adding sand to the tern island:

HQI = ([0.6 +1]/2)0.1 = 0.08 for the northerly island and HQI = ([0.2+1]/2) 0.1 = 0.6 for the southerly island

With implementation of the alternative of adding sand to the tern islands:

HQI = ([0.6+1]/2)1 = .8 for the northerly island and HQI = ([0.2+1]/2)1 = 0.6 for the southerly island

For sediment control Alternative 1, in which sand would be added to both tern islands, the without adding sand HU would be:

HU = .1(7.2) = .7

The HU with addition of clean sand =

HU = 0.8 (4.1)+ 0.6 (3.1) = 5.2

Therefore, the gain in HU for this habitat restoration measure under Alternative 1 = 4.5

For Alternatives 4, 5, and 6 in which sand would be added to the southerly hot dog shaped island, the without project HQI would be

HQI = = ([0.2+1]/2)0.1 = 0.1

And HU would be 0.1 (3.1) = 0.3

With the addition of clean sand

HQI = = ([0.2+1]/2)1 = 0.6

And HU = 0.6 (3.1) = 1.9

Therefore, the gain in HU under sediment control Alternatives 4, 5, and 6 would be 1.3.

The above calculations reflect the gain in HU for the terns and skimmers guild. The overall gain for Marine Open Water as a habitat would divide the HU by the 6 indicator species. For Alternative 1, this gain would be 0.8 HU. For Alternatives 4, 5, and 6, the gain would be 0.2 HU.

5.3 CONSTRUCT SMALL DENDRITIC CHANNELS THROUGH THE MARSH

This alternative would construct one dendritic channel through Shellmaker Island. Construction of the channel would be a pilot project to identify the impacts and benefits of restoring dendritic channels through marsh areas. The proposed pilot channel through Shellmaker Island would have an area of about 0.3 acres and would have a depth of -5 feet (-1.5 m) MSL.

Construction of a dendritic channel through Shellmaker Island would provide subtidal habitat for a variety of species and would provide some protection from predation and human disturbance for marsh and intertidal mudflat habitat bayward of the channel.

Six of the target species used as indicators of habitat quality in the HEP models for the sediment control alternatives use marine open water. Therefore these 6 species would benefit from the creation of a subtidal channel. Because Shellmaker Island is in Segment 3 where little fluctuation in salinity occurs, the freshwater influence variable (FWI) is considered to be 1. For northern anchovy, the depth variable (WDA) for depth below -6 feet (-1.8 m) MSL is 0.5. The water depth is within the preferred water depth for the lesser scaup (WDS = 1) and western grebe (WDG = 1). For the northern pintail, the channel would be at the pintail's preferred depth of -6 feet (-1.8 m) MSL or less so WPD would be 1. Therefore, HQI for the pintail for the channel is also 0.7. The dendritic channel would not be disturbed by boaters. Therefore, the variable for human disturbance by water (HDW) would be 1. If these variables are plugged into the formulas for the indicator species, HQI would be 0.7 for the halibut, grebe, scaup and tern. HQI would be 0.5 for the northern anchovy and 0.1 for the northern pintail. Multiplying the HQI for each species by the 0.3 acres of the dendritic channel, summing the individual species HU and dividing by the six indicator species yields a total HU for the dendritic channel for subtidal species of 0.17. The new dendritic channel would be constructed primarily along an existing upland ridge. Therefore minimal wetland habitat would be lost by construction of this channel.

Construction of a dendritic channel through Shellmaker Island would also benefit intertidal bird species by reducing predation from mammalian predators and human disturbance. Approximately 4 acres of intertidal mudflat directly west of the channel was considered to benefit from channel protection. Using the scale for P presented above for the Addition of Sand to Least Tern Islands, Shellmaker Island is considered to currently have a P of 0.2, highly vulnerable to predation and disturbance. Construction of a dendritic channel would increase P to 0.4 because the vulnerability to terrestrial predators and humans would be reduced from "highly vulnerable" to "moderately vulnerable." P is added to the calculation of HQI developed for the sediment control alternatives. Table 5.3-1 shows the calculation of HQI and HU for bird species for the 4 acres of intertidal mudflat immediately west of the dendritic channel. The gain in HU from increased protection of intertidal mudflats is thus 0.23.

Approximately 0.2 acre of low saltmarsh to the west of the dendritic channel will receive some protection from mammalian predators and human disturbance. As discussed above for intertidal mudflat, the dendritic channel would be expected to reduce mammalian predation and human disturbance of habitat bayward of the channel from highly vulnerable to moderately vulnerable. P without the dendritic channel is considered to be 0.2 and with the channel 0.4. Table 5.3-2 shows the calculation of HQI and HU for low saltmarsh species. The gain in HU by increased protection of saltmarsh is 0.01.

Bird species in mid saltmarsh habitat bayward of the channel will benefit from a decrease in mammalian predation and human disturbance. The channel was considered to reduce the vulnerability of saltmarsh to disturbance and predation from highly vulnerable to moderately vulnerable. P without the dendritic channel is considered to be 0.2 and with the channel 0.4. The indicator bird species that would benefit from this increased predation are great egret, clapper rail and Beldings savannah sparrow. HQI for each of these species for mid saltmarsh (see Table 2.7-1) is multiplied by the 0.2 gain in P with the channel to calculate the gain in HQI. HU is determined by multiplying HQI for each species by the 1 acre of mid saltmarsh habitat that would be protected by the channel. The HU for the three target species are averaged to derive an average gain in HU. The gain in mid saltmarsh HU from construction of the dendritic channel is 0.06.

Calculation of gain in high saltmarsh habitat units is similar to that for mid saltmarsh. Four indicator species, great egret, American avocet, light-footed clapper rail and Belding's savannah sparrow, are used to calculate HU for high saltmarsh. Like mid saltmarsh, high saltmarsh will not be affected directly by construction of the channel. High saltmarsh species will benefit from increased protection from mammalian predation and human disturbance. HQI for each of the four target species (see Table 2.7-1) is multiplied by the 0.2 gain in P to calculate the gain in HQI. HU is calculated by multiplying HQI by the 1 acre of high saltmarsh habitat bayward of the dendritic channel. The gain in high saltmarsh HU from construction of the dendritic channel is 0.06.

The total gain in HU from construction of a dendritic channel on Shellmaker Island is equal to the sum of the gain in HU for marine open water intertidal mudflat, low saltmarsh, mid saltmarsh, and high saltmarsh habitat. The total gain in HU is 0.5.

5.4 RESTORATION OF WETLANDS IN FILLED AREAS

This alternative would restore one or more filled areas to wetland habitat. The HU that could be gained from restoration of each of these areas is calculated below.

Northstar Beach. This alternative would create an island of 2.5 acres of intertidal habitat surrounded by approximately 1.5 acres of channels at an elevation of -5 feet (-1.5 m) MSL. Based on the HEP developed for the sediment control alternatives (see Table 2.7-1 for calculation of HQI for each indicator species for each habitat), Table 5.4-1 calculates HQI and HU for each of the two habitats that would be created at Northstar Beach. The current value of the degraded fill area to wetlands species is assumed to be zero. Therefore, the HU that would be gained by creation of wetlands habitat at Northstar Beach is equal to the sum of the HU calculated in Table 5.4-1 for each of the habitat types or 1.38.

Bull-Nose Section of Land at Lower End of Northern Side of Unit I/III Basin. This alternative would restore wetlands function to about 3.7 acres of land by excavating a fill area to -2.8 feet (-0.8 m) MSL. The area would, thus, be restored to intertidal mudflat habitat. Table 5.4-2 calculates HQI and HU for this area based on HQI formulas for indicator species in Table 2.7-1. The current value of the degraded fill habitat in this area is assumed to be zero. Therefore, the gain in HU from creation of wetlands on the northern side of the Unit I/III basin would be 1.29.

Dredge Spoil on Shellmaker Island. This restoration measure would restore approximately 3 acres of intertidal mudflat by excavating dredge spoil areas on Shellmaker Island. Table 5.4-3 calculates HQI and HU for this restoration alternative. The gain in HU from restoring intertidal mudflat habitat to dredge spoil areas on Shellmaker Island would be 1.17.

5.5 RESTORATION OF SIDE CHANNELS

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Each of these side channels would be excavated to a depth of -6 feet (-1.8 m) MSL. Restoration of these side channels would protect birds on the islands from mammalian predators and human disturbance.

West Side of Middle Island

The side channel on the west side of Middle Island is currently intertidal mudflat. Excavation to a depth of -5 feet (-1.5 m) would convert the 3.0 acres of mudflat in the channel to subtidal habitat. Table 5.5-1 calculates HQI and HU for the intertidal habitat that would be lost. The total HU for the intertidal habitat that would be lost is 2.32. However, birds using the 5.43 acres of intertidal habitat on Middle Island would gain protection from predators by restoration of the side channel. Using the scale of P presented in Section 1, restoration of the side channel would be expected to change P from 0.2 or highly vulnerable to predators to 0.6 protected from terrestrial predators but low to moderate avian predation. Table 5.5-2 calculates the gain in HU for birds from the increased protection from terrestrial predators and human disturbance. The total amount of HU for intertidal habitat on Middle Island that would be gained from the increased protection would be 0.71. Therefore, restoration of a side channel on Middle Island would result in a net loss of HU for intertidal mudflat of 1.61.

Restoration of the side channel near Middle Island would result in a gain in habitat for subtidal species. Based on the formulas presented in Table 2.7-1, Table 5.5-3 calculates the total HU for subtidal habitat that would be gained by excavation of the channel. The gain in subtidal habitat would be 1.71 HU.

Excavation of the side channel would protect birds using low and mid saltmarsh from terrestrial predators and human disturbance. Using the scale of P presented in Section 1.0, restoration of the side channel would be expected to change P from 0.2 or highly vulnerable to predators to 0.6 protected from terrestrial predators but low to moderate avian predation. Tables 5.5-4 and 5.5-5 calculate the gain in HU for low and mid saltmarsh on Middle Island. The 6.59 acres of low saltmarsh on Middle Island would gain .79 HU from increased protection from predators. The 11.88 acres of mid saltmarsh would gain 1.43 HU from increased protection from predators.

The total gain in HU from excavation of a side channel west of Middle Island would be 4.64 HU. If the 2.32 HU loss of intertidal habitat is subtracted from this total, the net gain in HU from excavation of the side channel would be 2.32.

East Side of Shellmaker Island

This restoration alternative would deepen the 3.5 acre side channel east of Shellmaker Island from its present depth of +2.5 feet (0.7 m) MSL to -5 feet (-1.5 m) MSL. The deepening of the channel would convert it from intertidal habitat to subtidal habitat. Table 5.5-6 calculates the gain in subtidal HU from conversion of the channel to subtidal habitat. The gain in HU for subtidal habitat from the deepening of the side channel would be 1.72. Excavation of the side channel would result in the loss of the 3.5 acres of intertidal habitat that would be converted to subtidal habitat. Table 5.5-7 calculates the loss in HU of intertidal mudflat. The loss in Intertidal Mudflat HU from deepening of the channel is 1.54

Birds on Shellmaker Island would gain habitat units from increased protection from predation. Using the scale of P presented in Section 1, restoration of the side channel would be expected to change P from 0.2 or highly vulnerable to predators to 0.6 protected from terrestrial predators but low to moderate avian predation. Table 5.5-8 calculates the gain in intertidal habitat HU for the increased protection from terrestrial predators. The gain in HU for intertidal habitat would be 1.21. This gain in HU from increased protection from predation and disturbance would partially offset the loss in Intertidal Mudflat HU from excavation of the side channel. The net loss in Intertidal Mudflat HU would thus be 0.33.

The 3.79 acres of low saltmarsh on Shellmaker Island will gain habitat value from the protection from terrestrial predators that would occur from side channel restoration. Table 5.5-9 calculates this gain in habitat units. The gain in HU for low saltmarsh from increased protection from predation would be 0.45.

The 9.32 acres of mid saltmarsh on Shellmaker Island will gain habitat value from the increased protection from terrestrial predators. Table 5.5-10 calculates the gain in HU for mid saltmarsh from this increased protection. The gain in HU would be 1.12.

Similarly, the 2.11 acres of high saltmarsh habitat on Shellmaker Island would gain habitat value for birds because of the increased protection from terrestrial predators and human disturbance. Table 5.5-11 calculates this gain in HU. The gain in HU for high saltmarsh on Shellmaker Island from excavation of the side channel would be 0.23.

The total gain in HU from excavation of a side channel east of Shellmaker Island would be 4.73 HU. If the 1.54 HU loss of intertidal habitat is subtracted from this total, the net gain in HU from excavation of the side channel would be 3.19.

5.6 RESTORATION OF EELGRASS BEDS IN LOWER PORTIONS OF BAY

This restoration would restore eelgrass beds to 0.6 acre of unvegetated soft bottom subtidal habitat in Segment 3. Eelgrass improves habitat value for fishes (including California halibut) by providing structure, shelter, and increasing the food base. Based on these variables, all of which are important to many species of fish:

$$HQI = (ST+SH+F)/3$$

Where ST = structure, SH = shelter, and F = food.

For the unvegetated soft bottom condition, ST and SH are both 0 because unvegetated soft bottom has no vertical structure and provides no shelter for fish. F is estimated to be about a 0.4 because productivity on unvegetated soft bottom is limited for the without-project condition, then,

HQI = (0+0+.4)/3 = 0.13 and

HU = (.13)0.6 = .08

For an eelgrass bed, ST is determined to be 0.7 because the eelgrass blades provide dense vertical structure but the structure does not extend all the way through the water column. SH for the eelgrass bed is determined to be 0.8 because fishes have greatly increased protection from predators amongst the eelgrass blades but they are not completely protected from predators. Finally, F is determined to be 1 because eelgrass beds are highly productive and provide a rich source of invertebrate prey and forage fish. Therefore for the eelgrass bed,

HQI = (0.7+0.8+1)/3 = .83 and

HU = (.83).6 = .5

Therefore, the gain in HU for fishes from restoring .6 acre of eelgrass habitat in Segment 3 would be:

HU gain = .5 -.08 = .42

Fish eating birds including the tern and grebe guilds would gain from the increased concentration of fishes in eelgrass beds. The density of forage fish in unvegetated soft bottom is assumed to have a forage value to fish eating birds of 0.2. For food resources for fish eating birds, then, the total HU for 0.6 acre of unvegetated soft bottom would be:

HU = 0.2(0.6) = .12

Forage fishes concentrate in eelgrass beds. Therefore the food resources for fish eating birds in an eelgrass bed is assumed to be 0.8 and HU would be:

HU = 0.8(0.6) = .48

Therefore the gain in HU for the two piscivorous bird indicator species would be 0.36. Invertebrate densities tend to be greater in eelgrass beds compared to unvegetated soft bottoms and diversity is substantially increased. Therefore, there would also be a greater forage base available for pintails and scaups. The density of invertebrates is fairly high on unvegetated soft bottom so an HQI of 0.5 was assigned for the forage base for these indicator species on unvegetated soft bottom. HU on unvegetated soft bottom would be:

HU = 0.5(0.6) = 0.3

The increase in density and diversity of invertebrate prey in an eelgrass bed is estimated to increase the forage base for pintails and scaups to 0.8. Therefore the HU for these guilds for the eelgrass bed would be:

HU = 0.8(0.6) = 0.48

The net gain in HU for scaups and pintails from creation of an eelgrass bed near Shellmaker Island would be = 0.18.

The total gain in HU for Marine Open Water Habitat for the two fish indicator species each of which would gain 0.42 HU, the two piscivorous bird species each of which would gain .36 HU and the two invertebrate eating bird species each of which would gain 0.18 HU would be:

HU = .42+.42+.36+.36+.18+.18 = 1.92

The 1.92 HU is divided by the six indicator species for Marine Open Water to derive a final gain in HU for Marine Open Water of 0.32 for transplanting eelgrass to Shellmaker Island.

5.7 REMOVAL OF SEGMENTS OF THE MAIN DIKE

This restoration measure would reduce disturbance to wetlands birds from humans and terrestrial predators by removing segments of the main dike therefore eliminating a heavily used access route into the marsh. Protection would primarily be from humans and their pets. Disturbance from humans accessing the marsh via the dike is assumed to be most severe within 165 feet (50 m) of the dike. Therefore, segmenting the marsh would most benefit birds using wetlands within about 165 feet of either side of the dike. Wetlands habitats within 165 feet of the main dike include 4.96 acres of intertidal mudflat, 6.45 acres of low saltmarsh, 5.23 acres of mid saltmarsh, and .55 acres of high saltmarsh. Segmentation of the dike would be expected to improve vulnerability to human disturbance and terrestrial predation, P from about a 0.3, vulnerable to avian and terrestrial predators (including human disturbance) to 0.4, moderately vulnerable. Table 5.7-1 calculates the gain in HU for intertidal birds. The gain in HU for intertidal mudflat from segmentation of the main dike would be 0.16. Table 5.7-2 calculates the gain in HU for low saltmarsh habitat from dike segmentation. The gain in HU for low saltmarsh from this restoration measure would be 0.19. Similarly, Table 5.7-3 calculates the gain in HU for mid saltmarsh habitat and Table 5.7-4 shows the gain in HU for high saltmarsh. The gains in HU would be 0.16 and 0.01 respectively. Therefore, the total gain in HU from segmentation of the Main Dike would be 0.52.

Table 5.3-1
HQI for Intertidal Mudflat with and without Dendritic Channels

Species	HQI formula	FWI	WDS	WDP	P w/Channel	P w/o Channel	HQI w/Channel	HU w/Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
grebe	0.3([FWI+P]/2)	1			0.4	0.2	0.21	0.84	0.18	0.72	0.12	
scaup	0.3P	1			0.4	0.2	0.12	0.48	0.06	0.24	0.24	
least tern	0.3([WDS+FWI+P]/3)	1	0.1		0.4	0.2	0.15	0.6	0.13	0.52	0.08	
pintail	0.3([FWI+P]/2)	1			0.4	0.2	0.21	0.84	0.18	0.72	0.12	
great egret	(WDP+P)/2*.9	1		0.8	0.4	0.2	0.54	2.16	0.45	1.8	0.36	
avocet	.4*P	1			0.4	0.2	0.16	0.64	0.08	0.32	0.32	
shorebirds	.5P	1			0.4	0.2	0.2	0.8	0.1	0.4	0.4	
											1.64	0.234285714

Table 5.3-2
HQI and HU for Low Saltmarsh with and without Dendritic Channels

Species	HQI formula	FWI	P w/Channel	P w/o Channel	HQI w/Channel	HU w/Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	0.4P		0.4	0.2	0.16	0.032	0.08	0.016	0.016	
clapper rail	.5P		0.4	0.2	0.2	0.04	0.1	0.02	0.02	
shorebirds	.2([FWI+P]/2)	1	0.4	0.2	0.14	0.028	0.12	0.024	0.004	
Belding's	.2P		0.4	0.2	0.08	0.016	0.04	0.008	0.008	
									0.048	0.012

Table 5.4-1
Calculation of HQI and HU for Each Wetlands Habitat that would be Created at Northstar Beach

SUBTIDAL										
	Variables									
Species	FWI	WDA	WDG	HDW	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1						0.7	0.5	0.35	
anchovy	1	0.5					0.525	0.5	0.2625	
grebe			1	1			0.7	0.5	0.35	
scaup	1			1	1		0.7	0.5	0.35	
least tern	1						0.7	0.5	0.35	
pintail				1		1	0.1	0.5	0.05	
									1.7125	0.285416667
INTERTIDAL										
	FWI	WDS	WDP	HQI	Acres	HU	HU/# Species			
halibut	1			0.3	2.5	0.75				
anchovy	1			0.3	2.5	0.75				
grebe				0.3	2.5	0.75				
scaup	1	0		0.15	2.5	0.375				
least tern	1			0.3	2.5	0.75				
pintail			1	0.9	2.5	2.25				
egret				0.4	2.5	1				
avocet				0.5	2.5	1.25				
shorebirds	1			0.8	2.5	2				
						9.875	1.09722222			

Table 5.4-2
Calculation of HQI and HU for Restoration of Wetlands in Unit I/III Basin

	FWI	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	0.8			0.24	3.7	.89	
anchovy	0.8			0.24	3.7	.89	
grebe				0.3	3.7	1.11	
scaup	0.8	0		0.12	3.7	.44	
least tern	0.8			0.24	3.7	.89	
pintail			0.5	0.45	3.7	1.67	
egret				0.4	3.7	1.48	
avocet				0.5	3.7	1.85	
shorebirds	0.8			0.64	3.7	2.37	
						11.58	1.29

Table 5.4-3
Calculation of HQI and HU Restoration of Intertidal Habitat on Shellmaker Island

	FWI	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1			0.3	3	.9	
anchovy	1			0.3	3	.9	
grebe				0.3	3	.9	
scaup	1	0		0.15	3	.45	
least tern	1			0.3	3	.9	
pintail			0.5	0.45	3	1.35	
egret				0.4	3	1.2	
avocet				0.5	3	1.5	
shorebirds	1			0.8	3	2.4	
						10.5	1.17

Table 5.5-1
Calculation of HQI and HU for Intertidal Habitat in Side Channel on Middle Island

	FWI	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1			0.3	3	.9	
anchovy	1			0.3	3	.9	
grebe				0.3	3	.9	
scaup	1	0		0.15	3	.45	
least tern	1			0.3	3	.9	
pintail			1	0.9	3	2.7	
egret				0.4	3	1.2	
avocet				0.5	3	1.5	
shorebirds	1			0.8	3	2.4	
						11.85	2.32

Table 5.5-2
Calculation of Gain in HU for Intertidal Mudflats from Side Channel on Middle Island

Species	HQI formula	FWI	WDS	WDP	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
grebe	0.3P	1			0.6	0.2	0.18	0.9774	0.06	0.3258	0.6516	
scaup	0.3([WDS+FWI+P]/3)	1	0.1		0.6	0.2	0.17	0.9231	0.13	0.7059	0.2172	
least tern	0.3([FWI+P]/2)	1			0.6	0.2	0.24	1.3032	0.18	0.9774	0.3258	
pintail	(WDP+P)/2*.9	1		0.8	0.6	0.2	0.63	3.4209	0.45	2.4435	0.9774	
great egret	.4*P	1			0.6	0.2	0.24	1.3032	0.08	0.4344	0.8688	
avocet	.5P	1			0.6	0.2	0.3	1.629	0.1	0.543	1.086	
shorebirds	(FWI+P)/2*.8	1			0.6	0.2	0.64	3.4752	0.48	2.6064	0.8688	
											4.9956	0.713657

Table 5.5-3
Calculation of HQI and HU for Gain in Subtidal Habitat in Side Channel on Middle Island

Species	FWI	WDA	WDG	HDW	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1						0.7	3	2.1	
anchovy	1	0.5					0.525	3	1.58	
grebe			1	1			0.7	3	2.1	
scaup	1			1	1		0.7	3	2.1	
least tern	1						0.7	3	2.1	
pintail				1		1	0.1	3	0.3	
									10.28	1.71

Table 5.5-4
Gain in HU for Low Saltmarsh from Excavation of Side Channel on Middle Island

Species	HQI formula	FWI	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	0.4P		0.6	0.2	0.24	1.5816	0.08	0.5272	1.0544	
clapper rail	.5P		0.6	0.2	0.3	1.977	0.1	0.659	1.318	
shorebirds	.2([FWI+P]/2)	1	0.6	0.2	0.16	1.0544	0.12	0.7908	0.2636	
Beldings	.2P		0.6	0.2	0.12	0.7908	0.04	0.2636	0.5272	
									3.1632	0.7908

Table 5.5-5
Gain in HU for Mid Saltmarsh from Excavation of Side Channel on Middle Island

Species	HQI formula	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	.1P	0.6	0.2	0.06	0.7128	0.02	0.2376	0.4752	
clapper rail	.3P	0.6	0.2	0.18	2.1384	0.06	0.7128	1.4256	
Beldings	.5P	0.6	0.2	0.3	3.564	0.1	1.188	2.376	
								4.2768	1.4256

Table 5.5-6
Calculation of Gain in HU for Subtidal Habitat from Restoring Shellmaker Island Side Channel

Species	FWI	WDA	WDG	HDW	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1						0.7	3.5	2.45	
anchovy	1	0.5					0.052265	3.5	0.182927	
grebe			1	1			0.7	3.5	2.45	
scaup	1			1	1		0.7	3.5	2.45	
least tern	1						0.7	3.5	2.45	
pintail				1		1	0.1	3.5	0.35	
									10.33293	1.722154

Table 5.5-7
Calculation of Loss of HU from Excavation of a Side Channel at Shellmaker Island

	FWI	WDS	WDP	HQI	Acres	HU	HU/# Species
halibut	1			0.3	3.5	1.05	
anchovy	1			0.3	3.5	1.05	
grebe				0.3	3.5	1.05	
scaup	1	0		0.15	3.5	0.525	
least tern	1			0.3	3.5	1.05	
pintail			1	0.9	3.5	3.15	
egret				0.4	3.5	1.4	
avocet				0.5	3.5	1.75	
shorebirds	1			0.8	3.5	2.8	
						13.825	1.536111

Table 5.5-8
Calculation of Gain in HU for Protection from Predation from Side Channel Restoration on Shellmaker Island

Species	HQI formula	FWI	WDS	WDP	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
grebe	0.3P	1			0.6	0.2	0.18	1.6704	0.06	0.5568	1.1136	
scaup	([WDS+FWI+P])	1	0.1		0.6	0.2	0.17	1.5776	0.13	1.2064	0.3712	
least tern	0.3([FWI+P]/2)	1			0.6	0.2	0.24	2.2272	0.18	1.6704	0.5568	
pintail	(WDP+P)/2*.9	1		0.8	0.6	0.2	0.63	5.8464	0.45	4.176	0.6704	
great egret	.4*P	1			0.6	0.2	0.24	2.2272	0.08	0.7424	1.4848	
avocet	.5P	1			0.6	0.2	0.3	2.784	0.1	0.928	0.856	
shorebirds	(FWI+P)/2*.8	1			0.6	0.2	0.64	5.9392	0.48	4.4544	1.4848	
											8.5376	1.219657143

Table 5.5-9
Gain in HU for Low Saltmarsh on Shellmaker Island from Protection from Predators

Species	HQI formula	FWI	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	0.4P		0.6	0.2	0.24	0.9096	0.08	0.3032	0.6064	
clapper rail	.5P		0.6	0.2	0.3	1.137	0.1	0.379	0.758	
shorebirds	.2([FWI+P]/2)	1	0.6	0.2	0.16	0.6064	0.12	0.4548	0.1516	
Beldings	.2P		0.6	0.2	0.12	0.4548	0.04	0.1516	0.3032	
									1.8192	0.4548

Table 5.5-10
Gain in HU for Mid Saltmarsh from Excavation of Side Channel on Shellmaker Island

Species	HQI Formula	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	.1P	0.6	0.2	0.06	0.5592	0.02	0.1864	0.3728	
clapper rail	.3P	0.6	0.2	0.18	1.6776	0.06	0.5592	1.1184	
Beldings	.5P	0.6	0.2	0.3	2.796	0.1	0.932	1.864	
								3.3552	1.1184

Table 5.5-11
Gain in HU for High Saltmarsh from Excavation of Side Channel on Shellmaker Island

Species	HQI Formula	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of species
egret	0.1	0.6	0.2	0.06	0.1266	0.02	0.0422	0.0844	
avocet	0.5	0.6	0.2	0.3	0.633	0.1	0.211	0.422	
clapper rail	0.2	0.6	0.2	0.12	0.2532	0.04	0.0844	0.1688	
Beldings	0.3	0.6	0.2	0.18	0.3798	0.06	0.1266	0.2532	
								0.9284	0.2321

Table 5.7-1
Calculation of Gain in HU for Intertidal Mudflat from Segmentation of Main Dike

Species	HQI formula	FWI	WDS	WDP	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
grebe	0.3P	0.8			0.4	0.3	0.12	0.5952	0.09	0.4464	0.1488	
scaup	0.3([WDS+FWI+P]/3)	0.8	0.1		0.4	0.3	0.13	0.6448	0.12	0.5952	0.0496	
least tern	0.3([FWI+P]/2)	0.8			0.4	0.3	0.18	0.8928	0.165	0.8184	0.0744	
pintail	(WDP+P)/2*.9	0.8		0.8	0.4	0.3	0.54	2.6784	0.495	2.4552	0.2232	
great egret	.4*P	0.8			0.4	0.3	0.16	0.7936	0.12	0.5952	0.1984	
avocet	.5P	0.8			0.4	0.3	0.2	0.992	0.15	0.744	0.248	
shorebirds	(FWI+P)/2*.8	0.8			0.4	0.3	0.56	2.7776	0.52	2.5792	0.1984	
											1.1408	0.162971429

Table 5.7-2
Gain in HU for Low Saltmarsh from Segmentation of Main Dike

Species	HQI formula	FWI	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/0 Channel	Gain in HU	HU/# of Species
great egret	0.4P		0.4	0.3	0.16	1.032	0.12	0.774	0.258	
clapper rail	.5P		0.4	0.3	0.2	1.29	0.15	0.9675	0.3225	
shorebirds	.2([FWI+P]/2)	0.8	0.4	0.3	0.12	0.774	0.11	0.7095	0.0645	
Beldings	.2P		0.4	0.3	0.08	0.516	0.06	0.387	0.129	
									0.774	0.1935

Table 5.7-3
Gain in HU for Mid Saltmarsh from Segmentation of Main Dike

Species	HQI Formula	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
great egret	.1P	0.4	0.3	0.04	0.2092	0.03	0.1569	0.0523	
clapper rail	.3P	0.4	0.3	0.12	0.6276	0.09	0.4707	0.1569	
Beldings	.5P	0.4	0.3	0.2	1.046	0.15	0.7845	0.2615	
								0.4707	0.1569

Table 5.7-4
Gain in HU for High Saltmarsh from Segmentation of Main Dike

Species	HQI Formula	P w/ Channel	P w/o Channel	HQI w/ Channel	HU w/ Channel	HQI w/o Channel	HU w/o Channel	Gain in HU	HU/# of Species
egret	0.1	0.4	0.3	0.04	0.022	0.03	0.0165	0.0055	
avocet	0.5	0.4	0.3	0.2	0.11	0.15	0.0825	0.0275	
clapper rail	0.2	0.4	0.3	0.08	0.044	0.06	0.033	0.011	
Beldings	0.3	0.4	0.3	0.12	0.066	0.09	0.0495	0.0165	
								0.0605	0.015125

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APPENDIX B

LIST OF VASCULAR PLAN SPECIES RECORDED FOR UPPER NEWPORT BAY

APPENDIX B
ECOLOGICAL COMMUNITY DATA

TABLE 1: Plants of Upper Newport Bay

Notes: * denotes old genus name
@ denotes variety or subspecies not recognized in the Jepson Manual, Higher Plants of California
# denotes plant is California native

Source: De Ruff (September 1995)

PLANTS OF UPPER NEWPORT BAY
ALPHABETICAL LIST BY GENUS NAME
AS COMPILED BY ROBERT DE RUFF THROUGH SEPTEMBER 1995

GENUS NAME	FAMILY NAME	COMMON NAME	PLANT DATA NO.
Abutilon theophrasti	Malvaceae	Velvet Leaf	359
Acacia cyanophylla	Fabaceae	Blue-Leaved Wattle	071
Acacia cyclops	Fabaceae	Acacia	294
Acacia latifolia*	Fabaceae	Golden Wattle	072
Acacia longifolia	Fabaceae	Golden Wattle	072
Acacia retinodes	Fabaceae	Wirilda	073
Achillea millefolium var. millefolium* #	Asteraceae	White Yarrow	141
Achillea millefolium #	Asteraceae	White Yarrow	141
Adiantum jordanii #	Polypodiaceae	California Maiden-Hair	486
Aeonium arboreum	Crassulaceae	Aeonium	234,421
Aeonium arboreum var. arboreum* @	Crassulaceae	Aeonium	234,421
Aeonium arboreum var. atropurpureum* @	Crassulaceae	Aeonium	234,421
Aeonium haworthii	Crassulaceae	Aeonium	412
Aeonium species (no. one)	Crassulaceae	Aeonium	406
Aeonium species (no. two)	Crassulaceae	Aeonium	433
Agave americana	Liliaceae	Century Plant	115
Agave attenuata	Liliaceae	Agave	357
Agrostis semiverticillata*	Poaceae	Water Bent-Grass	037
Agrostis stolonifera	Poaceae	Creeping Bent-Grass	390
Agrostis stolonifera var. palustris*	Poaceae	Creeping Bent-Grass	390
Agrostis viridis	Poaceae	Water Bent-Grass	037
Ailanthus altissima	Simroubaceae	Tree of Heaven	418
Aloe humilis	Liliaceae	Aloe	420
Aloe perfoliata var. humilis*	Liliaceae	Aloe	420
Aloe saponaria	Liliaceae	Aloe	109
Alopecurus pratensis	Poaceae	Meadow Foxtail	360
Amaranthus albus	Amaranthaceae	Tumbleweed	124
Amaranthus blitoides x albus	Amaranthaceae	Amaranthus Hybrid	299
Amaranthus blitoides #	Amaranthaceae	Prostrate Amaranth	451
Amaranthus deflexus	Amaranthaceae	Low Pigweed	403
Amaranthus graecizans*	Amaranthaceae	Tumbleweed	124
Amaranthus retroflexus	Amaranthaceae	Rough Pigweed	458
Amblyopappus pusillus #	Asteraceae	Coast Weed	142
Ambrosia acanthicarpa #	Asteraceae	Annual Burweed	298
Ambrosia chamissonis #	Asteraceae	Beach Bur	143
Ambrosia psilostachya var. californica* #	Asteraceae	Western Ragweed	144
Ambrosis psilostachya #	Asteraceae	Western Ragweed	144
Amsinckia intermedia* #	Boraginaceae	Fiddleneck	202
Amsinckia menziesii var. intermedia #	Boraginaceae	Fiddleneck	202
Amsinckia menziesii var. menziesii #	Boraginaceae	Rancher's Fireweed	461
Anagallis arvensis	Primulaceae	Scaralet Pimpernel	265,453
Anagallis arvensis var. arvensis* @	Primulaceae	Scarlet Pimpernel	265,453
Anagallis arvensis var. caerulea* @	Primulaceae	Blue Pimpernel	265,453

Anemopsis californica #	Saururaceae	Yerba Mansa	274
Anthemis cotula	Asteraceae	Mayweed	295
Anthriscus caucalis	Apiaceae	Bur-Chervil	483
Antirrhinum nuttallianum ssp. subsessile #	Scrophulariaceae	Nuttall's Snapdragon	275
Aphanes occidentalis #	Rosaceae	Western Lady's Mantle	477
Aphanisma blitoides #	Chenopodiaceae	Aphanisma	422
Apiastrum angustifolium #	Apiaceae	Mock Parsley	137
Apium graveolens	Apiaceae	Celery	136
Aristea capitata	Iridaceae	Aristea	116
Artemisia californica #	Asteraceae	Coastal Sagebrush	145
Artemisia douglasiana #	Asteraceae	California Mugwort	147
Artemisia dracunculus #	Asteraceae	Dragon Sagewort	146
Artemisia vulgaris var. californica* #	Asteraceae	California Mugwort	147
Arthrocnemum subterminale* #	Chenopodiaceae	Glasswort	226
Arundo donax	Poaceae	Giant Reed	036
Asclepias fascicularis #	Asclepiadaceae	Narrow-Leaved Milkweed	135
Asparagus asparagoides	Liliaceae	Smilax	436
Asparagus officinalis ssp. officinalis	Liliaceae	Garden Asparagus	108
Asparagus sprengeri	Liliaceae	Asparagus Fern	110
Aster exilis* #	Asteraceae	Slender Aster	148
Aster subulatus var. ligulatus #	Asteraceae	Slender Aster	148
Astragalus gambellianus #	Fabaceae	Gambel's Locoweed	408
Atriplex canescens ssp. canescens #	Chenopodiaceae	Four-Winged Saltbush	214
Atriplex decumbens* #	Chenopodiaceae	Watson's Saltbush	219
Atriplex glauca	Chenopodiaceae	Glaucus-Leaved Saltbush	297
Atriplex lentiformis ssp. breweri* #	Chenopodiaceae	Brewer's Saltbush	215
Atriplex lentiformis ssp. lentiformis #	Chenopodiaceae	Brewer's Saltbush	215
Atriplex patula ssp. hastata*	Chenopodiaceae	Spear Orache	216
Atriplex rosea	Chenopodiaceae	Redscale	217
Atriplex semibaccata	Chenopodiaceae	Australian Saltbush	218
Atriplex serenana var. davidsonii #	Chenopodiaceae	Davidson's Saltbush	361
Atriplex serenana var. serenana #	Chenopodiaceae	Bracted Saltbush	407
Atriplex species	Chenopodiaceae	Atriplex	369
Atriplex triangularis #	Chenopodiaceae	Spear Orache	216
Atriplex watsonii #	Chenopodiaceae	Watson's Saltbush	219
Avena barbata	Poaceae	Slender Wild Oat	038
Avena fatua	Poaceae	Wild Oat	039
Avena sativa	Poaceae	Cultivated Oat	435
Azolla filiculoides #	Azollaceae	Fern-Like Azolla	296
Baccharis emoryi #	Asteraceae	Emory Baccharis	149
Baccharis g~~lutinosa*~~ #	Asteraceae	Mule Fat	151
Baccharis piluaris #	Asteraceae	Coyote Brush	150
Baccharis pilularis ssp. consanguinea* #	Asteraceae	Coyote Brush	150
Baccharis salicifolia #	Asteraceae	Mule Fat	151
Baccharis sarathroides #	Asteraceae	Broom Baccharis	387
Baccharis viminea* #	Asteraceae	Mule Fat	151
Bassia hyssopifolia	Chenopodiaceae	Five-Hooked Bassia	220
Batis maritima #	Batidaceae	Saltwort	201
Beta vulgaris	Chenopodiaceae	Beet	221
Beta vulgaris var. cicla	Chenopodiaceae	Leaf-Beet	470
Bloomeria crocea ssp. crocea* #	Liliaceae	Golden Stars	125
Bloomeria crocea #	Liliaceae	Golden Stars	125

Bougainvillea glabra	Nyctaginaceae	Bougainvillea	348
Bowlesia incana #	Apiaceae	American Bowlesia	300
Brachypodium distachyon	Poaceae	Purple False Brome	395
Brassica campestris*	Brassicaceae	Common Yellow Mustard	002
Brassica geniculata*	Brassicaceae	Short-Podded Mustard	003
Brassica incana*	Brassicaceae	Short-Podded Mustard	003
Brassica nigra	Brassicaceae	Black Mustard	004
Brassica rapa	Brassicaceae	Common Yellow Mustard	002
Brassica rapa ssp. sylvestris*	Brassicaceae	Common Yellow Mustard	002
Brassica tournefortii	Brassicaceae	Wild Turnip	005
Briza minor	Poaceae	Small Quaking-Grass	478
Brodiaea capitatum* #	Liliaceae	Blue-Dicks	126
Brodiaea pulchella* #	Liliaceae	Blue-Dicks	126
Bromus carinatus var. carinatus #	Poaceae	California Brome Grass	098
Bromus catharticus	Poaceae	Rescue Grass	041
Bromus diandrus	Poaceae	Ripgut Grass	097
Bromus hordeaceous	Poaceae	Soft Chess	096
Bromus hordeaceous ssp. hordeaceous*	Poaceae	Soft Chess	096
Bromus madritensis ssp. rubens	Poaceae	Red Brome	040
Bromus mollis*	Poaceae	Soft Chess	096
Bromus rigidus*	Poaceae	Ripgut Grass	097
Bromus rubens*	Poaceae	Red Brome	040
Bromus tectorum	Poaceae	Cheat Grass	481
Bromus unioloides*	Poaceae	Rescue Grass	041
Cakile maritima	Brassicaceae	Sea Rocket	006
Calandrinia ciliata	Portulacaceae	Red Maids	253
Calandrinia ciliata var. menziesii*	Portulacaceae	Red Maids	253
Calendula officinalis	Asteraceae	Pot-Marigold	449
Callistemon viminalis	Myrtaceae	Weeping Bottle Brush	301
Callitriche longipedunculata* #	Callitrichaceae	Long-stalked Water-starwrt	441
Callitriche marginata #	Callitrichaceae	Long-stalked Water-starwrt	441
Calystegia macrostegia ssp. cyclostegia #	Convolvulaceae	Island Morning Glory	310
Calystegia macrostegia ssp. intermedia #	Convolvulaceae	Short-Lobed Morning Glory	463
Camissonia bistorta #	Onagraceae	Southern Suncup	157
Camissonia cheiranthifolia ssp. suffruticosa #	Onagraceae	Beach Evening Primrose	241
Camissonia lewisii #	Onagraceae	Lewis' Primrose	363
Camissonia micrantha #	Onagraceae	Small Primrose	087
Capsella bursa-pastoris	Brassicaceae	Shepherd's Purse	001
Cardamine oligosperma #	Brassicaceae	Few-seeded Bittercress	472
Carduus pycnocephalus	Asteraceae	Italian Thistle	303
Carex praegracilis #	Cyperaceae	Clustered Field Sedge	018
Carpobrotus aequilaterus*	Aizoaceae	Sea-Fig	117
Carpobrotus chilensis	Aizoaceae	Sea-Fig	117
Carpobrotus edulis	Aizoaceae	Hottentot Fig	118
Castilleja affinis ssp. affinis #	Scrophulariaceae	Coastal Paint Brush	276
Castilleja exserta #	Scrophulariaceae	Purple Owl's Clover	279
Centaurea melitensis	Asteraceae	Star Thistle	154
Centaurea muricata	Asteraceae	Muricated Thistle	364
Cerastium glomeratum	Caryophyllaceae	Mouse-ear Chickweed	475
Chaetochloa verticillata*	Poaceae	Bristly Foxtail	055
Chamaesyce maculata	Euphorbiaceae	Spotted Spurge	316
Chamaesyce polycarpa var. polycarpa* #	Euphorbiaceae	Golondrina	092

Chamaesyce polycarpa #	Euphorbiaceae	Golondrina	092
Chamaesyce serpens	Euphorbiaceae	Euphorbia	367
Chamomilla suaveolens #	Asteraceae	Pineapple Weed	187
Chenopodium album	Chenopodiaceae	Lamb's Quarters	222
Chenopodium ambrosioides	Chenopodiaceae	Mexican-Tea	223
Chenopodium berlandieri var. sinuatum* #	Chenopodiaceae	Pitseed Goosefoot	304
Chenopodium berlandieri #	Chenopodiaceae	Pitseed Goosefoot	304
Chenopodium californicum #	Chenopodiaceae	Soap Plant	224
Chenopodium carinatum*	Chenopodiaceae	Tasmanian Goosefoot	307
Chenopodium macrospermum var. farinosum* #	Chenopodiaceae	Coast Goosefoot	305
Chenopodium macrospermum var. halophilum #	Chenopodiaceae	Coast Goosefoot	305
Chenopodium murale	Chenopodiaceae	Nettle-Leaved Goosefoot	365
Chenopodium pumilio	Chenopodiaceae	Tasmanian Goosefoot	307
Chenopodium rubrum #	Chenopodiaceae	Red Goosefoot	306
Chrysanthemum coronarium	Asteraceae	Garland Chrysanthemum	152
Chrysanthemum parthenium *	Asteraceae	Feverfew	155
Cirsium lanceolatum*	Asteraceae	Bull Thistle	158
Cirsium occidentale var. venustum #	Asteraceae	Cobweb Thistle	484
Cirsium vulgare	Asteraceae	Bull Thistle	158
Cistus creticus	Cistaceae	Rock Rose	349
Cistus incanus ssp. creticus*	Cistaceae	Rock Rose	349
Cistus villosus ssp. creticus*	Cistaceae	Rock Rose	349
Citrullus colocynthis var. lanatus	Cucurbitaceae	Watermelon	302
Citrullus lanatus var. lanatus*	Cucurbitaceae	Watermelon	302
Citrullus vulgaris*	Cucurbitaceae	Watermelon	302
Claytonia perfoliata ssp. perfoliata #	Portulacaceae	Miner's Lettuce	264
Conium maculatum	Apiaceae	Poison-Hemlock	138
Convolvulus arvensis	Convolvulaceae	Bindweed	231
Conyza bonariensis	Asteraceae	Flax-Leaved Fleabane	161
Conyza canadensis #	Asteraceae	Horseweed	159
Conyza coulteri #	Asteraceae	Coulter's Conyza	160
Cordylanthus maritimus ssp. maritimus #	Scrophulariaceae	Saltmarsh Bird's Beak	277
Corethrogyne filaginifolia var. latifolia* @ #	Asteraceae	Common Corethrogyne	162,308
Corethrogyne filaginifolia var. virgata* @ #	Asteraceae	Virgate Corethrogyne	162,308
Coronopus didymus	Brassicaceae	Wart-Cress	089
Cortaderia atacamensis*	Poaceae	Pampas Grass	058
Cortaderia dioica*	Poaceae	Pampas Grass	058
Cortaderia selloana	Poaceae	Pampas Grass	058
Cosmos bipinnatus	Asteraceae	Cosmos	467
Cotula australis	Asteraceae	Aust. Brass-Buttons	163
Cotula coronopifolia	Asteraceae	Common Brass-Buttons	164
Crassula aquatica #	Crassulaceae	Water Pigmy-weed	480
Crassula argentea	Crassulaceae	Jade Plant	235
Crassula connata var. erectoides* #	Crassulaceae	Pigmy-Stonecrop	236
Crassula connata #	Crassulaceae	Pigmy-Stonecrop	236
Crassula erecta* #	Crassulaceae	Pigmy-Stonecrop	236
Crassula portulacea*	Crassulaceae	Jade Plant	235
Crassula tetragonia	Crassulaceae	Chinese Pine	350
Crassula tillaea	Crassulaceae	Crassula	476
Cressa truxillensis var. vallicola* #	Convolvulaceae	Alkali Clover	232
Cressa truxillensis #	Convolvulaceae	Alkali Clover	232
Croton californicus var. californicus* @ #	Euphorbiaceae	California Croton	028,345

Croton californicus var. tenuis* @ #	Euphorbiaceae	California Croton	028,345
Croton californicus #	Euphorbiaceae	California Croton	028,345
Cryophytum crystallinum*	Aizoaceae	Crystal Ice Plant	119
Cryptantha clevelandii var. clevelandii* @ #	Boraginaceae	Cleveland's Cryptantha	430,416
Cryptantha clevelandii var. florosa* @ #	Boraginaceae	Cleveland's Large Cryptantha	430,416
Cryptantha intermedia #	Boraginaceae	White Forget-Me-Not	203
Cucurbita foetidissima #	Cucurbitaceae	Calabazilla	016
Cuscuta salina var. major #	Cuscutaceae	Salicornia Dodder	233
Cynara cardunculus	Asteraceae	Artichoke Thistle	165
Cynodon dactylon	Poaceae	Bermuda Grass	043
Cynodon hybrid	Poaceae	Hybrid Bermuda Grass	457
Cyperus alternifolius*	Cyperaceae	Umbrella Plant	019
Cyperus eragrostis #	Cyperaceae	Tall Umbrella Sedge	020
Cyperus erythrorhizos #	Cyperaceae	Red-Rooted Cyperus	311
Cyperus esculentus #	Cyperaceae	Yellow Nut Grass	021
Cyperus ferax* #	Cyperaceae	Coarse Cyperus	309
Cyperus involucratus	Cyperaceae	Umbrella Plant	019
Cyperus odoratus #	Cyperaceae	Coarse Cyperus	309
Cyrptantha clevelandii #	Boraginaceae	Cleveland's Cryptantha	430,416
Cyrtomium falcatum	Dryopteridaceae	Holly Fern	487
Datura meteloides* #	Solanaceae	Jimson Weed	312
Datura wrightii #	Solanaceae	Jimson Weed	312
Daucus pusillus #	Apiaceae	Rattlesnake Weed	139
Descurainia pinnata ssp. menziesii #	Brassicaceae	Tansy-Mustard	007
Dichelostemma capitatum* #	Liliaceae	Blue-Dicks	126
Dichelostemma pulchella #	Liliaceae	Blue-Dicks	126
Dichondra repens	Convolvulaceae	Dichondra	313
Digitaria sanguinalis	Poaceae	Hairy Crab Grass	366
Dimorphotheca sinuata	Asteraceae	Blue-Eyed Cape-Marigold	320
Diplachne uninervia* #	Poaceae	Mexican Strangle-Top	050
Diplotaxis muralis	Brassicaceae	Sand Rocket	314
Distichlis spicata ssp. spicata* #	Poaceae	Salt Grass	042
Distichlis spicata #	Poaceae	Salt Grass	042
Drosanthemum floribundum	Aizoaceae	Ice Plant	120
Dudleya lanceolata #	Crassulaceae	Live-forever	237
Echinochloa crus-galli	Poaceae	Barnyard Grass	044
Echinochloa crus-galli var. crus-galli*	Poaceae	Barnyard Grass	044
Echinocystus macrocarpus* #	Cucurbitaceae	Chilicothe Vine	017
Echinopsilon hyssopifolium*	Chenopodiaceae	Five-Hooked Bassia	220
Echium fastuosum	Boraginaceae	Pride of Madeira	204
Eclipta alba*	Asteraceae	False Daisy	317
Eclipta prostrata	Asteraceae	False Daisy	317
Eichhornia crassipes	Pontederiaceae	Water Hyacinth	263
Eleocharis macrostachya #	Cyperaceae	Common Spike-Rush	023
Eleocharis palustris* #	Cyperaceae	Common Spike-Rush	023
Eleocharis parvula var. parvula* #	Cyperaceae	Little Spike-Rush	022
Eleocharis parvula #	Cyperaceae	Little Spike-Rush	022
Ellisia chrysanthemifolia* #	Hydrophyllaceae	Common Eucrypta	060
Elymus condensatus* #	Poaceae	Giant Rye Grass	095
Elymus triticoides* #	Poaceae	Beardless Wild-Rye	318
Encelia californica #	Asteraceae	California Encelia	166
Encelia farinosa x californica #	Asteraceae	Encelia Hybrid	315

Encelia farinosa #	Asteraceae	Brittlebush	167
Epilobium adenocaulon var. parishii* #	Onagraceae	Willow-Herb	088
Epilobium californicum* #	Onagraceae	Willow-Herb	088
Epilobium canum ssp. angustifolium* #	Onagraceae	California Fuchsia	460
Epilobium canum ssp. canum #	Onagraceae	California Fuchsia	460
Epilobium ciliatum ssp. ciliatum #	Onagraceae	Willow-Herb	088
Eremocarpus setigerus #	Euphorbiaceae	Turkey-Mullein	091
Ericameria pachylepis* #	Asteraceae	Palmer's Ericameria	178
Ericameria palmeri var. pachylepis #	Asteraceae	Palmer's Ericameria	178
Erigeron canadensis* #	Asteraceae	Horseweed	159
Erigeron linifolius*	Asteraceae	Flax-Leaved Fleabane	161
Eriogonum elongatum var. elongatum #	Polygonaceae	Long-Stemmed Buckwheat	254
Eriogonum fasciculatum var. fasciculatum #	Polygonaceae	California Buckwheat	255
Eriogonum fasciculatum var. foliolosum #	Polygonaceae	Flat-Topped Buckwheat	347
Eriogonum parvifolium #	Polygonaceae	Coast Buckwheat	256
Eriophyllum confertiflorum var. confertiflorum #	Asteraceae	Golden Yarrow	168
Erodium botrys	Geraniaceae	Broad Leaf Filaree	032
Erodium cicutarium	Geraniaceae	Red-stem Filaree	033
Erodium moschatum	Geraniaceae	White-stem Filaree	034
Erythrina indica	Fabaceae	Coral Tree	103
Eschscholzia californica cv. rosea #	Papaveraceae	Pink California Poppy	319
Eschscholzia californica var. peninsularis* #	Papaveraceae	California Poppy	239
Eschscholzia californica #	Papaveraceae	California Poppy	239
Eucalyptus globulus	Myrtaceae	Tasmanian Blue Gum	404
Eucrypta chrysanthemifolia var. chrysanthemifolia#	Hydrophyllaceae	Common Eucrypta	060
Euphorbia peplus	Euphorbiaceae	Petty Spurge	029
Euphorbia polycarpa var. polycarpa* #	Euphorbiaceae	Golondrina	092
Euphorbia serpens*	Euphorbiaceae	Euphorbia	367
Euphorbia supina*	Euphorbiaceae	Spotted Spurge	316
Euthamia occidentalis #	Asteraceae	Western Goldenrod	194
Festuca arundinacea	Poaceae	Tall Meadow Fescue	045
Festuca elatior var. arundinacea*	Poaceae	Tall Meadow Fescue	045
Festuca megalura*	Poaceae	Foxtail Fescue	445
Festuca myuros*	Poaceae	Rats Tail Fescue	046
Filago californica #	Asteraceae	California Filago	169
Filago gallica	Asteraceae	Narrow-Leaved Filago	170
Foeniculum vulgare	Apiaceae	Sweet Fennel	140
Foeniculum vulgare var. vulgare*	Apiaceae	Sweet Fennel	140
Frankenia grandiflora* #	Frankeniaceae	Alkali Heath	031
Frankenia salina #	Frankeniaceae	Alkali Heath	031
Franseria chamissonis ssp. bipinnatifida* #	Asteraceae	Beach Bur	143
Fraxinus uhdei	Oleaceae	Shamel Ash	086
Fraxinus velutina var. coriacea* #	Oleaceae	Velvet Ash	424
Fraxinus velutina #	Oleaceae	Velvet Ash	424
Fuchsia triphylla	Onagraceae	Gartenmeister	429
Fumaria parviflora	Papaveraceae	Fumitory	474
Galium angustifolium ssp. angustifolium #	Rubiaceae	Narrow-Leaved Bedstraw	322
Galium aparine #	Rubiaceae	Common Bedstraw	270
Gasoul crystallinum*	Aizoaceae	Crystal Ice Plant	119
Gasoul nodiflorum*	Aizoaceae	Small-Fld. Ice Plant	122
Gazania linearis	Asteraceae	Treasure Flower	351
Gazania longiscapa*	Asteraceae	Treasure Flower	351

Gazania species	Asteraceae	Gazania	171
Geranium dissectum	Geraniaceae	Cut-Leaved Geranium	093
Gilia angelensis #	Polemoniaceae	Grassland Gilia	368
Gilia australis #	Polemoniaceae	Southern Gilia	321
Gilia capitata ssp. abrotanifolia #	Polemoniaceae	Blue Field Gilia	251
Gilia clivorum #	Polemoniaceae	Hillside Gilia	252
Gnaphalium beneolens* #	Asteraceae	Fragrant Everlasting	346
Gnaphalium bicolor #	Asteraceae	Cudweed	172
Gnaphalium californicum #	Asteraceae	California Everlasting	173
Gnaphalium canescens ssp. beneolens #	Asteraceae	Fragrant Everlasting	346
Gnaphalium canescens ssp. microcephalum #	Asteraceae	White Everlasting	175
Gnaphalium chilense var. chilense* #	Asteraceae	Cotton-Batting Everlasting	174
Gnaphalium luteo-album	Asteraceae	Weedy Cudweed	370
Gnaphalium microcephalum* #	Asteraceae	White Everlasting	175
Gnaphalium palustre #	Asteraceae	Lowland Cudweed	454
Gnaphalium ramosissimum #	Asteraceae	Pink Everlasting	176
Gnaphalium stramineum #	Asteraceae	Cotton-Batting Everlasting	174
Grindelia camporum var. bracteosum #	Asteraceae	Gum Plant	177
Grindelia robusta* #	Asteraceae	Gum Plant	177
Haplopappus palmeri ssp. pachylepis* #	Asteraceae	Palmer's Ericameria	178
Haplopappus venetus ssp. vernonioides* #	Asteraceae	Coastal Goldenbush	179
Hedera canariensis	Araliaceae	Algerian Ivy	134
Hedera helix	Araliaceae	English Ivy	415
Hedypnois cretica	Asteraceae	Fragrant Rhagadiolus	180
Helianthus annuus ssp. lenticularis* #	Asteraceae	Common Sunflower	181
Helianthus annuus #	Asteraceae	Common Sunflower	181
Heliotropium curassavicum var. oculatum* #	Boraginaceae	Salt Heliotrope	205
Heliotropium curassavicum #	Boraginaceae	Salt Heliotrope	205
Hemizonia australis* #	Asteraceae	Southern Spike Weed	153
Hemizonia fasciculata #	Asteraceae	Tarweed	182
Hemizonia parryi ssp. australis #	Asteraceae	Southern Spike Weed	153
Hemizonia ramosissima* #	Asteraceae	Tarweed	182
Hesperocnide tenella #	Urticaceae	Western Nettle	371
Heteromeles arbutifolia #	Rosaceae	Toyon	266
Heterotheca grandiflora #	Asteraceae	Telegraph Weed	183
Hirschfeldia incana	Brassicaceae	Short-Podded Mustard	003
Hordeum depressum #	Poaceae	Meadow Barley	047
Hordeum geniculatum*	Poaceae	Mediterranean Barley	444
Hordeum leporinum*	Poaceae	Common Fox Tail	048
Hordeum marinum ssp. gussoneanum	Poaceae	Mediterranean Barley	444
Hordeum murinum ssp. leporinum	Poaceae	Common Fox Tail	048
Hordeum nodosum* #	Poaceae	Meadow Barley	047
Hordeum vulgare	Poaceae	Cultivated Barley	049
Hosackia americana* #	Fabaceae	Spanish Lotus	105
Hosackia micrantha* #	Fabaceae	San Diego Hosackia	104
Hosackia strigosa* #	Fabaceae	Strigose Hosackia	102
Hypochoeris glabra	Asteraceae	Smooth Cat's-Ear	323
Isocoma menziesii var. vernonioides #	Asteraceae	Coastal Goldenbush	179
Isocoma veneta var. vernonioides* #	Asteraceae	Coastal Goldenbush	179
Isomeris arborea var. globosa* #	Capparaceae	Inflated Bladderpod	209
Isomeris arborea #	Capparaceae	Inflated Bladderpod	209
Jaumea carnosa #	Asteraceae	Fleshy Jaumea	184

Juncus acutus ssp. leopoldii #	Juncaceae	Sharp-Leaved Rush	064
Juncus acutus var. sphaerocarpus* #	Juncaceae	Sharp-Leaved Rush	064
Juncus balticus #	Juncaceae	Baltic Rush	065
Juncus bufonius var. bufonius #	Juncaceae	Toad Rush	066
Juncus mexicanus #	Juncaceae	Mexican Rush	468
Jussiaea repens var. californica* #	Onagraceae	Yellow Water Weed	156
Kochia californica #	Chenopodiaceae	Mojave Red Sage	459
Lactuca scariola var. integrata*	Asteraceae	Prickly Lettuce	185
Lactuca scariola*	Asteraceae	Prickly Lettuce	185
Lactuca serriola	Asteraceae	Prickly Lettuce	185
Lamarckia aurea	Poaceae	Golden-Top	325
Lamium amplexicaule	Lamiaceae	Dead Nettle Mint	068
Lantana camara var. aculeata	Verbenaceae	Lantana	482
Lasthenia glabrata ssp. glabrata #	Asteraceae	Yellow-Rayed Lasthenia	372
Laurus nobilis	Lauraceae	Laurel	391
Lavatera cretica	Malvaceae	Tree Mallow	111
Lemna minima* #	Lemnaceae	Least Duckweed	324
Lemna minuscula #	Lemnaceae	Least Duckweed	324
Lepidium lasiocarpum var. lasiocarpum #	Brassicaceae	Sand Peppercress	008
Lepidium nitidum var. nitidum #	Brassicaceae	Peppercress	009
Leptochloa uninervia #	Poaceae	Mexican Strangle-Top	050
Lessingia filaginifolia var. filaginifolia #	Asteraceae	California-Aster	162,308
Leucojum aestivum	Liliaceae	Snowflake	352
Leymus condensatus #	Poaceae	Giant Rye Grass	095
Leymus triticoides #	Poaceae	Beardless Wild Rye	318
Ligustrum lucidum	Oleaceae	Wax Leaf Privet	353
Limonium californicum #	Plumbaginaceae	Marsh-Rosemary	247
Limonium perezii	Plumbaginaceae	Perez's Sea-Lavender	248
Limonium sinuatum	Plumbaginaceae	Winged Sea-Lavender	249
Linanthus dianthiflorus ssp. dianthiflorus* #	Polemoniaceae	Ground-Pink	373
Linanthus dianthiflorus #	Polemoniaceae	Ground Pink	373
Linaria canadensis var. texana #	Scrophulariaceae	Blue Toad-Flax	278
Linum grandiflorum var. rubrum	Linaceae	Scarlet Flax	469
Lippia nodiflora var. rosea*	Verbenaceae	Garden Lippia	293
Lobelia erinus	Campanulaceae	Lobelia	211
Lobularia maritima	Brassicaceae	Sweet-Alyssum	011
Lolium multiflorum	Poaceae	Italian Ryegrass	051
Lolium perenne ssp. multiflorum*	Poaceae	Italian Ryegrass	051
Lonicera japonica var. halliana	Caprifoliaceae	Japanese Honeysuckle	401
Lotus corniculatus	Fabaceae	Bird's Foot Trefoil	074
Lotus hamatus #	Fabaceae	San Diego Hosackia	104
Lotus purshianus var. purshianus #	Fabaceae	Spanish Lotus	105
Lotus scoparius var. scoparius #	Fabaceae	Deer Weed	075
Lotus strigosus var. strigosus #	Fabaceae	Strigose Lotus	102
Lotus strigosus #	Fabaceae	Strigose Lotus	102
Lotus wrangelianus #	Fabaceae	California Lotus	479
Ludwigia peploides ssp. peploides #	Onagraceae	Yellow Water Weed	156
Lupinus bicolor ssp. umbellatus* #	Fabaceae	Miniature Lupine	076
Lupinus bicolor #	Fabaceae	Miniature Lupine	076
Lupinus succulentus #	Fabaceae	Common Lupine	077
Lupinus truncatus #	Fabaceae	Slender Lupine	078
Lycium californicum #	Solanaceae	Boxthorn	283

Lycopersicon esculentum var. cerasiforme	Solanaceae	Cherry Tomato	280
Lycopersicon hybrid	Solanaceae	Roma VF Tomato	439
Lythrum californicum #	Lythraceae	California Loosestrife	326
Lythrum hyssopifolium	Lythraceae	Grass Poly	402
Malacothamnus fasciculatus ssp. laxiflorus* #	Malvaceae	Bush Mallow	112
Malacothamnus fasciculatus #	Malvaceae	Bush Mallow	112
Malacothrix saxatilis var. tenuifolia #	Asteraceae	Cliff Aster	186
Malephora crocea	Aizoaceae	Croceum Ice Plant	121
Malephora luteola	Aizoaceae	Malephora	398
Malva parviflora	Malvaceae	Cheeseweed	113
Malvastrum fasciculatum* #	Malvaceae	Bush Mallow	112
Malvella leprosa #	Malvaceae	Alkali Mallow	114
Marah macrocarpus var. macrocarpus #	Cucurbitaceae	Chilicothe Vine	017
Marrubium vulgare	Lamiaceae	Horehound	069
Marsilea vestita ssp. vestita #	Marsileaceae	Clover Fern	428
Matricaria matricarioides* #	Asteraceae	Pineapple Weed	187
Matthiola incana	Brassicaceae	Stock	010
Medicago hispida*	Fabaceae	Calif. Bur Clover	079
Medicago polymorpha	Fabaceae	Calif. Bur Clover	079
Medicago polymorpha var. polymorpha*	Fabaceae	Calif. Bur Clover	079
Medicago sativa	Fabaceae	Alfalfa	080
Megastachya uninervia* #	Poaceae	Mexican Strangle-Top	050
Melianthus major	Melianthaceae	Honey Flower	354
Melica imperfecta var. flexuosa* @ #	Poaceae	Small Flwd. Melic Grass	327,455
Melica imperfecta #	Poaceae	Small Flwd. Melic Grass	327,455
Melilotus alba	Fabaceae	White Sweet Clover	081
Melilotus indica	Fabaceae	Yellow Sweet Clover	082
Mesembryanthemum chilense*	Aizoaceae	Sea-Fig	117
Mesembryanthemum crocea*	Aizoaceae	Croceum Ice Plant	121
Mesembryanthemum crystallinum	Aizoaceae	Crystal Ice Plant	119
Mesembryanthemum edulis*	Aizoaceae	Hottentot-Fig	118
Mesembryanthemum floribundum*	Aizoaceae	Ice Plant	120
Mesembryanthemum nodiflorum	Aizoaceae	Small-Fld. Ice Plant	122
Mirabilis californica var. californica* #	Nyctaginaceae	Wishbone Bush	085
Mirabilis californica #	Nyctaginaceae	Wishbone Bush	085
Mirabilis laevis* #	Nyctaginaceae	Wishbone Bush	085
Monanthochloe littoralis #	Poaceae	Shoregrass	099
Montia perfoliata* #	Portulacaceae	Miner's Lettuce	264
Muhlenbergia microsperma #	Poaceae	Annual Muhlenbergia	389
Myoporum laetum	Myoporaceae	Myoporum	084
Narcissus tazetta	Liliaceae	Polyanthus Narcissus	127
Nassella lepida #	Poaceae	Foothill Needle Grass	385
Nassella pluchra #	Poaceae	Purple Needlegrass	059
Nas~~turtium officinale*~~	Brassicaceae	Water Cress	012
Nemacaulis denudata var. denudata #	Polygonaceae	Woolly-heads	450
Nemophila menziesii var. menziesii #	Hydrophyllaceae	Baby Blue-Eyes	061
Nerium oleander	Apocynaceae	Oleander	132
Nicotiana bigelovii var. wallacei* #	Solanaceae	Indian Tobacco	374
Nicotiana clevelandii #	Solanaceae	Cleveland's Tobacco	284
Nicotiana glauca	Solanaceae	Tree Tobacco	285
Nicotiana quadrivalvis #	Solanaceae	Indian Tobacco	374
Nolana acuminata	Nolanaceae	Nolana	331

Oenothera bistorta* #	Onagraceae	Southern Suncup	157
Oenothera cheiranthifolia ssp. suffruticosa* #	Onagraceae	Beach Evening Primrose	241
Oenothera elata ssp. hirsutissima #	Onagraceae	Hooker's Evening Primrose	375
Oenothera hirta* #	Onagraceae	Small Primrose	087
Oenothera hookeri* #	Onagraceae	Hooker's Evening Primrose	375
Oenothera micrantha* #	Onagraceae	Lewis' Primrose	363
Oenothera spiralis var. linearis* #	Onagraceae	Southern Suncup	157
Olea europaea	Oleaceae	Olive	329
Oligomeris linifolia #	Resedaceae	Narrow-Leaved Oligomeris	419
Opuntia ficus-indica	Cactaceae	Indian Fig	328
Opuntia hybrid demissa #	Cactaceae	Prickly Pear	438
Opuntia littoralis var. austrocalifornica* #	Cactaceae	Red Fld. Prickly Pear	376
Opuntia littoralis #	Cactaceae	Coastal Prickly Pear	206
Opuntia oricola #	Cactaceae	Oracle Cactus	362
Opuntia prolifera x littoralis #	Cactaceae	Opuntia Hybrid	377
Opuntia prolifera #	Cactaceae	Coast Cholla	207
Opuntia x occidentalis #	Cactaceae	Western Prickly Pear	471
Opuntia x vaseyi #	Cactaceae	Red Fld. Prickly Pear	376
Orthocarpus purpurascens var. purpurascens* #	Scrophulariaceae	Purple Owl's Clover	279
Oryzopsis miliacea*	Poaceae	Smilo Grass	423
Osteospermum ecklonis	Asteraceae	Freeway Daisy	188
Oxalis cernua*	Oxalidaceae	Bermuda-Buttercup	238
Oxalis pes-caprae	Oxalidaceae	Bermuda-Buttercup	238
Parapholis incurva	Poaceae	Sickle Grass	052
Paspalum dilatatum	Poaceae	Dallis Grass	054
Pectocarya linearis ssp. ferocula #	Boraginaceae	Slender Pectocarya	414
Pelargonium hortorum	Geraniaceae	Common Geranium	035
Pelargonium peltatum	Geraniaceae	Ivy Geranium	355
Pennisetum setaceum	Poaceae	Fountain Grass	378
Penstemon species	Scrophulariaceae	Penstemon	434
Pentagramma triangularis ssp. triangularis #	Pteridaceae	Goldenback Fern	473
Persicaria lapathifolia* #	Polygonaceae	Willow Weed	258
Persicaria punctata* #	Polygonaceae	Water Smartweed	259
Phacelia ramosissima var. latifolia #	Hydrophyllaceae	Branching Phacelia	417
Phacelia tanacetifolia #	Hydrophyllaceae	Tansy Phacelia	062
Phalaris canariensis	Poaceae	Canary Grass	427
Phalaris minor	Poaceae	Medit. Canary Grass	094
Phoenix canariensis	Arecaceae	Canary Island Date Palm	199
Pholistoma auritum var. auritum #	Hydrophyllaceae	Blue Fiesta Flower	063
Pholiurus incurvus*	Poaceae	Sickle Grass	052
Phyla nodiflora var. nodiflora	Verbenaceae	Garden Lippia	293
Picris echioides	Asteraceae	Bristly Ox-Tongue	189
Pinus halepensis	Pinaceae	Aleppo Pine	240
Piptatherum milliaceum	Poaceae	Smilo Grass	423
Pisum sativum	Fabaceae	Garden Pea	083
Pittosporum tobira	Pittosporaceae	Mock Orange	242
Plagiobothrys californicus var. californicus* #	Boraginaceae	Popcorn Flower	208
Plagiobothrys collinus var. californicus #	Boraginaceae	Popcorn Flower	208
Plantago arenaria*	Plantaginaceae	Sand Plantain	437
Plantago elongata #	Plantaginaceae	Calif. Alkali Rush	466
Plantago erecta ssp. erecta* #	Plantaginaceae	Dwarf Plantain	243
Plantago erecta #	Plantaginaceae	Dwarf Plantain	243

Plantago hookeriana var. californica* #	Plantaginaceae	Dwarf Plantain	243
Plantago indica	Plantaginaceae	Sand Plantain	437
Plantago insularis* #	Plantaginaceae	Woolly Plantain	332
Plantago lanceolata	Plantaginaceae	English Plantain	245
Plantago major	Plantaginaceae	Common Plantain	244
Plantago ovata #	Plantaginaceae	Woolly Plantain	332
Platanus racemosa #	Platanaceae	Western Sycamore	246
Pluchea camphorata* #	Asteraceae	Marsh Fleabane	190
Pluchea odorata #	Asteraceae	Marsh Fleabane	190
Pluchea purpurascens* #	Asteraceae	Marsh Fleabane	190
Plumbago capensis	Plumbaginaceae	Blue Cape Plumbago	250
Poa annua	Poaceae	Annual Bluegrass	447
Polycarpon tetraphyllum	Caryophyllaceae	Four-Leaved Polycarp	330
Polygonum arenastrum	Polygonaceae	Yard Knotweed	257,379
Polygonum aviculare* @	Polygonaceae	Common Knotweed	257,379
Polygonum lapathifolium #	Polygonaceae	Willow Weed	258
Polygonum punctatum #	Polygonaceae	Water Smartweed	259
Polypodium californicum #	Polypodiaceae	California Polypody Fern	262
Polypogon interruptus	Poaceae	Beard Grass	336
Polypogon lutosus*	Poaceae	Beard Grass	336
Polypogon monspeliensis	Poaceae	Rabbitfoot Grass	053
Polypogon semiverticillatus*	Poaceae	Water Bent Grass	037
Populus fremontii ssp. fremontii #	Salicaceae	Western Cottonwood	358
Portulaca oleracea	Portulacaceae	Purslane	380
Portulacaria afra	Portulacaceae	Elephant's Food	413
Prunus davidiana	Rosaceae	Flowering Peach	356
Psilocarphus tenellus var. tenellus #	Asteraceae	Slender Woolly Heads	425
Pterostegia drymarioides #	Polygonaceae	Pterostegia	411
Pulicaria hispanica*	Asteraceae	Spanish Sunflower	191
Pulicaria paludosa	Asteraceae	Spanish Sunflower	191
Pyracantha koidzumii	Rosaceae	Fire Thorn	267
Rafinesquia californica #	Asteraceae	California Chicory	333
Raphanus raphanistrum	Brassicaceae	Jointed Charlock	464
Raphanus raphanistrum x sativus	Brassicaceae	Raphanus Hybrid	465
Raphanus sativus	Brassicaceae	Wild Radish	013
Rhagadiolus cretica*	Asteraceae	Fragrant Rhagadiolus	180
Rhamnus alaternus	Rhamnaceae	Rhamnus	405
Rhus diversiloba* #	Anacardiaceae	Poison Oak	128
Rhus integrifolia #	Anacardiaceae	Lemonade Berry	129
Ricinus communis	Euphorbiaceae	Castor Bean	030
Rorippa nasturtium-aquaticum	Brassicaceae	Water Cress	012
Rosa californica #	Rosaceae	California Wild Rose	268
Rosa species	Rosaceae	Rose	269
Rosmarinus officinalis	Lamiaceae	Rosemary	070
Rubus discolor	Rosaceae	Himalaya Berry	397
Rubus procerus*	Rosaceae	Himalaya Berry	397
Rumex conglomeratus	Polygonaceae	Green Dock	260
Rumex crispus	Polygonaceae	Curley Dock	261
Rumex hymenosepalus #	Polygonaceae	Wild-Rhubarb	392
Sagina decumbens ssp. occidentalis #	Caryophyllaceae	Western Pearlwort	440
Sagina occidentalis* #	Caryophyllaceae	Western Pearlwort	440
Salicornia ambigua* #	Chenopodiaceae	Pickleweed	227

Salicornia bigelovii #	Chenopodiaceae	Bigelow's Glasswort	225
Salicornia subterminalis #	Chenopodiaceae	Glasswort	226
Salicornia virginica #	Chenopodiaceae	Pickleweed	227
Salix discolor	Salicaceae	Pussy Willow	334
Salix exigua #	Salicaceae	Sandbar Willow	272
Salix gooddingii var. gooddingii* @ #	Salicaceae	Goodding's Black Willow	271,381
Salix gooddingii var. variabilis* @ #	Salicaceae	Black Willow	271,381
Salix gooddingii #	Salicaceae	Goodding's Black Willow	271,381
Salix hindsiana var. leucodendroides* #	Salicaceae	Sandbar Willow	272
Salix lasiolepis var. lasiolepis #	Salicaceae	Arroyo Willow	273
Salix lasiolepis #	Salicaceae	Arroyo Willow	273
Salix nigra var. vallicola* #	Salicaceae	Black Willow	271
Salsola australis*	Chenopodiaceae	Russian Thistle	228
Salsola iberica*	Chenopodiaceae	Russian Thistle	228
Salsola tragus	Chenopodiaceae	Russian Thistle	228
Salvia columbariae #	Lamiaceae	Chia	101
Sambucus mexicana #	Caprifoliaceae	Mexican Elderberry	210
Schinus molle	Anacardiaceae	California Pepper Tree	130
Schinus terebinthifolius	Anacardiaceae	Brazilian Pepper Tree	131
Schismus barbatus	Poaceae	Mediterranean Schismus	338
Scirpus acutus var. occidentalis #	Cyperaceae	Hard-Stem Bulrush	090
Scirpus acutus* #	Cyperaceae	Hard-Stem Bulrush	090
Scirpus americanus #	Cyperaceae	Olney Bulrush	026
Scirpus californicus #	Cyperaceae	California Bulrush	024
Scirpus campestris* #	Cyperaceae	Salt Marsh Bulrush	027
Scirpus cernuus var. californicus* #	Cyperaceae	California Club-Rush	025
Scirpus cernuus #	Cyperaceae	California Club Rush	025
Scirpus maritimus #	Cyperaceae	Pacific Coast Bulrush	335
Scirpus olneyi* #	Cyperaceae	Olney Bulrush	026
Scirpus pacificus* #	Cyperaceae	Pacific Coast Bulrush	335
Scirpus paludosus* #	Cyperaceae	Salt Marsh Bulrush	027
Scirpus pungens #	Cyperaceae	Three Square	396
Scirpus robustus #	Cyperaceae	Salt Marsh Bulrush	027
Senecio vulgaris	Asteraceae	Common Groundsel	192
Setaria lutescens*	Poaceae	Yellow Bristle Grass	339
Setaria pumila	Poaceae	Yellow Bristle Grass	339
Setaria verticillata	Poaceae	Bristly Foxtail	055
Sida leprosa var. hederacea* #	Malvaceae	Alkali Mallow	114
Silene gallica	Caryophyllaceae	Windmill Pink	212
Silybum marianum	Asteraceae	Milk Thistle	193
Sisymbrium altissimum	Brassicaceae	Tumble Mustard	399
Sisymbrium irio	Brassicaceae	London Rocket	014
Sisymbrium orientale	Brassicaceae	Oriental Hedge Mustard	015
Sisymbrium pinnatum ssp. menziesii* #	Brassicaceae	Tansy Mustard	007
Sisyrinchium bellum #	Iridaceae	Blue-Eyed Grass	382
Solanum douglasii #	Solanaceae	Douglas' Nightshade	286
Soleirolia soleirolii	Urticaceae	Baby Tears	394
Solidago californica #	Asteraceae	California Goldenrod	409
Solidago occidentalis* #	Asteraceae	Western Goldenrod	194
Sonchus asper ssp. asper	Asteraceae	Prickly Sow-Thistle	195
Sonchus oleraceus	Asteraceae	Common Sow-Thistle	196
Sorghum halepense	Poaceae	Johnson Grass	100

Spartina foliosa #	Poaceae	Cord Grass	056
Spartium junceum	Fabaceae	Spanish Broom	106
Spergula arvensis ssp. arvensis	Caryophyllaceae	Corn Spurrey	383
Spergularia bocconii	Caryophyllaceae	Boccone's Sand Spurry	337
Spergularia marina #	Caryophyllaceae	Salt-Marsh Sand Spurry	384
Spergularia villosa	Caryophyllaceae	Villous Sand Spurry	213
Sphaeralcea emoryi var. emoryi #	Malvaceae	Emory's Desert Mallow	452
Sporobolus airoides #	Poaceae	Alkali Dropseed	426
Statice californicum* #	Plumbaginaceae	Marsh-Rosemary	247
Statice perezii*	Plumbaginaceae	Perez's Sea-Lavender	248
Statice sinuatum*	Plumbaginaceae	Winged Sea-Lavender	249
Stellaria media	Caryophyllaceae	Common Chickweed	448
Stenotaphrum secundatum	Poaceae	St. Augustine Grass	057
Stephanomeria virgata ssp. pleuocarpa #	Asteraceae	Tall Wreath Plant	462
Stephanomeria virgata ssp. virgata #	Asteraceae	Twiggy Wreath Plant	197
Stipa lepida* #	Poaceae	Foothill Needlegrass	385
Stipa pulchra* #	Poaceae	Purple Needlegrass	059
Suaeda calceoliformis #	Chenopodiaceae	Horned Sea-Blite	388
Suaeda californica var. pubescens* #	Chenopodiaceae	Sea-Blite	229
Suaeda depressa var. erecta* #	Chenopodiaceae	Pursh's Sea-Blite	388
Suaeda esteroa #	Chenopodiaceae	Estuary Sea-Blite	230
Suaeda taxifolia #	Chenopodiaceae	Woolly Sea-Blite	229
Tamarix chinensis	Tamaricaceae	Tamarix	281
Tanacetum parthenium	Asteraceae	Feverfew	155
Taraxacum officinale	Asteraceae	Common Dandelion	386
Tecomaria capensis	Bignoniaceae	Cape Honeysuckle	485
Tetragonia expansa*	Aizoaceae	New Zealand Spinach	123
Tetragonia tetragonioides	Aizoaceae	New Zealand Spinach	123
Tillaea erecta* #	Crassulaceae	Pigmy Stonecrop	236
Toxicodendron altissimum*	Simroubaceae	Tree of Heaven	418
Toxicodendron diversilobum #	Anacardiaceae	Poison Oak	128
Tribulus terrestris	Zygophyllaceae	Puncture Vine	340
Trifolium amplectens* #	Fabaceae	Pale Sack Clover	442
Trifolium ciliolatum #	Fabaceae	Tree Clover	443
Trifolium depauperatum var. truncatum #	Fabaceae	Southern Sack Clover	442
Trifolium gracilentum var. gracilentum #	Fabaceae	Pin-Point Clover	432
Trifolium hirtum	Fabaceae	Bristled Clover	107
Trifolium microcephalum #	Fabaceae	Small-Headed Clover	431
Trifolium tridentatum var. tridentatum* #	Fabaceae	Tomcat Clover	456
Trifolium willdenovii #	Fabaceae	Tomcat Clover	456
Triglochin concinna var. concinna #	Juncaginaceae	Slender Arrow-Grass	067
Tropaeolum majus	Tropaeolaceae	Garden Nasturtium	287
Typha angustifolia #	Typhaceae	Narrow-Leaved Cat-Tail	288
Typha domingensis #	Typhaceae	Slender Cat-Tail	289
Typha latifolia #	Typhaceae	Broad-Leaved Cat-Tail	290
Urtica dioica ssp. holosericea #	Urticaceae	Creek Nettle	291
Urtica gracilis var. holosericea* #	Urticaceae	Creek Nettle	291
Urtica holosericea* #	Urticaceae	Creek Nettle	291
Urtica urens	Urticaceae	Dwarf Nettle	292
Verbena lasiostachys var. lasiostachys #	Verbenaceae	Western Verbena	400
Verbesina encelioides ssp. encelioides	Asteraceae	Golden Crownbeard	341
Veronica anagallis-aquatica	Scrophulariaceae	Speedwell	282

Vicia exigua* #	Fabaceae	Slender Vetch	446
Vicia faba	Fabaceae	Horse-Bean	342
Vicia ludoviciana var. ludoviciana #	Fabaceae	Slender Vetch	446
Vulpia myuros var. hirsuta	Poaceae	Foxtail Fescue	445
Vulpia myuros var. myuros	Poaceae	Rats Tail Fescue	046
Washingtonia robusta	Arecaceae	Mexican Fan Palm	200
Xanthium spinosum #	Asteraceae	Spiny Clotbur	410
Xanthium strumarium var. canadense* #	Asteraceae	Cocklebur	198
Xanthium strumarium #	Asteraceae	Cocklebur	198
Yucca aloifolia	Liliaceae	Spanish Bayonet	344
Yucca gloriosa	Liliaceae	Spanish Dagger	343
Zannichellia palustris #	Zannichelliaceae	Horned Pondweed	393
Zanschneria californica ssp. californica* #	Onagraceae	California Fuchsia	460
Zantedeschia aethiopica	Araceae	Calla Lily	133

APPENDIX C

BIRDS KNOWN TO OCCUR IN OR ADJACENT TO UPPER NEWPORT BAY

APPENDIX C
BIRD SUMMARY DATA

TABLE 1: Birds of Upper Newport Bay

Source: Marsh (1990)

BIRDS OF UPPER NEWPORT BAY

These species are known to occur in or adjacent to Upper Newport Bay.

A = Abundant
C = Common
U = Uncommon
R = Rare
V = Vagrant
Br = Breeding
M = Migrant
OW = Open water
TF = Tideflats
Ms = Salt Marsh
Mf = Freshwater Marsh
Up = Uplands
@ = Observed in Upper Newport Bay Regional Park
E = Expected in Park

	LOONS	
	Common loon (Gavia immer)	R, OW
	Artic loon (Gavia arctica)	R, OW
	Red-throated loon (Gavia stellata)	R, OW
	Pacific loon (Gavia pacifica)	R, OW
	GREBES	
	Red-necked grebe (Podiceps grisegena)	V, OW
	Horned grebe (Podiceps auritus)	U, OW
	Eared grebe (Podiceps nigricollis)	C, OW
	Western Grebe (Aechmophorus occidentalis)	C, OW
	Clark's grebe (Aechmophorus clarkii	U, OW
	Pied-billed grebe (Podilymbus podiceps)	C, OW
	PELICANS	
	American White pelican (Pelicanus erythrorhynchos)	R, OW
	Brown pelican (Pelicanua occidentalis)	C, OW
	CORMORANTS	
	Double-crested cormorant (Phalacrocorax auritus)	C, OW
	Brandt's cormorant (Phalacrocorax penicillatus)	U, OW
	HERONS & BITTERNS	
E	Great blue heron (Ardea herodius)	C, Ms, Tf
E	Green-backed heron (Butorides striatus)	U, Mf
E	Great egret (Casmerodius albus)	C, Tf, Ms
E	Snowy egret (Egretta thula)	C, Tf, Ms
	Reddish egret (Egretta rufescens)	R, Ms
	Tricolored heron (Egretta tricolor)	R, Ms
	Little blue heron (Egretta caerulea)	V
E	Black-crowned night heron (Nycticorax nycticorax)	U, Ms, Mf
E	American bittern (Botaurus lentiginosus)	U, Mf, Ms
E	Least bittern (Ixobrychus exilis)	U, Mf
	Cattle egret (Bubulcus ibis)	R

FALCONS	
Prairie falcon (Falco mexicanus)	R, M, Up
Peregrine falcon (Falco peregrinus)	U, M, Ms, Tf
American kestral (Falco sparverius)	C, Br, Up
Merlin (Falco columbarius)	O, Up, Air
PHEASANTS & QUAIL	
California quail (Callipepla californica)	U, Br, Up
Ring-necked pheasant (Phasianus colchicus)	U, Br, Up
RAILS	
Light-footed clapper rail (Rallus longirostrus livepes)	C, Br, Ms, Mf
Virginia Rail (Rallus limicola)	C, M, Mf
Yellow rail (Coturnicops noveboracensis)	R, M, Mf
Sora (Porzana carolina)	C, Br, Mf, Ms
Black rail (Laterallus jamaicensis)	R, M, Mf
Common moorhen (Gallinula chloropus)	R, Mf
American coot (Fulica americana)	A, M, Tf, Ms, Mf
PLOVERS	
Semipalmated plover (Charadrius semipalmatus)	C, M, Tf
Snowy plover (Charadrius alexandrinus)	U, Br, Tf
Killdeer (Charadrius vociferus)	C, Br, Tf
Mountain plover (Charadrius montanus)	R, M
Lesser golden plover (Pluvialis dominica)	R, M, Tf
Black-bellied plover (Pluvialis squatarola)	C, M, Tf
STILTS & AVOCETS	
Black-necked stilt (Himantopus mexicanus)	C, Mf, Br
American avocet (Recurvirostra americana)	C, TF, Br, Ms
SANDPIPERS & PHALAROPES	
Ruddy turnstone (Arenaria interpres)	U, M, Tf
Black turnstone (Arenaria melanocephala)	R, M, Tf
Common snipe (Gallinago)	U, M, Mf
Long-billed curlew (Numenius americanus)	C, M, Tf
whimbrel (numenius phaeopus)	u, m, tf
willet (catoptrophorus semipalmatus)	a, m, mf
spotted sandpiper (actitis macularia)	u, m, tf
solitary sandpiper (tringa solitaria)	r, m, tf
greater yellowlegs (tringa melanoleucus)	u, m, tf, ms
lesser yellowlegs (tringa flavipes)	u, m, tf, mf
red knot (calidris canutus)	u, m, tf
pectoral sandpiper (calidris melanotos)	r, m, tf, mf
Semipalmated sandpiper (Calidris pusillas)	
Baird's sandpiper (Calidris bairdi)	R, M, Tf
Least sandpiper (Calidris minutilla)	C, M, Tf
Sharptailed sandpiper (Calidris acuminata)	
Dunlin (Calidris alpina)	C, M, Tf
Western sandpiper (Calidris mauri)	A, M, Tf
Sanderling (Calidris alba)	U, M, Tf

NIGHTJARS

Lesser nighthawk (*Chordeiles acutipennis*) A, Up

SWIFTS

White-throated swift (*Aeronautes saxatalis*) U, Br, Up
Vaux's swift (*Chaetura vauxi*) U, Up

HUMMINGBIRDS

@ Black-chinned hummingbird (*Archilochus alexandri*) U, Up
@ Anna's hummingbird (*Calypte anna*) C, Br, Up
E Costa's hummingbird (*Calypte costae*) R, Up, MF
E Rufous hummingbird (*Selasphorus rufus*) R, Up, MF
@ Allen's hummingbird (*Selasphorus sasin*) U, Up, MF

KINGFISHER

@ Belted kingfisher (*Ceryle alcyon*) U, Br, Up

WOODPECKERS

@ Northern flicker (*Colaptes auratus*) U, Br, Up
E Nuttall's woodpecker (*Picoides nuttallii*) U, Up
E Red-breasted sapsucker (*Sphyrapicus ruber*) R, Wf
E Downy woodpecker (*Picoides pubescens*) R, Wf

TYRANT FLYCATCHERS

Tropical kingbird (*Tyrannus melancholicus*) U, Up
E Western kingbird (*Tyrannus verticalis*) U, Br, Up
E Cassin's kingbird (*Tyrannus vociferans*) U, Br, Up
@ Black phoebe (*Sayronis nigricans*) R, M, Ms, Mf
@ Say's phoebe (*Sayornis saya*) U, M, Up
E Western flycatcher (*Empidonax difficilis*) U, Br, Up
Olive-sided flycatcher (*CoutopusNborealis*) O, Up
Western wood-pewee (*Contopus sordidalus*) U, Up
E Willow flycatcher (*Empidonax traillii*) R, Up
Hammond's flycatcher (*Empidonax hommondii*) R, Up
Ash-throated flycatcher (*Myiarchus cinerascens*) U, M, Up

LARKS

@ Horned lark (*Fremophila alpestris*)

SWALLOWS

E Violet-green swallow (*Tachycineta thalassina*) R, M
E Tree swallow (*Tachycineta bicolor*) R, M
E Bank swallow (*Riparia riparia*) R, M
E Northern rough-winged swallow (*Stelgidoptery serripennis*) C, Br, Up
E Barn swallow (*Hirundo rustica*) U, Br, Up
@ Cliff swallow (*Hirundo pyrrhonota*) U, Br, Up
Purple martin (*Progne subis*) R,M

E	Hermit warbler (Dendroica occidentalis)	
	Palm warbler (Dendrocia palmarum)	
E	MacGillivray's warbler (Oporornis tolmiei)	
E	Yellow-breasted chat (Icteria virens)	
@	Common Yellowthroat (Geothlypis trichas)	C, Br, Mf, Up
E	Wilson's warbler (Wilsonia pusilla)	U, M
	American redstart (Setophaga ruticilla)	R, M
	BLACKBIRDS & ORIOLES	C, Br, Up
@	Western meadowlark (Sturnella neglecta)	C, Br, Up, Ms
@	Red-winged blackbird (Agelaius phoeniceus)	U, Mf
@	Brewer's blackbird (Euphapus cynocephalus)	C, Up
E	Northern oriole (Icterus galbula)	U, Br, Up
E	Brown-headed cowbird (Molothrus ater)	C, Br, Up
E	Tricolored blackbird (Agelaius tricolor)	
	Great-tailed grackle (Quiscalus mexicanus)	
E	Yellow-headed blackbird (Xanthocephalus xanthocephalus)	R, Mf
	TANAGERS	
E	Western Tanager (Piranga ludoviciana)	U, Br, Up.
	Summer tanager (Piranga rubra)	R, M
	GROSBEAKS & BUNTINGS	
E	Black-headed grosbeak (Pheucticus melanocephalus)	U, Br, Up
E	Blue grosbeak (Guiraca caerulea)	R
E	Lasuli Bunting (Passerina amoena)	R, Br
	FINCHES	
	Purple finch (Carpodacus purpureus)	R
E	House finch (Carpodacus mexicanus)	C, Br, Up
E	American goldfinch (Carduelis tristis)	U, Br, Up
@	Lesser goldfinch (Carduelis psaltria)	C, Br, Up
	Lawrence's goldfinch (Spinus lawrencei)	
	Pine siskin (Carduelis pinus)	U, Up
	WEAVER FINCHES	
@	House sparrow (English sparrow) (Passer domesticus)	C, Br, Up
	SPARROWS	
E	Rufous-sided towhee (Pipilo erythrophthalmus)	R, Br, Up
@	Brown towhee (Pipilo fuscus)	C, Br, Up
	Green-tailed towhee (Pipilo chlorurus)	
E	Savannah sparrow (Passerculus sandwichensis)	C, Br, Ms
@	White-crowned sparrow (Zonotrichia leucophrys)	C, M, Up
E	Golden-crowned sparrow (Zonotrichia atricapilla)	U, M, Up
E	Lincoln's sparrow (Melospiza lincolnii)	U, Up
@	Song sparrow (Melospiza melodia)	C, Br, Mf, Up
	Chipping sparrow (Spizella passerina)	
	Clay-colored sparrow (Spizella pallider)	
	Vesper sparrow (Pooecetes gramineus)	

APPENDIX C
BIRD SUMMARY DATA

TABLE 2: Regularly Occurring Birds, Upper Newport Bay

Source: Audubon (1997), Corps (1997), Caffrey (1997), Gallagher (1997), Garrett & Dunn (1981), Hamilton & Willick (1996), Hays et al. (1990) & Unitt (1984)

Table B.4. Regularly Occurring Birds of Newport Bay: Species Status and Habitat Use.

BIRDS		Legal Status	Habitat Type								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Common Loon	*Gavia immer*	CSC	UM								
Red-throated Loon	*Gavia stellata*		U-CM								
Pacific Loon	*Gavia pacifica*		UM								
Pied-billed Grebe*	*Podilymbus podiceps*		CMW, US					US+, CMW			
Horned Grebe	*Podiceps auritus*		U-CMW					U-CMW			
Eared Grebe*	*Podiceps nigricollis*		U-CMW					U-CMW			
Western Grebe*	*Aechmophorus occidentalis*		U-CMW					U-CMW			
Clarke's Grebe*	*Aechmophorus clarkii*		UMW					CMW			
American White Pelican	*Pelecanus erythrorhynchus*	CSC	UW								
California Brown Pelican*	*Pelecanus occidentalis californicus*	FE, SE	U-CSMW	U-CSMW					U-CSMW		
Double-crested Cormorant*	*Phalacrocorax auritus*	CSC	U-CSMW	U-CSMW					U-CSMW		
Brandt's Cormorant	*Phalacrocorax penicillatus*		UMW	UMW					UMW		
American Bittern	*Botaurus lentiginosus*			UMW	UMW	UMW	UMW	UMW			
Great Blue Heron*	*Ardea herodias*		U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	
Great Egret*	*Ardea alba*		U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	
Snowy Egret*	*Egretta thula*			U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW		
Green Heron*	*Butorides virescens*			U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW, US+?			US+?
Black-crowned Night-Heron*	*Nycticorax nycticorax*			U-CSMW	U-CSMW	U-CSMW	U-CSMW	U-CSMW			
Brant	*Branta bernicla*		UMW	UMW							
Canada Goose	*Branta canadensis*		C-AW	C-AW							C-AW
Green-winged Teal*	*Anas crecca*		CMW	CMW				CMW	CMW		
Mallard*	*Anas platyrhynchos*		CSWM	CSWM	CSWM	CSWM, CS+	CSWM, CS+	CSWM, CS+	CSWM	CSWM, CS+	CSWM, CS+
Northern Pintail*	*Anas acuta*		CMW	CMW				CMW	CMW		
Blue-winged Teal*	*Anas discors*		U-CSMW	U-CSMW	U-CSMW			U-CMW, US+	U-CSMW		

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Cinnamon Teal*	*Anas cyanoptera*		CMW, US	CMW, US	CMW, US			CMW, US+	CMW, US		
Northern Shoveler*	*Anas clypeata*		CMW	CMW				CMW	CMW		
Gadwall*	*Anas strepera*		CMW, US	CMW, US	CMW, US	CMW, US+?		CMW, US+?	CMW, US		
American Wigeon	*Anas americana*		CMW	CMW				CMW	CMW		
Canvasback	*Aythya valisineria*		UMW	UMW				UMW	UMW		
Lesser Scaup	*Aythya affinis*		CMW					CMW			
Surf Scoter	*Melanitta perspicillata*		UW								
Bufflehead	*Bucephala albeola*		CW								
Red-breasted Merganser	*Mergus serrator*		CMW								
Ruddy Duck*	*Oxyura jamaicensis*		C-AMW					C-AMW			
Turkey Vulture*	*Cathartes aura*			U-CMW	U-CMW	U-CMW	U-CMW		U-CMW	U-CMW	U-CMW
Osprey*	*Pandion haliaetus*	CSC	UMW	UMW							
White-tailed Kite*	*Elanus leucurus*	CFP				U-CSWM	U-CSWM	U-CSWM	U-CSWM	U-CSWM +?	U-CSWM +?
Northern Harrier*	*Circus cyaneus*	CSC		USMW	USMW	USMW	USMW		USMW	USMW	USMW
Sharp-shinned Hawk*	*Accipiter striatus*	CSC		UMW	UMW	UMW	UMW	UMW	UMW	UMW	UMW
Cooper's Hawk	*Accipiter cooperii*	CSC		USMW	USMW	USMW	USMW	USMW	USMW	USMW	USMW +?
Red-shouldered Hawk	*Buteo lineatus*									USMW	USMW+
Red-tailed Hawk*	*Buteo jamaicensis*					USMW	USMW		USMW	USMW	USMW+
American Kestrel*	*Falco sparverius*					USMW	USMW		USMW	USMW+	USMW+
Merlin	*Falco columbarius*	CSC	UMW	UMW	UMW	UMW	UMW	UMW	UMW	UMW	UMW
American Peregrine Falcon	*Falco peregrinus anatum*	FE, SE, CFP	USMW	USMW	USMW	USMW	USMW	USMW	USMW	USMW	USMW
California Quail	*Callipepla californica*									CR	CR+
Light-footed Clapper Rail*	*Rallus longirostris levipes*	ST, FE, CFP		CR	CR+	CR	CR	CR+?			
Virginia Rail*	*Rallus limicola*			USMW	USMW	USMW	USMW	USMW			
Sora*	*Porzana carolina*							UW			

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Common Moorhen*	*Gallinula chloropus*							US+, CMW			
Black-bellied Plover*	*Pluvialis squatarola*			C-AMW					C-AMW		
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT, CSC		UMW					UMW+?		
Semipalmated Plover*	*Charadrius semipalmatus*			U-CMW				U-CMW			
Killdeer	*Charadrius vociferus*			CR					CR+	CR+	CR+
Black-necked Stilt	*Himantopus mexicanus*			US,CMW			US+, CMW	US+, CMW	US+, CMW		
American Avocet*	*Recurvirostra americana*			US, CMW			US+	US+, CMW	US+, CMW		
Greater Yellowlegs*	*Tringa melanoleuca*			U-CMW				U-CMW	U-CMW		
Lesser Yellowlegs	*Tringa flavipes*			UM				UM	UM		
Willet*	*Catoptrophorus semipalmatus*			C-AMW, U-CS	C-AMW, U-CS			C-AMW, U-CS	C-AMW, U-CS		
Spotted Sandpiper*	*Actitis macularia*			CMW				CMW	CMW		
Whimbrel*	*Numenius phaeopus*			U-CMW	U-CMW	U-CMW		U-CMW	U-CMW		
Long-billed Curlew*	*Numenius americanus*	CSC		U-CSMW	U-CSMW	U-CSMW		U-CSMW	U-CSMW		
Marbled Godwit*	*Limosa fedoa*			C-AMW, US	C-AMW, US	C-AMW, US		C-AMW, US	C-AMW, US		
Ruddy Turnstone	*Arenaria interpres*			U-CMW					U-CMW		
Red Knot*	*Calidris canutus*			CMW				CMW	CMW		
Sanderling*	*Calidris alba*			CMW					CMW		
Western Sandpiper*	*Calidris mauri*			AMW				AMW	AMW		
Least Sandpiper*	*Calidris minutilla*			C-AMW				C-AMW	C-AMW		
Dunlin	*Calidris alpina*			CMW				CMW	CMW		
Short-billed Dowitcher*	*Limnodromus griseus*			C-AMW				C-AMW	C-AMW		
Long-billed Dowitcher	*Limnodromus scolopaceus*			C-AMW				C-AMW	C-AMW		
Red-necked Phalarope*	*Phalaropus lobatus*		U-CM	U-CM					U-CM		
Bonaparte's Gull	*Larus philadelphia*		U-CMW	U-CMW					U-CMW		
Heermann's Gull	*Larus heermanni*		U-CMW	U-CMW					U-CMW		

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Mew Gull	*Larus canus*		U-CMW	U-CMW					U-CMW		
Ring-billed Gull*	*Larus delawarensis*		CMW	CMW					CMW		
California Gull	*Larus californicus*	CSC	U-CMW	U-CMW					U-CMW		
Herring Gull	*Larus argentatus*		UMW	UMW					UMW		
Western Gull*	*Larus occidentalis*		CSMW	CSMW					CSMW		US+
Caspian Tern*	*Sterna caspia*		U-CSMW	U-CSMW				U-CSMW	U-CSMW		
Royal Tern	*Sterna maxima*		USM	USM					USM		
Elegant Tern*	*Sterna elegans*	CSC	C-ASM	C-ASM					C-ASM		
Common Tern*	*Sterna hirundo*		UM	UM					UM		
Forster's Tern*	*Sterna forsteri*		C-AMW, US	C-AMW, US			C-AMW, US+	C-AMW, US	C-AMW, US+		
California Least Tern	*Sterna antillarum browni*	FE, SE, CFP	CSM	CSM				CSM	CSM+		
Black Skimmer*	*Rynchops niger*	CSC	C-ASMW	C-ASMW					C-ASMW		
Mourning Dove*	*Zenaida macroura*									C-AMW, CS+	C-AMW, CS+
Greater Roadrunner	*Geococcyx californianus*									UR	UR+?
Barn Owl	*Tyto alba*					UR	UR		UR	UR	UR+
Great Horned Owl	*Bubo virginianus*					UR	UR		UR	UR	UR+
Vaux's Swift	*Chaetura vauxi*	CSC									/UM
White-throated Swift	*Aeronautes saxatalis*										U-CSMW+/ U-CSMW
Black-chinned Hummingbird	*Archilochus alexandri*										CSM+
Anna's Hummingbird*	*Calypte anna*									CR+	CR+
Costa's Hummingbird	*Calypte costae*									UM	US+
Rufous Hummingbird	*Selasphorus rufus*									UM	UM
Allen's Humminbird	*Selasphorus sasin*									UM	UR+, UM
Belted Kingfisher	*Ceryle alcyon*		USMW					USMW			US+?
Red-breasted Sapsucker	*Sphyrapicus ruber*										UMW

BIRDS		Legal Status	Habitat Type								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Nuttall's Woodpecker	*Picoides nuttallii*										UR+
Downy Woodpecker	*Picoides pubescens*										UR+
Red-shafted Flicker	*Colaptes auratus*										CMW
Western Wood- Pewee	*Contopus sordidulus*										UM
Willow Flycatcher (full species)	*Empidonax traillii*	SE									UM
Hammond's Flycatcher	*Empidonax hammondii*										UM
Pacific-slope Flycatcher	*Empidonax difficilis*										UMW
Black Phoebe*	*Sayornis nigricans*				UR	UR	UR	UR	UR	UR	UR+
Say's Phoebe*	*Sayornis saya*									U-CMW	U-CMW
Ash-throated Flycatcher	*Myiarchus cinerascens*									USM	USM+?
Cassin's Kingbird	*Tyrannus vociferans*									UR	UR+
Western Kingbird	*Tyrannus verticalis*									U-CSM	US+?
California Horned Lark	*Eremophila alpestris actia*	CSC							U-CMW	U-CMW	U-CMW
Tree Swallow	*Tachycineta bicolor*							US+			US+/CSM
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*										US+/CSM
Cliff Swallow	*Hirundo pyrrhonota*										CS+/C-ASM
Barn Swallow	*Hirundo rustica*										CS+/CSM
Western Scrub-Jay	*Aphelocoma californica*										UR+?
American Crow*	*Corvus brachyrhynchos*			CR	CR	CR	CR	CR	CR	CR	CR+
Common Raven*	*Corvus corax*			CR	CR	CR	CR	CR	CR	CR	CR+
Bushtit*	*Psaltriparus minimus*									C-AR	C-AR+
Rock Wren	*Salpinctes obsoletus*										UR+
Bewick's Wren*	*Thryomanes bewickii*						CR	CR		CR	CR+
House Wren*	*Troglodytes aedon*									USMW	USMW+
Marsh Wren*	*Cistothorus palustris*					CR	CR	CR+			
Ruby-crowned Kinglet	*Regulus calendula*										CMW
Blue-gray Gnatcatcher	*Polioptila caerulea*										CMW
Coastal California Gnatcatcher*	*Polioptila californica californica*	FT, CSC									CR+

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Western Bluebird	*Sialia mexicana*									UMW	UMW
Swainson'S Thrush	*Catharus ustulatus*										UM
Hermit Thrush	*Catharus guttatus*										U-CM
American Robin	*Turdus migratorius*										U-CMW, US+?
Wrentit*	*Chamaea fasciata*										U-CR+
Northern Mockingbird*	*Mimus polyglottos*									CR	CR*
California Thrasher	*Toxostoma redivivum*										U-CR+
American Pipit	*Anthus rufescens*									CMW	CMW
Cedar Waxwing	*Bombycilla cedrorum*										U-AMW
Phainopepla	*Phainopepla nitens*										UMW
Loggerhead Shrike*	*Lanius ludovicianus*	CSC								UR+	UR+
Cassin's Vireo	*Vireo cassinii*										UM
Hutton's Vireo	*Vireo huttoni*									UM	USM+?
Warbling Vireo	*Vireo gilvus*									UM	UM
Orange-crowned Warbler	*Vermivora celata*									U-CMW	U-CMW
Nashville Warbler	*Vermivora ruficapilla*										U-CM
Western Yellow Warbler	*Dendroica petechia brewsteri*	CSC								CM	CM
Yellow-rumped Warbler	*Dendroica coronata*									CMW	CMW
Black-throated Gray Warbler	*Dendroica nigrescens*										UM
Townsend's Warbler	*Dendroica townsendi*										UMW
Hermjt Warbler	*Dendroica occidentalis*										UM
MacGillivrays Warbler	*Oporornis tolmiei*										UM
Common Yellowthroat*	*Geothlypis trichas*						CSMW+	CSMW+		CSMW	CSMW
Wilson's Warbler	*Wilsonia pusilla*									U-CM	U-CM
Yellow-breasted Chat	*Icteria virens*	CSC									USM
Western Tanager	*Piranga ludoviciana*										CM
Black-headed Grosbeak	*Pheucticus melanocephalus*										CM, US+
Blue Grosbeak	*Guiraca caerulea*										USM+

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial
Lazuli Bunting	*Passerina amoena*									UM	UM
Spotted Towhee	*Pipilo maculatus*										U-CR+?
California Towhee*	*Pipilo crissalis*										CR+
Chipping Sparrow	*Spizella passerina*									UM	UM
Lark Sparrow	*Chondestes grammacus*									UMW	UMW
Savannah Sparrow (other than *P.s. beldingi* and *P.s. rostratus*)	*Passerculus sandwichensis*			C-AMW	C-AMW	C-AMW	C-AMW	C-AMW	C-AMW	C-AMW	C-AMW
Belding's Savannah Sparrow*	*Passerculus sandwichensis beldingi*	SE		AR	AR	AR+	AR		AR	AR	AR
Large-billed Savannah Sparrow*	*Passerculus sandwichensis rostratus*	CSC		UM	UM	UM	UM		UM	UM	UM
Song Sparrow*	*Melospiza melodia*			C-AR	C-AR	C-AR	C-AR+	C-AR+		C-AR+	C-AR
Lincoln Sparrow's	*Melospiza lincolnii*						U-CMW			U-CMW	
Golden-crowned Sparrow	*Zonotrichia atricapilla*									UMW	UMW
White-crowned Sparrow	*Zonotrichia leucophrys*									C-AMW	C-AMW
Dark-eyed Junco	*Junco hyemalis*										CMW
Red-winged Blackbird*	*Agelaius phoeniceus*							CR+		CR	CR
Western Meadowlark	*Sturnella neglecta*									CR	CR+
Brewer's Blackbird	*Euphagus cyanocephalus*									C-AR+	C-AR+
Brown-headed Cowbird*	*Molothrus ater*					CSM+	CSM+	CSM+		CSM+	CSM+
Hooded Oriole	*Icterus cucullatus*									USM+	USM+
Bullock's Oriole	*Icterus bullockii*										U-CSM+
House Finch*	*Carpodacus mexicanus*						AR	AR+		AR+	AR+
Lesser Goldfinch	*Carduelis psaltria*									CR+	CR+
American Goldfinch	*Carduelis tristis*										USMW+
Eurasian Starling*	*Sturnus vulgaris*			CR	CR	CR	CR	CR	CR	CR+	CR+
House Sparrow	*Passer domesticus*									C-AR	C-AR+
Rock Dove	*Columba livia*									CR	CR+
Spotted Dove	*Streptopelia chinensis*									CR+	CR+

BIRDS		Legal Status	Habitat Types								
English Name	Scientific Name		Open Water	Mudflat	Low Marsh	Mid Marsh	High Marsh	Freshwater Marsh	Salt Panne	Ruderal	Other/ Aerial

Source: Current field surveys and Audubon 1997, Caffrey 1997, Gallagher 1997, Garrett and Dunn 1981, Hamilton and Willick 1996, Hays et al. 1990, Unitt 1984.

Abbreviations/Symbols:

*	species observed during current surveys
+	confirmed breeder for that habitat
+?	possible breeder for that habitat
U	uncommon (1-15 birds observed in a day by a qualified observer)
C	common (16-75 birds observed in a day by a qualified observer)
A	abundant (>75 birds observed in a day by a qualified observer)
M	migrant (fall/spring)
W	wintering migrant
S	summering migrant
R	resident (individuals of the species is a year-round inhabitant)

Legal Status Codes

SE	state endangered
ST	state threatened
CFP	state fully protected
CSC	state species of special concern
FE	federally endangered
FT	federally threatened

APPENDIX C
BIRD SUMMARY DATA

TABLE 3: Bird Count Data By Area, Upper Newport Bay

Source: Corps (1997)

Upper Newport Bay Bird Data
8 September 1997

AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
1	Aerial		Pied-billed Grebe	*Podilymbus podiceps*	1
			California Brown Pelican (FE,SE)	*Pelecanus occidentalis californica*	3
			Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	1
			Great Blue Heron	*Ardea herodias*	1
			Great Blue Heron	*Ardea herodias*	1
			Great Egret	*Casmerodius albus*	1
			Snowy Egret	*Egretta thula*	6
			Black-crowned Night-heron	*Nycticorax nycticorax*	2
			Mallard	*Anas platyrhynchos*	2
			Green-winged Teal	*Anas crecca*	2
			Cinnamon Teal	*Anas cyanoptera*	3
			Sharp-shinned Hawk (CSC)	*Accipiter striatus*	1
			Northern Harrier (CSC)	*Circus cyaneus*	1
			Black-bellied Plover	*Pluvialis squatarola*	1
			Long-billed Curlew (CSC)	*Numenius americanus*	1
			Greater Yellowlegs	*Tringa melanoleuca*	1
			Willet	*Catoptrophorus semipalmatus*	1
			Willet	*Catoptrophorus semipalmatus*	1
			Short-billed Dowitcher	*Limnodromus griseus*	11
			Western Gull	*Larus occidentalis*	1
			Ring-billed Gull	*Larus delawarensis*	1
			Black Skimmer (CSC)	*Rhynchops niger*	3
			Barn Swallow	*Hirundo rustica*	1
			Savannah Sparrow	*Passerculus sandwichensis*	1
			European Starling	*Sturnus vulgaris*	1
			American Crow	*Corvus brachyrhynchos*	3
			American Crow	*Corvus brachyrhynchos*	7
1	Low marsh	East	Great Egret	*Casmerodius albus*	1
		Middle Island	Great Blue Heron	*Ardea herodias*	1
		Middle Island	Snowy Egret	*Egretta thula*	1
		Middle Island	Light-footed Clapper Rail (FE,SE)	*Rallus longirostris levipes*	1
		Shellmaker Island	Great Blue Heron	*Ardea herodias*	1
		Shellmaker Island	Great Egret	*Casmerodius albus*	1
		Shellmaker Island	Snowy Egret	*Egretta thula*	1
1	Mudflat	East	Mallard	*Anas platyrhynchos*	13
		East	Green-winged Teal	*Anas crecca*	7
		East	Black-bellied Plover	*Pluvialis squatarola*	2
		East	Long-billed Curlew (CSC)	*Numenius americanus*	2
		East	Whimbrel	*Numenius phaeopus*	1
		East	Willet	*Catoptrophorus semipalmatus*	59
		East	Least Sandpiper	*Calidris minutilla*	10
		East	Western Sandpiper	*Calidris mauri*	19
		East	Dowitcher spp.	*Limnodromus spp.*	106
		East	Marbled Godwit	*Limosa fedoa*	44
		Middle Island	Spotted Sandpiper	*Actitis macularia*	3
		Shellmaker Island	Willet	*Catoptrophorus semipalmatus*	7
		Sandspit	Great Blue Heron	*Ardea herodias*	1
		West	Great Egret	*Casmerodius albus*	1
		West	Black-bellied Plover	*Pluvialis squatarola*	1
		West	Willet	*Catoptrophorus semipalmatus*	1
		West	Willet	*Catoptrophorus semipalmatus*	2
		West	Western Gull	*Larus occidentalis*	6
		West	Western Gull	*Larus occidentalis*	1
		West	American Crow	*Corvus brachyrhynchos*	2
1	Mid-marsh	East	Great Blue Heron	*Ardea herodias*	1
		East	Bewick's Wren	*Thryomanes bewickii*	1
		East	Savannah Sparrow	*Passerculus sandwichensis*	1
		East	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	1

FE = Federal Endangered; SE= State Endangered
CSC = CDFG species of concern

Upper Newport Bay Bird Data
8 September 1997

AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
		East	Song Sparrow	*Melospiza melodia*	1
1	Other		Red-tailed Hawk	*Buteo jamaicensis*	1
1	Open water		Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	1
			Osprey (CSC)	*Pandion haliaetus*	2
			Western Gull	*Larus occidentalis*	2
			Ring-billed Gull	*Larus delawarensis*	1
			Forster's Tern	*Sterna forsteri*	2
			Forster's Tern	*Sterna forsteri*	5
			Common Tern	*Sterna hirundo*	1
			Caspian Tern	*Sterna caspia*	1
1	Perches		Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	1
		Shellmaker Island	Red-tailed Hawk	*Buteo jamaicensis*	1
		Shellmaker Island	American Kestrel	*Falco sparverius*	1
		West	Western Gull	*Larus occidentalis*	2
1	Ruderal	East	Black Phoebe	*Sayornis nigricans*	1
		East	Common Raven	*Corvus corax*	3
		Shellmaker Island	White-tailed Kite	*Elanus caeruleus*	1
		Shellmaker Island	American Kestrel	*Falco sparverius*	1
		Shellmaker Island	Say's Phoebe	*Sayornis saya*	1
		Shellmaker Island	Northern Mockingbird	*Mimus polyglottos*	1
1	Salt panne	East	Snowy Egret	*Egretta thula*	1
		East	Mallard	*Anas platyrhynchos*	6
		West	Turkey Vulture	*Cathartes aura*	3
2	Aerial		Mourning Dove	*Zenaida macroura*	1
			Common Raven	*Corvus corax*	1
2	Freshwater marsh	East	Pied-billed Grebe	*Podilymbus podiceps*	1
		East	Snowy Egret	*Egretta thula*	3
		East	Black-crowned Night-heron	*Nycticorax nycticorax*	2
		East	Mallard	*Anas platyrhynchos*	8
		East	Northern Pintail	*Anas acuta*	19
		East	Green-winged Teal	*Anas crecca*	3
		East	Blue-winged Teal	*Anas discors*	4
		East	Cinnamon Teal	*Anas cyanoptera*	7
		East	Virginia Rail	*Rallus limicola*	1
		East	Common Moorhen	*Gallinula chloropus*	1
		East	American Coot	*Fulica americana*	4
		East	Anna's Hummingbird	*Calypte anna*	2
		East	Allen's/Rufous Hummingbird	*Selasphorus sasin/rufus*	1
		East	Marsh Wren	*Cistothorus palustris*	1
		East	Wrentit	*Chamaea fasciata*	1
		East	Common Yellowthroat (CSC)	*Geothlypis trichas*	8
		East	Red-winged Blackbird	*Agelaius phoeniceus*	1
		East	Song Sparrow	*Melospiza melodia*	5
2	Low marsh	East	Marsh Wren	*Cistothorus palustris*	1
2	Other	East	Bewick's Wren	*Thryomanes bewickii*	1
		East	House Finch	*Carpodacus mexicanus*	10
		East	California Towhee	*Pipilo crissalis*	1
2	Ruderal	East	House Wren	*Troglodytes aedon*	3
2	Salt panne	East	Killdeer	*Charadrius vociferus*	1
		East	Ring-billed Gull	*Larus delawarensis*	8

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Upper Newport Bay Bird Data
8 September 1997

AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
		West	Cattle Egret	*Bubulcus ibis*	1
		West	Great Egret	*Casmerodius albus*	2
		West	Snowy Egret	*Egretta thula*	2
		West	Snowy Egret	*Egretta thula*	1
		West	Mallard	*Anas platyrhynchos*	2
		West	Mallard	*Anas platyrhynchos*	10
		West	Gadwall	*Anas strepera*	3
		West	Green-winged Teal	*Anas crecca*	7
		West	Cinnamon Teal	*Anas cyanoptera*	21
		West	Northern Shoveler	*Anas clypeata*	3
		West	Light-footed Clapper Rail (FE,SE)	*Rallus longirostris levipes*	1
		West	Semipalmated Plover	*Charadrius semipalmatus*	11
		West	Killdeer	*Charadrius vociferus*	2
		West	Black-bellied Plover	*Pluvialis squatarola*	68
		West	Long-billed Curlew (CSC)	*Numenius americanus*	1
		West	Long-billed Curlew (CSC)	*Numenius americanus*	1
		West	Spotted Sandpiper	*Actitis macularia*	1
		West	Greater Yellowlegs	*Tringa melanoleuca*	2
		West	Willet	*Catoptrophorus semipalmatus*	120
		West	Least Sandpiper	*Calidris minutilla*	125
		West	Western Sandpiper	*Calidris mauri*	1815
		West	Dowitcher spp.	*Limnodromus spp.*	45
		West	Marbled Godwit	*Limosa fedoa*	68
		West	Red-necked Phalarope	*Phalaropus lobatus*	1
		West	Forster's Tern	*Sterna forsteri*	5
		West	Black Skimmer (CSC)	*Rhynchops niger*	85
		West	Black Skimmer (CSC)	*Rhynchops niger*	10
		West	Common Yellowthroat (CSC)	*Geothlypis trichas*	1
		West	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	5
		West	Large-billed Savannah Sparrow	*Passerculus sandwichensis rostratus*	2
3	Mid-marsh	East	Savannah Sparrow	*Passerculus sandwichensis*	22
		West	Black Phoebe	*Sayornis nigricans*	1
		West	Brown-headed Cowbird	*Molothrus ater*	2
		West	Savannah Sparrow	*Passerculus sandwichensis*	45
3	Open water		Western Grebe	*Aechmophorus occidentalis*	1
			Clark's Grebe	*Aechmophorus clarkii*	1
			Pied-billed Grebe	*Podilymbus podiceps*	2
			Pied-billed Grebe	*Podilymbus podiceps*	9
			California Brown Pelican (FE,SE)	*Pelecanus occidentalis californica*	1
			Great Egret	*Casmerodius albus*	1
			Northern Shoveler	*Anas clypeata*	2
			Ruddy Duck	*Oxyura jamaicensis*	1
			Western Gull	*Larus occidentalis*	1
			Forster's Tern	*Sterna forsteri*	4
			Black Skimmer (CSC)	*Rhynchops niger*	1
3	Perches		Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	2
		East	American Kestrel	*Falco sparverius*	1
3	Ruderal	West	Sharp-shinned Hawk (CSC)	*Accipiter striatus*	1
		West	Northern Harrier (CSC)	*Circus cyaneus*	1
		West	Hummingbirds	*Trochilidae*	1
		West	House Finch	*Carpodacus mexicanus*	10
3	Salt panne	West	Killdeer	*Charadrius vociferus*	1
4	Aerial		Great Egret	*Casmerodius albus*	3
			Snowy Egret	*Egretta thula*	28
			Black-crowned Night-heron	*Nycticorax nycticorax*	1

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Upper Newport Bay Bird Data
8 September 1997

AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
3	Aerial		California Brown Pelican (FE,SE)	*Pelecanus occidentalis californica*	3
			Great Blue Heron	*Ardea herodias*	2
			Snowy Egret	*Egretta thula*	2
			Black-crowned Night-heron	*Nycticorax nycticorax*	2
			Mallard	*Anas platyrhynchos*	4
			Northern Pintail	*Anas acuta*	16
			Cinnamon Teal	*Anas cyanoptera*	12
			Cinnamon Teal	*Anas cyanoptera*	5
			Turkey Vulture	*Cathartes aura*	1
			Western Sandpiper	*Calidris mauri*	20
			Dowitcher spp.	*Limnodromus spp.*	3
			Marbled Godwit	*Limosa fedoa*	1
			American Avocet	*Recurvirostra americana*	1
			Western Gull	*Larus occidentalis*	1
			Ring-billed Gull	*Larus delawarensis*	1
			Black Skimmer (CSC)	*Rhynchops niger*	1
			Barn Swallow	*Hirundo rustica*	1
			Red-winged Blackbird	*Agelaius phoeniceus*	4
3	Freshwater marsh	East	Bushtit	*Psaltriparus minimus*	10
3	Low marsh	East	Light-footed Clapper Rail (FE,SE)	*Rallus longirostris levipes*	1
		East	Marsh Wren	*Cistothorus palustris*	4
		East	Red-winged Blackbird	*Agelaius phoeniceus*	40
		West	Savannah Sparrow	*Passerculus sandwichensis*	6
		West	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	3
3	Mudflat	East	California Brown Pelican (FE,SE)	*Pelecanus occidentalis californica*	1
		East	Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	9
		East	Great Egret	*Casmerodius albus*	2
		East	Snowy Egret	*Egretta thula*	3
		East	Light-footed Clapper Rail (FE,SE)	*Rallus longirostris levipes*	2
		East	Light-footed Clapper Rail (FE,SE)	*Rallus longirostris levipes*	1
		East	Semipalmated Plover	*Charadrius semipalmatus*	4
		East	Killdeer	*Charadrius vociferus*	1
		East	Killdeer	*Charadrius vociferus*	1
		East	Black-bellied Plover	*Pluvialis squatarola*	2
		East	Black-bellied Plover	*Pluvialis squatarola*	14
		East	Long-billed Curlew (CSC)	*Numenius americanus*	3
		East	Willet	*Catoptrophorus semipalmatus*	23
		East	Least Sandpiper	*Calidris minutilla*	80
		East	Western Sandpiper	*Calidris mauri*	27
		East	Dowitcher spp.	*Limnodromus spp.*	5
		East	Marbled Godwit	*Limosa fedoa*	10
		East	Ring-billed Gull	*Larus delawarensis*	5
		East	Forster's Tern	*Sterna forsteri*	5
		East	Forster's Tern	*Sterna forsteri*	1
		East	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	1
		Island 1	Semipalmated Plover	*Charadrius semipalmatus*	12
		Island 1	Black-bellied Plover	*Pluvialis squatarola*	16
		Island 1	Long-billed Curlew (CSC)	*Numenius americanus*	3
		Island 1	Long-billed Curlew (CSC)	*Numenius americanus*	1
		Island 1	Willet	*Catoptrophorus semipalmatus*	38
		Island 1	Least Sandpiper	*Calidris minutilla*	26
		Island 1	Western Sandpiper	*Calidris mauri*	735
		Island 1	Dowitcher spp.	*Limnodromus spp.*	8
		Island 1	Marbled Godwit	*Limosa fedoa*	39
		South	Marbled Godwit	*Limosa fedoa*	7
		West	Great Blue Heron	*Ardea herodias*	2
		West	Great Blue Heron	*Ardea herodias*	1

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AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
			Mallard	*Anas platyrhynchos*	21
			Gadwall	*Anas strepera*	7
			Northern Pintail	*Anas acuta*	1
			Cinnamon Teal	*Anas cyanoptera*	4
			Northern Shoveler	*Anas clypeata*	6
			White-tailed Kite	*Elanus caeruleus*	1
			Yellowlegs spp.	*Tringa spp.*	1
			Western Gull	*Larus occidentalis*	1
			Ring-billed Gull	*Larus delawarensis*	2
			Black Skimmer (CSC)	*Rhynchops niger*	11
			Barn Swallow	*Hirundo rustica*	2
			Common Raven	*Corvus corax*	2
			American Crow	*Corvus brachyrhynchos*	13
4	Mudflat	North	Great Blue Heron	*Ardea herodias*	1
		North	Mallard	*Anas platyrhynchos*	2
		North	Green-winged Teal	*Anas crecca*	3
		North	Cinnamon Teal	*Anas cyanoptera*	8
		North	Semipalmated Plover	*Charadrius semipalmatus*	54
		North	Killdeer	*Charadrius vociferus*	3
		North	Black-bellied Plover	*Pluvialis squatarola*	9
		North	Spotted Sandpiper	*Actitis macularia*	1
		North	Greater Yellowlegs	*Tringa melanoleuca*	1
		North	Willet	*Catoptrophorus semipalmatus*	30
		North	Least Sandpiper	*Calidris minutilla*	40
		North	Western Sandpiper	*Calidris mauri*	25
		North	Sanderling	*Calidris alba*	1
		North	Marbled Godwit	*Limosa fedoa*	14
		North	Ring-billed Gull	*Larus delawarensis*	1
		South	Great Blue Heron	*Ardea herodias*	1
		South	Great Egret	*Casmerodius albus*	1
		South	Ducks, unidentified	*Anas spp.*	2
		South	Mallard	*Anas platyrhynchos*	6
		South	Northern Pintail	*Anas acuta*	11
		South	Green-winged Teal	*Anas crecca*	2
		South	Cinnamon Teal	*Anas cyanoptera*	2
		South	Semipalmated Plover	*Charadrius semipalmatus*	3
		South	Killdeer	*Charadrius vociferus*	5
		South	Black-bellied Plover	*Pluvialis squatarola*	65
		South	Willet	*Catoptrophorus semipalmatus*	46
		South	Red Knot	*Calidris canutas*	22
		South	Least Sandpiper	*Calidris minutilla*	175
		South	Western Sandpiper	*Calidris mauri*	905
		South	Dowitcher spp.	*Limnodromus spp.*	200
		South	Short-billed Dowitcher	*Limnodromus griseus*	3
		South	Marbled Godwit	*Limosa fedoa*	39
		South	American Avocet	*Recurvirostra americana*	4
		South	Red-necked Phalarope	*Phalaropus lobatus*	4
		South	Forster's Tern	*Sterna forsteri*	2
		South	Caspian Tern	*Sterna caspia*	1
4	Mid-marsh	Island 2	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	2
		North	Savannah Sparrow	*Passerculus sandwichensis*	1
		South	Common Yellowthroat (CSC)	*Geothlypis trichas*	1
		South	Belding's Savannah Sparrow (SE)	*Passerculus sandwichensis beldingi*	5
4	Other	South	Anna's Hummingbird	*Calypte anna*	1
		South	Red-winged Blackbird	*Agelaius phoeniceus*	30
		South	Song Sparrow	*Melospiza melodia*	2
4	Open water		Eared Grebe	*Podiceps nigricollis*	1

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Upper Newport Bay Bird Data
8 September 1997

AREA	HABITAT	SHORE	COMMON	SPECIES	NUMBER
			Pied-billed Grebe	*Podilymbus podiceps*	6
			Double-crested Cormorant (CSC)	*Phalacrocorax auritus*	2
			Forster's Tern	*Sterna forsteri*	3
			Caspian Tern	*Sterna caspia*	1
4	Perches	South	White-tailed Kite	*Elanus caeruleus*	1
4	Ruderal	North	Red-winged Blackbird	*Agelaius phoeniceus*	1
		North	American Crow	*Corvus brachyrhynchos*	1
		South	Song Sparrow	*Melospiza melodia*	1
4	Salt panne	Island 3	Killdeer	*Charadrius vociferus*	4

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APPENDIX D

REPTILE AND AMPHIBIAN SPECIES OBSERVED IN UPPER NEWPORT BAY

AMPHIBIANS AND REPTILES OF UPPER NEWPORT BAY

Amphibians

	California newt	*Taricha torosa*
E	California slender salamander*	*Batrachoseps attenuatus*
@	Western toad	*Bufo boreas*
@	Pacific treefrog*	*Hyla regilla*
E	Bullfrog* +	*Rana catesbiena*
@	African clawed frog* +	*Xenopus laevus*

Reptiles

E	Pond slider+	*Chrysemys scripta*
E	Pacific pond turtle*	*Clemmys marmorata*
	California legless lizard	*Anniella pulchra*
	Coast horned lizard	*Phrynosoma coronatum*
@	Side-blotched lizard*	*Uta stansburina*
@	Western fence lizard*	*Sceloporus occidentalis*
	Western whiptail	*Cnemidophorus tigris*
E	Southern alligator lizard*	*Gerrhonotus multicarinatus*
@	Common kingsnake*	*Lampropeltis getulus*
E	Striped racer*	*Masticophis lateralis*
E	Coachwhip*	*Masticophis flagellum*
@	Gopher snake*	*Pituophis melanoleucus*
E	Western rattlesnake*	*Crotalus virdis*

* Collected or observed within the Reserve
\+ Exotic
@ Observed in Upper Newport Bay Regional Park
E Expected in Upper Newport Bay Regional Park

APPENDIX E

USFWS COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, California 92008

AUG 09 2000

Colonel John P. Carroll
District Engineer
Los Angeles District
U.S. Army Corps of Engineers
911 Wilshire Boulevard
Los Angeles, California 90017

Attn: Jim Hutchison, Environmental Resources Branch

Re: Fish and Wildlife Coordination Act Report for the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California (Reference No. FP/COE-052)

Dear Colonel Carroll:

Enclosed is our Fish and Wildlife Coordination Act Report (CAR) for the U.S. Army Corps of Engineers' (Corps) Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California. We provide the CAR in fulfillment of the scope of work (W81EYN83171206) between our respective agencies dated November 19, 1998, for Fiscal Year 1999. The enclosed report describes the biological conditions in the study area and assesses the potential impacts of implementing the preferred alternative on fish and wildlife resources. The CAR constitutes the report of the Secretary of the Interior pursuant to section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). We coordinated the development of this CAR with the National Marine Fisheries Service and California Department of Fish and Game.

We look forward to continued coordination and cooperation on this project as it proceeds through the planning process. Per your letter to the Service dated May 9, 2000, concerns we have raised about this project will be addressed by the Corps during the preconstruction, engineering, and design phase. If you have any questions, please contact Jill Terp, Project Biologist, or John Hanlon, Chief, Branch of Federal Projects, at (760) 431-9440.

Sincerely,

Jim A. Bartel
Assistant Field Supervisor

Enclosure

cc: Robert Hoffman, NMFS
Terri Stewart, CDFG

FISH AND WILDLIFE
COORDINATION ACT REPORT

UPPER NEWPORT BAY ECOSYSTEM RESTORATION FEASIBILITY STUDY ORANGE COUNTY, CALIFORNIA

prepared for the
U.S. Army Corps of Engineers
Los Angeles District
Los Angeles, California

prepared by the
U.S. Department of Interior
Fish and Wildlife Service
Carlsbad, California

Ken S. Berg
Field Supervisor

John R. Hanlon
Chief, Branch of Federal Projects

Jill M. Terp
Project Biologist

August 2000

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EXECUTIVE SUMMARY

The U. S. Army Corps of Engineers (Corps), in support of the local sponsor Orange County Public Facilities and Resources Department, is proposing an ecosystem restoration project for Upper Newport Bay, Orange County, California. The purpose of the Corps' project is to restore the design capacity of existing in-bay sediment detention basins and enhance existing biological resources. Another more recent goal is to meet criteria outlined by the Environmental Protection Agency and California Regional Water Quality Control Board for total maximum daily load (TMDL) inputs into the bay, particularly sediment. Sedimentation in Upper Newport Bay is the result of runoff from extensive urban and agricultural developments throughout the entire San Diego Creek watershed. Sedimentation changes the dynamics of the estuary in several ways, including a significant reduction in tidal influence. Upper Newport Bay is a significantly rich and diverse coastal resource. Restoration of the tidal prism could benefit present biological resources, however, changes to habitat types may negatively affect some sensitive species.

Discussions between the Corps, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, Orange County Public Facilities and Resources Department, and consultants to the Corps during Technical Advisory Group (TAG) meetings have facilitated the delineation of alternatives. The alternative selected as the preferred alternative dredges both in-bay basins in the upper bay, relocates one of the two California least tern nesting islands, includes many biological restoration elements, and outlines a projected maintenance schedule. This project does not address reducing sediment at its source within the San Diego Creek watershed, however, another Corps feasibility study is being undertaken to study the watershed and address sedimentation and increased runoff among other issues.

The Service commends the Corps and Orange County Public Facilities and Resources Department for working in a cooperative manner with resource agencies to develop project alternatives. Analysis of the preferred alternative indicates that it exceeds the goals set by the TAG for a not greater than 10 percent change for any habitat type. According to the draft Public Report, the preferred alternative has an increase of 19.5 percent for open water and a loss of 14.7 percent for intertidal mudflats (Corps 2000). An increase in open water may benefit many fish and fish-eating birds. However, the loss of intertidal mudflats is a significant detrimental impact to species that rely on that limited habitat, such as benthic invertebrates, shorebirds, seabirds, dabbling birds, and juvenile fish.

While this proposed preferred alternative comes close to a project with acceptable impacts, the Service believes this alternative requires modification to achieve the TAG goals. Our analysis indicates that a refinement of the preferred alternative, Alternative 6, may best achieve the goals of the TAG and still meet the TMDL criteria. This modified alternative would keep the dredge depths of -20 ft mean sea level (MSL) and Unit I/III basin configuration but reduce the dredging

footprint in the Unit II basin. Restoration of additional areas to offset permanent loss of intertidal mudflats is recommended. This revision would better achieve the goal of a not greater than 10 percent change in habitat type for mudflats while keeping an extended interval between maintenance dredging.

We raised concerns regarding the loss of mudflat habitat associated with this project during Technical Advisory Group meetings and in our DCAR dated May 2000. Per your letter to the Service dated May 9, 2000 (attachment), we understand that further refinement of the preferred alternative will take place during the Preconstruction, Engineering, and Design (PED) phase. In that letter, the Corps agreed to model and assess basin depth and areal extent requirements to reduce mudflat losses in Unit II Basin during the PED phase. Also, the Corps would work with agencies to identify additional areas in Upper Newport Bay for restoration to intertidal mudflat. We encourage the Corps during the PED phase to reduce the initial loss of intertidal mudflats to approach the maximum 10 percent loss of any habitat type that the TAG outlined in their meetings. We look forward to working with the Corps during the PED phase on this issue.

Biological restoration elements such as enhancement of California least tern nesting substrate, segmentation of dikes, restoration of side channels for predator deterrence, and restoration of upland areas to intertidal habitats may have beneficial effects, if construction timing is carefully considered. We make recommendations to minimize impacts to biological resources, and recommend monitoring of biological resources before, during, and after construction and maintenance to better assess impacts.

PREFACE

This constitutes a Fish and Wildlife Coordination Act Report (CAR) by the U.S. Fish and Wildlife Service (Service) on the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California. The CAR is in fulfillment of the Scope of Work (SOW) W81EYN83171206 dated 19 November 1998 between the Service and the U.S. Army Corps of Engineers (Corps). It constitutes the report of the Secretary of the Interior within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The information herein is provided as technical assistance to aid in the Corps' planning process.

The goals of the Service in cooperating in this analysis are to identify and evaluate the impacts of the proposed project on fish and wildlife resources and habitats in the immediate vicinity of the proposed project, and to recommend measures to avoid project related impacts.

INTRODUCTION

This document constitutes a Fish and Wildlife Coordination Act Report (CAR) by the U.S. Fish and Wildlife Service (Service) on the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California. The information provided is to aid in the Corps' planning process. This CAR describes the biological impacts of the proposed preferred alternative and recommendations to avoid project related impacts.

The recommendations are based on information provided in: 1) the Scope of Work (SOW) project description; 2) preliminary support documents for the SOW provided to the Service including the draft Environmental Impact Statement/Report, draft Public Report, and draft biological assessment; 3) various scientific papers, technical reports, and letters; 4) discussions between the Corps, the Service, National Marine Fisheries Service, California Department of Fish and Game, and consultants to the Corps during Technical Advisory Group meetings; 5) the information contained in the Carlsbad Fish and Wildlife Office files and library; and 6) the best collective professional judgement of Service personnel.

The Service commends the Corps and the local sponsor, Orange County Public Facilities and Resources Department, for working in a cooperative manner with resource agencies to develop project alternatives. Discussions between the Corps, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, Orange County Public Facilities and Resources Department, and consultants to the Corps during Technical Advisory Group (TAG) meetings facilitated the delineation of alternatives. The TAG established a goal that habitat types would not be changed by more than plus or minus 10 percent from existing conditions. The exception to this goal was for salt marsh which was targeted for a "no net change" from existing conditions. Also during the planning process, the Corps and local sponsor decided to incorporate into the project the Environmental Protection Agency (EPA) and California Regional Water Quality Control Board (RWQCB) program for total maximum daily load (TMDL) for sediment input into the bay. That program includes minimum maintenance dredging interval targets for the basins of 10 years, with a long term goal of 20-30 year intervals.

Seven project alternatives for the Upper Newport Bay Ecosystem Restoration project were suggested by the TAG. Six of the project alternatives incorporated various dredging designs for the Unit I/III and Unit II basins and lower bay; the seventh was the no project alternative. Modeling of sediment transport was conducted to determine the sediment capture capability of the various designs and to determine habitat changes. Two alternatives were eliminated from further consideration after analysis of sediment transport modeling which indicated an unacceptable level of sediment containment or due to ecological concerns voiced by resource agencies. Our Planning Aid Report dated March 2000 (USFWS 2000) for this project analyzed the four remaining dredging alternatives and the no project alternative.

The proposed preferred alternative, Alternative 6, analyzed within this document, however, does not represent the most recent discussions of the TAG. As will be further described within this CAR, the preferred alternative exceeds the habitat change goals set by the TAG. Therefore, while this proposed preferred alternative comes close to a project with acceptable impacts, the Service believes Alternative 6 must be modified such that it would achieve the TAG goals of a not greater than 10 percent loss of mudflat habitat.

We raised concerns regarding the loss of mudflat habitat associated with this project during Technical Advisory Group meetings and in our DCAR dated May 2000. Per your letter to the Service dated May 9, 2000 (attachment), we understand that further refinement of the preferred alternative will take place during the Preconstruction, Engineering, and Design (PED) phase. In that letter, the Corps agreed to model and assess basin depth and areal extent requirements to reduce mudflat losses in Unit II Basin during the PED phase. Also, the Corps would work with agencies to identify additional areas in Upper Newport Bay for restoration to intertidal mudflat. We will analyze impacts of the proposed preferred alternative as described in Corps documents within this CAR. We encourage the Corps during the PED phase to reduce the initial loss of intertidal mudflats to approach the maximum 10 percent loss of any habitat type that the TAG outlined in their meetings. We look forward to working with the Corps during the PED phase on this issue.

DESCRIPTION OF PROJECT AREA

Upper Newport Bay is located in Newport Beach, Orange County, California, approximately 40 miles southeast of Los Angeles and 70 miles northwest of San Diego. The area encompasses the uplands, wetlands, and open-water channel north of the Pacific Coast Highway bridge into the Narrows and basins of the Upper Newport Bay bordering Jamboree Road (Figure 1). Newport Beach has extensive commercial, residential, and recreational development on terrestrial lands surrounding Newport Bay, as well as on filled lands within the bay. Newport Harbor, a densely developed small boat marina now occupies lower Newport Bay. Newport Bay has over 1,200 acres of wetland, a reduction from its historic area of 2,800 acres. The upper bay area experiences tidal influence daily and receives fresh water input from San Diego Creek, the Santa Ana-Delhi Channel, and drainage from surrounding areas. The San Diego Creek watershed drains about 399 square kilometers (154 square miles), and flows about 30 cubic feet per second (cfs) during dry summer months, while storm events can exceed 20,000 cfs (Corps 1997). Three different dredging projects in the upper bay in the 1980s and 1990s constructed and/or maintained sediment trapping basins within the bay. Unit I/III detention basin is the upstream-most basin and the Unit II basin is downstream of the old saltworks main dike (Figure 1).

The immediate direct impacts of this project will be within Upper Newport Bay, upstream of Pacific Coast Highway to Jamboree Road Bridge, and at dredge spoil hauling, treatment, and

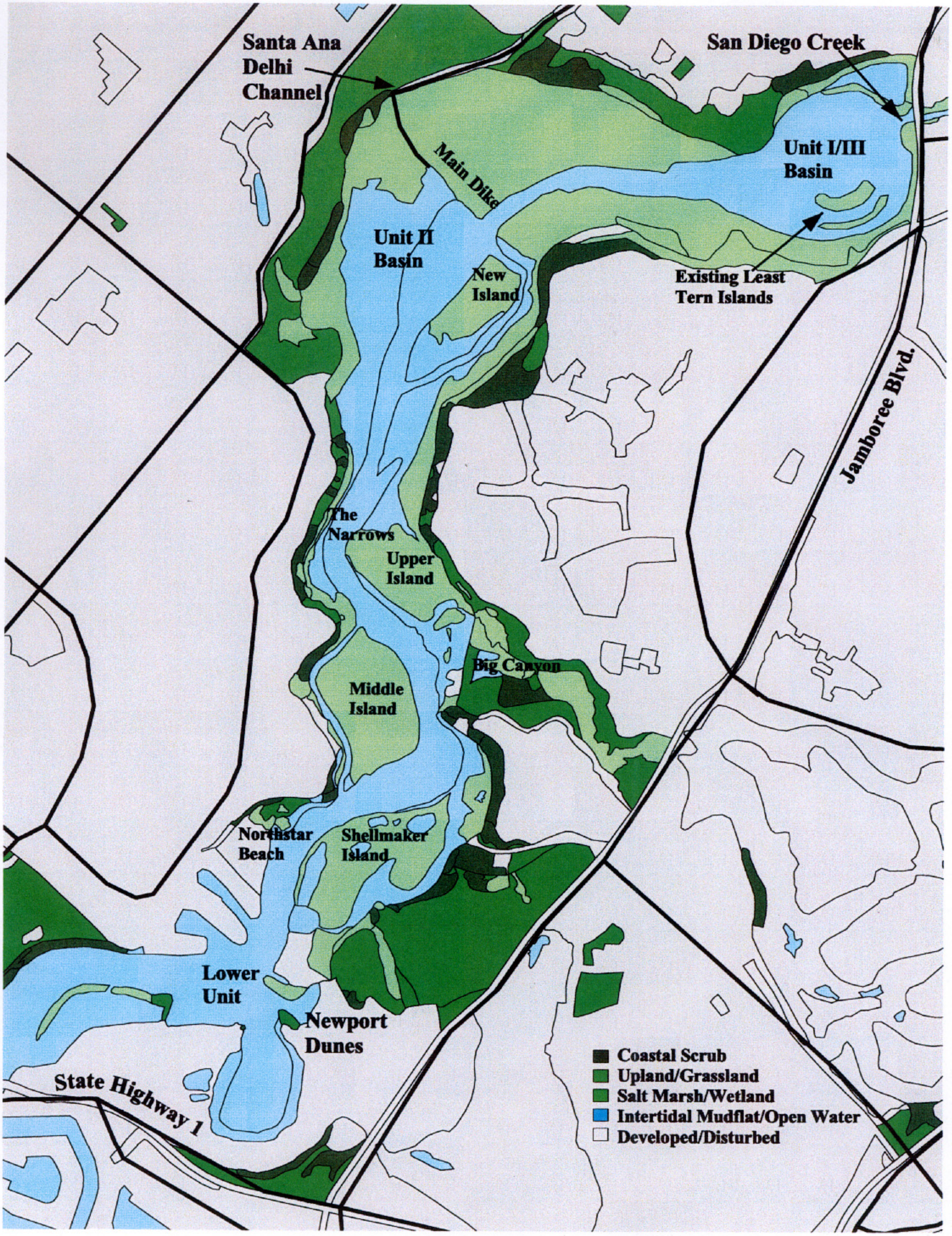

Figure 1. Project areas within Upper Newport Bay.

disposal sites. The Corps and local sponsor are currently looking at two dredging options using either a clamshell or hydraulic dredge for both construction and maintenance. The disposal site for dredged material has been preliminarily identified as LA-3, an offshore disposal area historically used in prior dredging projects. This site is scheduled to close on 1 January 2003, unless a site management plan for the area is completed and approved. If another disposal site is used due to the closure of LA-3 or for other reasons, the disposal impacts associated with the new site cannot be addressed at present.

The most recent dredging conducted in the Unit I/III basin by Orange County and the City of Newport Beach was terminated on 15 April 1999. This was an emergency dredging project to remove sediment, plus sediment deposited during the El Niño storms of winter 1997-1998. The project called for removing 725,000 to 825,000 cubic yards (cu yds) from the Unit I/III basin and the channel down to the Pacific Coast Highway bridge (Helix Environmental Planning 1996). During operations, an additional 107,000 cu yd beyond the planned volume were identified for removal from the upper basin. The project removed about 60,000-70,000 cu yds of this additional material, leaving approximately 30,000 cu yds in the upper basin. Slopes of 20:1 were dredged on the tern island side of the upper basin while slopes of about 5:1 were made on the north side (Tom Rossmiller, County of Orange, pers. comm.).

DESCRIPTION OF THE PROJECT

The Corps' project is a feasibility study to assess ecosystem restoration opportunities in Upper Newport Bay while maintaining and/or enhancing the ability of the upper bay basins to trap sediment. These basins function to capture sediment before it reaches Lower Newport Bay where recreationists require deep water for small boat navigation. The overall project objective is to restore the sediment capture ability in the basins and restore the tidal prism in Upper Newport Bay to enhance the productivity of native estuarine fish and wildlife resources.

Water quality standards are not being attained within Newport Bay and the watershed of San Diego Creek. Recently, the EPA and RWQCB began outlining criteria for total maximum daily load (TMDL) inputs of sediment, nutrients, and pathogens into the bay. In 1998, RWQCB adopted a TMDL for sediment that includes target intervals for maintenance dredging. The purpose of a long maintenance interval is to reduce adverse biological impacts from dredging. Another objective of the Corps' project is to assess the proposed alternatives for addressing the TMDL criteria, particularly for sediment control and maintenance.

In 1998, the Corps formed the TAG to assist in formulating project alternatives. None of the alternatives address reducing the sediment load at its source. However, the EPA and RWQCB TMDL goal is to decrease sediment input in the watershed by 50 percent within 10 years. The Corps is also initiating a watershed study for San Diego Creek to assess restoration measures that may reduce sediment inflows within the watershed in the future.

An increase in open water and a decrease in intertidal mudflats will result from dredging and expansion of the sediment basins in the upper reaches of the bay. The project's increase of open water would enhance fishery resources by increasing foraging and spawning areas. It would also create habitat for wintering migratory seabirds and waterfowl. By dredging to create open water habitat, however, intertidal mudflats developed from sedimentation will be lost, thereby reducing habitat for foraging and resting shorebirds and dabbling waterbirds, and nursery areas for juvenile fish. Habitats for endangered, threatened, and rare species associated with Upper Newport Bay could be enhanced as a result of some of the biological restoration elements of this project, while impacts to other sensitive species may occur if some elements are not carefully implemented. By restoring open water and incorporating some of the other habitat restoration elements in Upper Newport Bay, opportunities for scientists and educators and natural open space for public enjoyment could be enhanced.

The TAG established a goal that habitat types would not be changed by more than plus or minus 10 percent from existing conditions. The exception to this goal was for salt marsh which was targeted for a "no net change" from existing conditions. During the planning process, seven project alternatives for the Upper Newport Bay Ecosystem Restoration project were suggested by the TAG. Six of the project alternatives incorporated various dredging designs for the Unit I/III and Unit II basins. The seventh alternative presented was the No Project alternative. Two alternatives were eliminated from consideration after analysis of sediment transport modeling which indicated an unacceptable level of sediment containment or due to ecological concerns voiced by resource agencies.

The preferred alternative, Alternative 6, would deepen both of the in-bay sediment detention basins. In this alternative, the larger least tern nesting island ("kidney-shaped" island) would be removed from the Unit I/III basin and reconstructed along the southeastern portion of the main dike within Unit II. The upper basin would be dredged to -20 feet mean sea level (MSL), except for mudflat areas that would remain in the northeast corner by the marsh peninsula and around the remaining tern island ("hot-dog" island). About 100 foot wide mudflat would remain around the shoreline perimeter of the basin and the remaining tern island to a depth of -3 feet MSL. Between -3 and -20 feet MSL sides would be dredged at 5:1 slope. A channel with a 20 foot bottom width and 3:1 slopes will be constructed to the southern tip of the tern island to provide boat access for vegetation removal. A channel of this same dimension will be dredged between the island and the shore. A navigation channel from Pacific Coast Highway through Unit II into the Unit I/III basin would be maintained at -14 feet MSL for boat access.

The Unit II basin would be dredged to expand to the 0 foot MSL contour line from the reconstructed least tern island to New Island. The basin would be deepened to -20 feet MSL.

About 100 foot wide mudflat would remain around the perimeter of the basin to -3 feet MSL. Between -3 and -20 feet MSL sides would be dredged at 5:1 slope. A boat access channel would be constructed along the eastern tip of the tern island by the boat channel between the basins with a 20 foot wide bottom, -6 feet MSL depth, and 3:1 side slopes. The Santa Ana-Delhi Channel would also be dredged to -6 feet MSL with a 50 foot wide bottom and 2:1 side slopes.

The following biological restoration measures would be included in the project:

1) Vegetation clearing and addition of sand to the least tern nesting island in Unit I/III;
2) Removal of upland and creation of intertidal habitat along a "bullnosed" section of the north shore of Unit I/III;
3) Grading and restoration of Northstar Beach to a wetland;
4) Removal of dredge spoils on Shellmaker Island and restoration of 3.5-4 acres to mudflat;
5) Construction of a dendritic channel on Shellmaker Island from north to south along an old roadway footprint;
6) Removal and/or segmentation of old dikes in marsh areas to reduce access by humans and predators;
7) Restoration of side channels along the upland sides of New, Middle, and Shellmaker islands with 50 foot top widths and 3:1 side slopes;
8) Restoration of eelgrass beds off of Shellmaker Island.

Dredging Methods

Two different methods of dredging for construction and maintenance include use of either a large clamshell dredge or small hydraulic dredge. For clamshell dredging, a floating barge carries the crane-mounted large clamshell bucket. The bucket grabs a plug of sediment, then lifts and dumps it onto a scow. When filled, the scow is pushed by a small tugboat to a marshaling area, then the tug returns to the barge with an empty scow. The filled scow is pushed by an ocean-going tugboat to the offshore disposal site for dumping. About three round trips per day would be made to the disposal site. A guide boat would accompany all tug and barge movements through the bay to increase safety. The south end of Shellmaker Island is proposed by the Corps as the base for marshaling, refueling, office space, and storage for the dredge operation.

The small hydraulic dredge would operate a cutterhead to mechanically dislodge sediment, which would be pumped through a 12 inch pipeline to disposal scows at Shellmaker Island. The pipe would be laid along Back Bay Drive and booster pumps would assist in pumping the sediment slurry to the scow. When the slurry reaches the scow, the sediment needs to be separated from water in the slurry. Three scows moored at Shellmaker Island would be progressively filled with slurry, allowed time for the sediment to settle, then the water decanted via a pump over the side of the scow. Flocculation agents may be used to permit a rapid settling of the sediment in the scow to decrease the time needed for the process. The specific type of agent has not been identified, nor have potential effects of the decanted water containing the flocculation agent on the ecosystem been outlined. The draft EIS states that an Environmental Protection Agency approved flocculating agent would be used, of the type used for waste water treatment prior to discharge. This hydraulic method avoids scow trips through the Unit I/III and II basins. The hydraulic dredge requires less fuel than the clamshell dredge and could be refueled from the shore at Jamboree Road. The scows would be dumped at the offshore disposal site as in the clamshell dredging option. Shellmaker Island or possibly a section of the Newport Dunes parking lot would be used for the hydraulic dredge operations staging area.

Dredge operations for either method would occur 24 hours per day for 6 days per week during construction. Table 1 below outlines the sediment volume and construction time for the alternatives and dredge methods. Clamshell dredge volumes are greater than those for the hydraulic dredge because access channels are needed for the barge through the upper bay.

Table 1. Dredge volumes and construction duration for Upper Newport Bay Ecosystem Restoration Feasibility Study.

	Clamshell Dredge		Hydraulic Dredge	
Preferred Alternative	**Months to Complete Construction**	**Volume Removed (Cubic Yards)**	**Months to Complete Construction**	**Volume Removed (Cubic Yards)**
	21.7	2,027,000	27.8	1,952,000

<u>Maintenance</u>

The preferred alternative has an associated maintenance aspect, as the project will attempt to maintain the post-construction footprint and depth configuration. Maintenance dredging within the bay would be triggered if the following criteria were exceeded:

1) The cumulative percent of sediments trapped in the basins drops below 50 percent, or if more than 50 percent of cumulative sediments deposit beyond the basins;

2) If greater than 30 percent of cumulative sediment deposits below Pacific Coast Highway bridge;

3) Sediment accumulation reaches levels where there is a net change in habitat types, such as

open water changing to mudflat. This criterion is for Units I/III and II at this time and is based on the storage capacity of the basins below -3 feet MSL.

Based on these criteria and the modeling results for projected deposition patterns, the maintenance dredging interval and dredging volumes are given in Table 2.

Table 2. Dredge volumes, maintenance duration, and maintenance frequency for Upper Newport Bay Ecosystem Restoration Feasibility Study.

Preferred Alternative	Clamshell Dredge			Hydraulic Dredge		
	Duration (Months)	Frequency (Years)	Volume (cu yds)	Duration (Months)	Frequency (Years)	Volume (cu yds)
	20.3	21	1,902,000	22.8	21	1,602,000

DESCRIPTION OF ABIOTIC FACTORS

Upper Newport Bay's estuarine system experiences a range of tide heights during the year from a high of over 2.1 m (7 ft) to lows of nearly -0.6 m (-2 ft). Mean higher high water is about 1.6 m (5.3 ft) and mean lower low water is about 0 m (0 ft). Mean lower low water of 0 feet equates to 2.75 feet MSL. The bay's salt marsh system receives fresh water inflows from San Diego Creek, Santa Ana-Delhi Channel, limited local springs, and drainage from adjacent lands. The San Diego Creek watershed drains an area of 399 square kilometers (154 square miles), delivering sediment to Upper Newport Bay on a continuous basis with significant seasonal variations. Large volumes of stormwater flow occur during a few winter months, with low volume perennial creek flows the rest of the year. Sediment is trapped in basins in Upper Newport Bay, thus the habitat changes from open water to mudflats and marsh over time.

Sediment flows from San Diego Creek and Santa Ana-Delhi Channel enter the Unit I/III and Unit II sediment basins within Upper Newport Bay. The biology of Newport Bay is primarily influenced by tidal movement, however, the physical parameters are continually changed by sediment inflow. Sediment is problematic, as both intensive urbanization and agricultural development have increased runoff with an increased sediment load. Modifications to existing streambeds have decreased, if not eliminated, their ability to trap sediments. Instream sediment detention basins were constructed in San Diego Creek to capture bedload sediment. The fines not trapped upstream are the bulk of sediment settling out in Upper Newport Bay. In 1993, the Unit I/III basin was 90 percent full and the Unit II basin was 50 percent full (MBC 1980, Corps 1993). After completion of dredging in April 1999 within the upper basin some capture capacity was reestablished there.

Habitat changes in Upper Newport Bay will result if the sediment basins are not dredged as the upper bay will continue to fill with sediment and tidal influences will be reduced and/or locally shifted. Tidal exchanges are controlled by physical parameters and affect nutrient availability and distribution within the estuarine system. These physical parameters are directly influenced by sedimentation. Increasing sedimentation elevates the marsh, creating more high marsh and upland and reducing the extent of open water, low and mid-level marsh. The end result is a reduction of overall productivity of an extremely diverse estuarine system. Loss of lower marsh reduces nursery areas for fish and nesting areas for the light-footed clapper rail *(Rallus longirostris levipes*). At the same time, however, the sedimentation increases shallow intertidal areas, which also serve as nursery areas for a variety of fish, and are an important foraging and resting area for shorebirds and other bird species.

Another abiotic factor is the release of treated wastewater into the upper bay. This type of wastewater release may trigger or contribute to nuisance blooms of macroalgae in estuaries. Upper Newport Bay has a history of these algal blooms. Preliminary studies from the bay indicate that phosphorus may be the limiting factor for macroalgal growth at certain times of the year (Fong and Boyle 1997). Since no limit on phosphorus is currently mandated in the release of wastewater increasing nuisance blooms may occur.

DESCRIPTION OF BIOLOGICAL RESOURCES

In two Planning Aid Reports prepared by the Service for the Corps (USFWS 1997a, 2000), we fully described the habitats and wildlife present or potentially occurring within Upper Newport Bay, including sensitive species. We herein incorporate those documents by reference, and in this document will generally describe biological resources and focus on impacts of the preferred alternative on sensitive habitats and species.

The general habitat types directly or indirectly impacted by this project are open water, mudflats, salt marsh, and upland. Approximately 209 acres of open water, 240 acres of intertidal mudflat, 310 acres of salt marsh (low, middle and high), and 58 acres of uplands are present in Upper Newport Bay (Corps 2000). Mudflats and salt marsh are limited habitat types in the general area of Newport Bay. The nearest extensive mudflats and salt marsh are about 8 mi (13 km) to the north at Anaheim Bay, Seal Beach, and Bolsa Chica. Many species, especially migratory shorebirds and seabirds, rely on these two limited habitat types. Uplands are also limited due to the widespread commercial, residential, and recreational developments in the area.

Upper Newport Bay's diverse habitat structure hosts a myriad of plant and animal species. Open water is used by fish such as topsmelt (*Atherinops affinis*), flatfishes and basses, while mullet

(*Mugil cephalus*) and staghorn sculpin (*Leptocottus armatus*) frequent the mudflats during high tide. Fish-eating birds forage within the bay, including herons, egrets, diving waterbirds, and plunge divers such as the State and federally endangered brown pelican (*Pelecanus occidentalis californicus*) and California least tern (*Sterna antillarum browni*). Intertidal areas of mudflats and low marsh are nursery areas for fish and foraging areas for dabbling birds and shorebirds, including the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*). The salt marsh provides nesting habitat for birds such as the State endangered Belding's Savannah sparrow (*Passerculus sandwichensis beldingi*) and State and federally endangered light-footed clapper rail. Upper Newport Bay is home to the greatest single population of light-footed clapper rails, with over 100 breeding pairs noted in the past 13 breeding seasons. Salt marsh bird's-beak (*Cordylanthus maritimus* ssp. *maritimus*), a federally endangered plant, thrives in the marsh areas of the upper bay.

<u>Sensitive Species</u>

Upper Newport Bay supports or historically supported a number of species that are sensitive or that are listed under the Endangered Species Act of 1973, as amended. Table 3 lists some of these, including nine plants, two invertebrates, one fish, one amphibian, one mammal and eight birds. Not listed are bat species, many of which are considered sensitive but are likely to be migrants in the area. Brief descriptions of the species in Table 3 follows.

Table 3. Sensitive species known to occur or potentially occurring in the Upper Newport Bay area. Status indicates listing status or California Native Plant Society (CNPS) level of concern.

COMMON NAME	SPECIES	STATUS
PLANTS		
Aphanisma	*Aphanisma blitoides*	CNPS 1B
Pacific saltbush	*Atriplex pacifica*	CNPS 1B
Davidson's saltbush	*Atriplex serenana davidsonii*	CNPS 1B
Salt marsh bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*	Federal & State endangered
Many-stemmed dudleya	*Dudleya multicaulis*	CNPS 1B
Los Angeles sunflower	*Helianthus nuttallii* ssp. *parishii*	CNPS 1A, presumed extinct
Southern tarplant	*Hemizonia parryi* ssp. *australis*	CNPS 1B
Coast woolly-heads	*Nemacaulis denudata* var. *denudata*	CNPS 2
Nuttall's scrub oak	*Quercus dumosa*	CNPS 1B

COMMON NAME	SPECIES	STATUS
INVERTEBRATES		
Mimic tryonia	*Tryonia imitator*	sensitive
Quino checkerspot butterfly	*Euphydryas editha quino*	Federal endangered
FISH		
Tidewater goby	*Eucyclogobius newberryi*	Federal endangered
AMPHIBIANS		
Arroyo toad	*Bufo microscaphus californicus*	Federal endangered
MAMMALS		
Pacific pocket mouse	*Perognathus longimembris pacificus*	Federal endangered
BIRDS		
California black rail	*Laterallus jamaicensis coturniculus*	State threatened
Light-footed clapper rail	*Rallus longirostrus levipes*	Federal & State endangered
Brown pelican	*Pelecanus occidentalis californicus*	Federal & State endangered
California least tern	*Sterna antillarum browni*	Federal & State endangered
Western snowy plover	*Charadrius alexandrinus nivosus*	Federal threatened
Peregrine falcon	*Falco peregrinus*	State endangered
Coastal California gnatcatcher	*Polioptila californica californica*	Federal threatened
Belding's Savannah sparrow	*Passerculus sandwichensis beldingi*	State endangered

Aphanisma

This species has a distribution from Los Angeles County south to Baja California, Mexico. It also occurs on several Channel Islands (Munz 1974). Aphansima typically grows on coastal strands and bluffs in coastal sage scrub and maritime plant communities. An annual herb, this species is declining on the mainland (California Native Plant Society 1994). This species has been recorded in the Upper Newport Bay area (Corps 1997).

South coast saltbush

This saltbush species is a prostrate, mat-like annual, restricted to coastal bluffs and shrubland below 100 m elevation (Hickman 1993). The distribution of this species is on the Channel Islands and from Los Angeles County south to Baja California (Skinner and Pavlik 1994), and therefore may occur in the project area.

Davidson's saltbush

An annual herb, this saltbush species is found in coastal sage scrub habitat below 200 m elevation (Hickman 1993). This species has been identified within the Upper Newport Bay area (Corps 1997).

Salt marsh bird's-beak
This annual herb occurs in saltmarsh (California Native Plant Society 1994). This State and federally endangered species is common throughout Upper Newport Bay by Wilcox (1986) and is confined to a narrow band of intertidal salt marsh mostly in the lower part of Upper Newport Bay.

Many-stemmed dudleya
A perennial herb, this dudleya occurs in chaparral, coastal scrub, and foothill grasslands (California Native Plant Society 1994). Its occurrence in Upper Newport Bay would be restricted to coastal scrub, and therefore has potential to be within the project area.

Los Angeles sunflower
The Los Angeles sunflower is a perennial herb found in coastal marshes that include salt, brackish, and fresh water. This species was last seen in 1937 and therefore should not be considered further in this restoration project (California Native Plant Society 1994).

Southern tarplant
Southern tarplant, an annual herb, occurs in estuary margins, valley and foothill grassland, and vernal pools. This species has been identified within Upper Newport Bay (Corps 1997).

Coast woolly-heads
This species, an annual herb, occurs in coastal dunes, and has been much reduced by development. It has been identified as occurring within Upper Newport Bay (Corps 1997).

Nuttall's scrub oak
An evergreen oak, this perennial species is threatened by development. It has the potential to occur in the Upper Newport Bay area in chaparral and coastal scrub habitats.

Mimic tryonia
Populations were found in 1971 in upper Newport Bay (Taylor 1978 in Kellogg 1980) and in 1980. This small subtidal snail was found in high densities at the mouth of San Diego Creek and the Santa Ana Delhi Channel (MBC 1980 in Draft Baseline Conditions Report for Upper Newport Bay, December 1997). This species can apparently tolerate a wide salinity range (Kellogg 1980), but stormwater runoff can reduce water and sediment salinity reducing population density.

Quino checkerspot butterfly

A federally endangered species, this is a small member of the brush-footed butterfly family that inhabits open grasslands and openings within shrublands. Upper Newport Bay contains host plants for this species including dwarf plantain (*Plantago erecta*) and owl's clover (*Castilleja exserta*) (Corps 1997), however, the species has likely been extirpated from the area.

Tidewater goby

This fish is restricted to brackish waters in the upper portions of coastal lagoons. The species has not been documented within Newport Bay, but habitat for this species may exist in the upper bay.

Arroyo toad

Historically, this species was distributed along southern California drainages, restricted to riparian environments in the middle reaches of third order coastal streams. The area of Upper Newport Bay near San Diego Creek or Big Canyon could potentially support this federally endangered species. No data are available for the presence or absence of the arroyo toad within the project area.

Pacific pocket mouse

This federally endangered species occurs within 5 kilometers of the coast, generally in habitats associated with sandy, friable soils. Little is known about this small mammal and the current distribution of the population is not well delineated (USFWS 1997b). Upper Newport Bay lies within the species' historic range and has habitat that may support a population of Pacific pocket mice.

California black rail

This species is reported on checklists for the general Newport Bay area and has been documented infrequently in the upper bay (R. Zembal, pers. comm.). Currently its breeding distribution is disjunct with populations in San Francisco Bay and along the lower Colorado River (Eddlemen et al. 1994). Adults in California are apparently sedentary, but dispersal habits of juveniles are not well understood and may account for sightings outside of these established breeding areas. Upper Newport Bay contains habitat suitable for black rail, especially in areas with freshwater marsh vegetation.

Light-footed clapper rail

This species is a State and federally endangered species. Upper Newport Bay supports the largest population of light-footed clapper rails in southern California (Zembal 1996, Zembal et al. 1997). Since 1986 Upper Newport Bay has been the only area in California that supported more than 100 pairs of this very endangered species. Light-footed clapper rails nest March to August in cordgrass habitat of the lower salt marsh.

Brown pelican

Federally endangered brown pelicans are piscivorus feeders that favor the open water and deep channels of Upper Newport Bay (Wilcox 1986). These areas are mainly located near the boundary between Upper and Lower Newport Bay. Pelican numbers have rebounded since the banning of DDT, which was implicated in thinning of eggshells and reduced productivity.

California least tern

This State and federally endangered species nests from April to August. Upper Newport Bay provides a nesting area for terns and open channels rich in small fish for foraging (Caffrey 1997). As part of the Early Action Plan, a nesting island was created in Upper Newport Bay for California least terns. Starting in 1986 the number of breeding pairs increased, peaking at an estimated 90 pairs in 1995, and thereafter declined to less than 60 pairs in 1996. The decline was attributed to the growth of vegetation on the nesting island. The numbers rebounded in 1997 to 82 pairs, then was down to 28 pairs in 1998 when numbers statewide were lower (K. Keane, pers. comm.).

Western snowy plover

This federally threatened shorebird nests along the coast of California on beaches and salt panne. Its sensitive status is due to the loss of these habitat types. Snowy plovers use similar habitat types for nesting as those used by least terns, and therefore, have potential to use tern islands in the upper bay. Western snowy plovers rely on intertidal mudflats and beaches with kelp wrack for foraging.

Peregrine falcon

This falcon was removed from the Federal endangered species list in August 1999, however it remains on the State list. Peregrine falcons may use Upper Newport Bay as a foraging area.

Coastal California gnatcatcher

A federally threatened species, the coastal California gnatcatchers are reported in Upper Newport Bay with approximately 8 pairs present in 1998 (L. Hays, pers. comm.). Coastal sage scrub habitat for this species is found on the upland perimeters adjacent to wetland habitats. Disturbance to this habitat, via either direct loss or from noise during the project, may negatively affect breeding.

Belding's Savannah sparrow

This State endangered species occupies pickleweed (*Salicornia virginica*) habitat within the salt marsh vegetation. Historically, Upper Newport Bay has been one of the more productive breeding sites statewide (Zembal et al. 1988). Over 250 pairs were noted in 1996 (R. Zembal, pers. comm.). Disturbance to this habitat, via either direct loss or from noise during the project, may negatively affect breeding.

IMPACTS OF THE PREFERRED ALTERNATIVE ON BIOLOGICAL RESOURCES

The preferred alternative, Alternative 6, would increase the amount of open water by 19.5 percent and decrease intertidal mudflats by 14.7 percent within the two upper bay basins. These habitat changes are higher than the no greater than 10 percent change target set by the TAG. While the increase in open water would benefit fish and fish-eating species, the loss of mudflats would destroy and disturb benthic organisms, decrease nursery areas for juvenile fish, and reduce foraging and loafing areas for shorebirds and waterfowl. Benthic organisms are expected to recolonize dredged areas within a year of disturbance, but take longer to reach pre-disturbance populations. Species using the mudflats would continue to have areas within the upper bay for their use. However, the reduction of mudflat area could have a significant detrimental impact on foraging and resting shorebirds and seabirds since this habitat type is limited not only within the bay but also in the greater Orange County coastal area.

The biological restoration elements proposed for Alternative 6 would impact resources in various ways. Vegetation clearing and the addition of sand to nesting islands in Unit I/III would benefit California least terns. Weedy vegetation has reduced nesting areas, therefore removal of weeds along with the addition of good quality sand would enhance the habitat quality of these islands for this species. Alternative 6 would remove the larger least tern nesting island in the Unit I/III and reconstruct it along the old main dike in Unit II. This relocation is not anticipated to adversely impact least terns if the reconstruction occurs during the non-nesting season. Terns have colonized newly created sites at many locations in southern California.

Removal of upland and restoration to intertidal habitat along the "bullnosed" section of the north shore of Unit I/III, grading along with restoration of Northstar Beach to a wetland, and removal of dredge spoils on Shellmaker Island and restoration of 3.5-4 acres to mudflat or marsh would benefit fish and wildlife species using intertidal habitats. While there would be a time lag between construction and development of a natural vegetation and benthic community, over time species such as light-footed clapper rail, Belding's Savannah sparrow, western snowy plover and juvenile fish would benefit from intertidal mudflat and low marsh habitats in the bay. Removal of uplands, however, may impact Pacific pocket mouse, California coastal gnatcatcher, and sensitive plants. Surveys for Pacific pocket mouse in the uplands of the bay have not been conducted. Upland areas need to be adequately surveyed prior to the conversion of those areas to determine presence and distribution of sensitive upland species.

Construction of a dendritic channel through existing marsh on Shellmaker Island from north to south along an old upland roadway footprint and connecting to the dredge spoil restoration area would increase circulation to that restored site and increase edge area for rails and other species that forage along marsh margins. However, care would be needed to avoid impact to salt marsh bird's-beak during construction. Removal and/or segmentation of old dikes and the restoration of side channels at New, Middle, and Shellmaker Islands would reduce access by humans and terrestrial predators, thereby decreasing disturbance in marsh areas to the benefit of marsh dwelling species. Eelgrass restoration studies are underway by the Corps in the lower bay and portions of the upper bay. Restoration of eelgrass beds off of Shellmaker Island would develop that subtidal resource that has been absent in the upper bay, and be complementary to the other Corps study.

Dredging Method Options

Impacts to biological resources associated with using either a clamshell or hydraulic dredge include disturbance to the area from operation of the dredge, turbidity, noise and lighting associated with the operation, and impacts at the offshore disposal site. The impact to sensitive species from the dredge operation can be minimized by dredging near marsh areas outside of the breeding season and by screening and directing lights downward. Turbidity can be contained through best management practices including the use of silt curtains. Disposal at the offshore site would increase turbidity in the area until the sediment settled and cause mounding of the sediment on the ocean floor. This area has been designated and used for this type of disposal and the impacts are considered to be not significant.

Clamshell dredging would have impacts from the boat and scow traffic through the upper bay. The boat and scow traffic could create wakes that would swamp the nests of rails and sparrows in the lower marsh. This impact could be minimized by strict adherence to a speed limit for equipment in the upper bay and the placement of floats to attenuate wake near salt marsh. There is potential for a fuel spill into the bay during refueling of the dredge. Fuel spills could be minimized with best management practices. Clamshell dredging increases turbidity which could affect least tern and brown pelican foraging. Turbidity could be contained with use of silt curtains.

Hydraulic dredging would eliminate scow traffic and minimize boat traffic in the Unit I/III and II basins, therefore reducing impacts from disturbance and wakes to the lower marsh and the bay. The dredge would be refueled from an area by Jamboree Road reducing the risk of a fuel spill into the bay. While it is expected to create less turbidity than the clamshell dredge, silt curtains could be used to localize any turbidity from the hydraulic dredge. The decanted water would be released into the lower portion of Upper Newport Bay. Best management practices need to be used to reduce turbidity at the decant site. Other impacts include noise from booster pumps used to move the slurry through pipes to the decanting scows and disturbance from the laying of pipes through the marsh to reach Back Bay Drive. These impacts could be minimized by using the quietest pumps available or sound-proofing the pumps. Pipes should be laid only after the pipeline route has been surveyed and marked by a biologist so that sensitive areas are avoided.

The flocculation agent that would be necessary for the viability of the hydraulic dredging option has not been identified. Currently, water treatment facilities use flocculation chemicals in their processing. These chemicals have been approved by the EPA for use in this manner, however, these chemicals have not been used in this type of dredging operation, so it is unclear whether RWQCB would allow their discharge into the bay. Further study of these flocculation agents by the Corps and local sponsor will be necessary before we can fully evaluate the impacts to biological resources associated with their use and discharge.

Maintenance

Maintenance dredging is associated with the preferred alternative. Alternatives 6 has a maintenance interval of 21 years and a maintenance dredging duration of just under two years. Impacts from maintenance would be the same as that for the initial construction dredging, that is, noise, disturbance, turbidity, lights, boat wake, disposal, and potential fuel spills, as described above. A proposed staging area within the California Department of Fish and Game Ecological Reserve at south Shellmaker Ilsand would interfere with Reserve operations and interpretive programs. However, the Corps has identified the possibility of using part of the parking lot at Newport Dunes as a dredge staging area.

Impacts on Sensitive Species

Sensitive species most affected by any of the dredging alternatives are salt marsh bird's-beak, light-footed clapper rail, brown pelican, California least tern, western snowy plover, and Belding's Savannah sparrow. Salt marsh bird's-beak may be destroyed by restoration of dredge spoils and construction of the dendritic channel on Shellmaker Island. Surveys for this endangered species should be conducted prior to restoration and populations avoided during construction. Brown pelican, California least tern, light-footed clapper rail, and Belding's Savannah sparrow may be negatively impacted by the turbidity, noise, motion, lights, and boat wake of the dredging operation. These impacts may be lessened by use of silt curtains near dredge operation, conducting dredging and island construction adjacent to marsh areas outside of nesting season, using noise reduction methods, directing lights downward on the dredge barge, and keeping boat and scow speeds low during movement through the area.

Light-footed clapper rail and Belding's Savannah sparrow should benefit after the project's completion due to better protection from terrestrial predators by side channel construction and dike segmentation. California least tern and brown pelican will benefit from increased open water that should enhance their prey resources in the upper bay. California least terns will also benefit from improvements to nesting areas by removal of excess vegetation and augmentation of the sand substrate on existing and created nesting islands, provided those improvements are completed outside of nesting season. Western snowy plover may be negatively impacted by the loss of mudflat foraging areas but that impact is not expected to be significant. Snowy plover may use the enhanced California least tern islands for nesting. All these species should be monitored prior, during, and after construction to better evaluate effects from the project implementation.

Upland species, such as the sensitive plants aphanisma, Pacific and Davidson's saltbush, many-stemmed dudleya, southern tarplant, coast woolly-heads, and Nuttall's scrub oak, and sensitive animals such as Pacific pocket mouse and coastal California gnatcatcher may be impacted by this project by the removal of upland areas for restoration, especially along the bull-nosed section of land adjacent to Unit I/III. Therefore, surveys for those species should be conducted to determine their presence in upland areas before restoration takes place.

Other sensitive species occurring or potentially occurring in the project area are mimic tryonia, tidewater goby, and arroyo toad, however, impacts to these species are not considered to be significant. Tryonia will likely recolonize the newly dredged benthic areas from subtidal areas that are not disturbed. Tidewater goby has a low likelihood of presence in the upper bay, therefore disturbance is not anticipated. Arroyo toad may occur further upstream in more freshwater conditions of San Diego Creek and may occur in the Big Canyon area.

RECOMMENDATIONS

The Fish and Wildlife Coordination Act states that "...wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation...". Should the Corps' preferred alternative be implemented, incorporation of the following recommendations would minimally offset project induced losses to fish and wildlife resources and avoid impacts to federally listed species.

The Service, therefore, recommends that:

1) The Corps refine the preferred alternative such that it is composed of a dredging depth of -20 feet MSL in Basins I/III and II and the project footprint in Basin II is reduced to reduce impact to mudflat habitat.

2) The Corps restore additional areas to intertidal mudflat to reduce the permanent loss of mudflat to no greater than 10 percent of that existing habitat type.

3) The Corps avoid removing salt marsh during construction of side channels around

New, Middle, and Shellmaker islands.

4) The Corps construct the new California least tern nesting island outside the nesting season for the California least tern and the light-footed clapper rail, using materials from the old island with substrate having appropriate grain size, color, and shell fragments acceptable by the resource agencies.

5) The Corps dredge near marsh areas and remove dike segments during the non-breeding season.

6) The Corps have surveys conducted for plants, invertebrates, fish, amphibians, reptiles, mammals, and birds over time, before, during, and after project construction.

7) The Corps have a qualified biologist monitoring sensitive species during construction to assure no affect on species. The biologist would have authority to halt construction in that area if any affect was detected.

8) The local sponsor retain appropriate access for dredging equipment and a staging area in the Newport Dunes vicinity that avoids the ecological reserve.

9) The Corps and local sponsor ban vessels, including canoes and kayaks, upstream of Shellmaker Island.

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LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

MAY 1 2 2000
US FWS
CARLSBAD FIELD OFFICE, CA

May 9 2000

Office of the Chief
Environmental Resources Branch

Mr. Ken Berg
Field Supervisor
U. S. Fish and Wildlife Service
ATTN: Jack Fancher
2730 Loker Avenue West
Carlsbad, California 92008

Dear Mr. Berg:

The Los Angeles District of the U. S. Army Corps of Engineers has worked closely with members of your staff, other agencies, and the local sponsor on the development and evaluation of alternatives for the Upper Newport Bay Restoration Project Feasibility Study. We also received two Planning Aid Reports from you, the latest in March 2000. We have been working on an array of alternative plans that address the problems and needs within Newport Bay, and have selected Alternative 6 as the recommended plan.

This alternative, of those subjected to rigorous modeling up to this time, most closely meets the two objectives of improving the control of sediment deposition within the Bay, without significantly changing existing habitat types. Alternative 6 meets the Total Maximum Daily Load (TMDL) objective of maintenance dredging at intervals no more than once every 20-years on average, while narrowly exceeding the objective of causing no more than a maximum of 10% change in any one habitat type in the Bay. The TMDL Objective is a water quality goal set in accordance with the Clean Water Act. The 10% loss objective is an ecosystem restoration objective established by the Upper Newport Bay Ecosystem Restoration Habitat Evaluation Group.

We are aware of your concern for losses of intertidal mudflats in excess of 10%. Due to time constraints given by the local sponsor's need to have this project included in the Water Resources Development Act (WRDA) of 2000, we are unable to rigorously model another alternative. However, we believe that further refinement during the post-authorization, Pre-construction, Engineering, and Design (PED) phase, prior to construction, will further reduce the permanent intertidal mudflat habitat loss to within agreed upon limits, while retaining the longest possible interval between maintenance dredging cycles. Therefore, the U. S. Army Corps of Engineers will continue to work throughout the project's design phase to further refine this alternative to reduce the initial loss of intertidal mudflats while continuing to meet all TMDL requirements. Our intent will be to approach both a minimum 20-year dredging cycle and a maximum 10% loss of any habitat type.

The U. S. Army Corps of Engineers will concurrently look into two methods to either reduce loss of intertidal mudflat or to create additional intertidal mudflat. The first method is to modify the lower basin (Unit II) configuration. Alternative 6 currently includes an enlarged basin designed to help meet the minimum maintenance-dredging interval. During the PED Phase, the Corps will assess basin depth and aerial extent requirements in order to reduce mudflat losses in the Unit II basin. Mudflat losses will be balanced against reductions in the maintenance-dredging interval. The latter requires extensive modeling to assess the impacts of this modification, which cannot be accomplished within the time remaining in the feasibility phase.

The second method is to continue to work with the California Department of Fish and Game to identify additional areas in the Upper Newport Bay Ecological Reserve for restoration to intertidal mudflat. We feel that additional areas might be found within the Ecological Reserve that are available and suitable for this purpose. Final details, including exact configuration modifications and identification of specific restoration areas, will be addressed in consultation with the HEG during the final design phase.

Final details, including exact configuration modifications and identification of specific restoration areas, will be addressed in consultation with the Upper Newport Bay Ecosystem Restoration Habitat Evaluation Group during the final design phase.

These methods to reduce the net loss of intertidal mudflat were addressed at the recent Alternatives Formulation Briefing (AFB) where the Los Angeles District was directed to proceed in this manner by our Headquarters personnel. The other members of the Upper Newport Bay Environmental Restoration Habitat Evaluation Group who were present at the AFB also agreed to this approach.

If you have any questions please call Mr. Larry Smith at (213) 452-3846. He may also be reached by e-mail at "lsmith@spl.usace.army.mil".

Sincerely,

Robert E. Koplin, P.E.
Chief, Planning Division.

cc: Upper Newport Bay Environmental Restoration Habitat Evaluation Group

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

JUL 27 2000

F/SWR4:RSH

Mr. Ken S. Berg
Field Supervisor
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, California 92008

Dear Mr. Berg:

Thank you for the opportunity to review the Draft Fish and Wildlife Coordination Act Report (CAR) for the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California.

The National Marine Fisheries Service has participated in extensive meetings to develop this Feasibility Study. As a consequence, we believe the recommendations contained in the CAR are reasonable, feasible, and necessary to ensure that an acceptable project is implemented. We, therefore, concur with the recommendations contained in the CAR.

Should you have any questions, please contact Mr. Robert Hoffman at 562-980-4043 or email: bob.hoffman@noaa.gov.

Sincerely,

JJ Slawson

James J. Slawson
Assistant Regional Administrator
for Habitat Conservation

STATE OF CALIFORNIA-THE RESOURCES AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF FISH AND GAME
South Coast Region
4949 Viewridge Avenue
San Diego, California 92123
(858) 467-4201
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August 2, 2000

Mr. Ken Berg, Field Supervisor
United States Fish and Wildlife Service
2730 W. Loker Avenue
Carlsbad, California 92008

Dear Mr. Berg:

Draft Fish and Wildlife Coordination Act Report (CAR) for the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California (May 2000)

The Department of Fish and Game (Department) has reviewed the Draft Fish and Wildlife Coordination Act Report (CAR) for the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California, prepared by your office in May 2000, and concurs with its findings. As you know, the subject of this feasibility report is the Upper Newport Bay Ecological Reserve managed by the Department. Both of our agencies have been attending Technical Advisory Group (TAG) meetings on this study consistently for over a year now, and intermittently prior to that. The Army Corps of Engineers has been the lead agency for the preparation of this Study and for the associated Draft Environmental Impact Report/Statement (DEIR/EIS) for the restoration project which is currently under public review. The County of Orange and City of Newport are the local sponsors for this project.

The Department feels that the proposed modified alternative described in the CAR will produce a restoration product which achieves the goals set forth by the TAG. The Department and other agencies have been working on identifying potential restoration areas within Upper Newport Bay where mud-flat habitat can be incorporated into the restoration plan. Three of the Department's main concerns include 1) implementing the dredging depth necessary to achieve maximum protection of the least tern island in the upper reach of the Bay; 2) maximizing the interval between maintenance dredging; and 3) reducing impacts from proposed staging area(s) and dredging operations on the Reserve's public outreach and education programs. The CAR addresses these issues, however with respect to the dredging depth, the May 2000 version states a -3 MSL depth will occur. This is inconsistent with the DEIR/EIS which indicates a -5 MSL depth. We ask that this inconsistency be corrected in the Final CAR. With respect to the other two main concerns, the Department will be sending a comment letter to the Army Corps on the DEIR/EIS.

In conclusion, the Department concurs with the CAR's recommendations on the Biological restoration elements, the impact minimization measures and the monitoring approach for this project. We appreciate the opportunity to review this CAR and to provide comments to you at this point in time. We also appreciate the knowledgeable staff who attend the TAG meetings and the Service's commitment to and continued involvement in the protection and enhancement of the Department's Upper Newport Bay Ecological Reserve.

If you have any questions, please contact Ms. Terri Stewart, Senior Biologist for the Region's Land Management and Monitoring Program. She can be reached at the letterhead address, or by telephone at (858)467-4209.

Sincerely,

C. F. Raysbrook
Regional Manager

cc: Department of Fish and Game:

Terri Stewart
San Diego

Erick Burres
Huntington Beach

USFWS
Jack Fancher
Carlsbad

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APPENDIX F

BIOLOGICAL ASSESSMENT

BIOLOGICAL ASSESSMENT FOR THE UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT, ORANGE COUNTY, CALIFORIA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
911 Wilshire Boulevard
Los Angeles, California 90017

September 2000

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SECTION 1.0 - INTRODUCTION

1.1 DOCUMENT PURPOSE

This Biological Assessment has been prepared to document the impacts of the Upper Newport Bay Ecosystem Restoration Project in Orange County, California, on threatened and endangered species. It has been prepared to facilitate the formal consultation pursuant to Section 7 of the Endangered Species Act, 16 U.S.C. 1536(c), between the U.S. Army Corps of Engineers (Corps) and the U.S. Fish and Wildlife Service (USFWS).

1.2 LISTED SPECIES CONSIDERED

Table 1-1 lists sensitive species that may potentially occur at Upper Newport Bay. Ten species listed as threatened or endangered by the federal government are considered in this document. These 10 species include one endangered plant species, salt marsh bird's-beak (*Cordylanthus maritimus maritimus*), one insect species, Quino checkerspot butterfly (*Euphydryas editha quino*), one fish species, tidewater goby (*Eucyclogobius newberryi*) and seven wildlife species, arroyo toad (*Bufo microscaphus*), Pacific pocket mouse (*Perognathus longimembris pacificus*), light-footed clapper rail (*Rallus longirostrus levipes*), brown pelican (*Pelecanus occidentalis californicus*), California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrinus nivosus*) and coastal California gnatcatcher (*Polioptila californica californica*).

1.3 ORGANIZATION OF THE BIOLOGICAL ASSESSMENT

Section 2 describes the proposed project. Section 3 discusses the existing biological resources at the project site. Section 4 predicts the impacts of the proposed project on biological resources and the actions that will be taken to mitigate identified adverse impacts. Section 5 presents alternatives to the proposed project. Section 6 discusses cumulative impacts. Section 7 is the conclusions and determination.

1.4 AGENCY COORDINATION

The Corps and the local sponsor, the Orange County Public Facilities and Resources Department (OCPFRD), have coordinated with USFWS and the other resource agencies throughout the planning process for this project.

To facilitate coordination among the resource agencies and special interest groups concerned about the Bay, the Upper Newport Bay Environmental Restoration Technical Advisory Group (TAG) was formed. Several Meetings of this group have been held to provide a forum for the various agencies and groups with an interest in Upper Newport Bay to identify their concerns, goals, objectives, and potential restoration efforts for Upper Newport Bay. The resource agencies and special interest groups who participated in these meetings included the following:

Table 1-1
Listed Species Occurring or Potentially Occurring at Upper Newport Bay in Orange County, California

Scientific Name	Common Name	Status	PFO	Habitat	Comments
PLANTS					
Cordylanthus maritimus maritimus	salt marsh bird's-beak	CNPS 1B FE, SE	H	Occurs in coastal salt marshes and coastal dunes, It is limited to the higher zones of the salt marsh habitats.	Known to occur in project area.
WILDLIFE					
CLASS INSECTA	**INSECTS**				
NYMPHALIDAE	**BRUSH-FOOTED BUTTERFLIES**				
Euphydryas editha quino	Quino checkerspot	FE, CSC	M	Requires presence of larval host plant *Plantago erecta*, adult nectar sources, and topographic features including bare open soils and ridgetops.	Host plant present but no reports of species from Upper Newport Bay.
CLASS OSTEICHTHYES	**BONY FISH**				
GOBIIDAE	**GOBIES**				
Eucyclogobius newberryi	Tidewater Goby	FE	L	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	Not reported from Upper Newport Bay.
CLASS AMPHIBIA	**AMPHIBIANS**				
BUFONIDAE	**TRUE TOADS**				
Bufo microscaphus californicus	arroyo southwestern toad	FE, CSC	L	Sandy banks adjacent to washes, streams, and arroyos in semiarid parts of the southwest.	No suitable habitat within project area. Could occur upstream in San Diego Creek.
CLASS AVES	**BIRDS**				
Scientific Name	**Common Name**	**Status**	**PFO**	**Habitat**	**Comments**
PELECANIDAE	**PELICANS**				
Pelecanus occidentalis californica	California brown pelican	FE, SE	H	Nests on the Channel Islands off the coast of southern California and Baja California but can be found year- round along the southern Californian coast. They inhabit open water, mudflats, and salt pannes.	Reported from project area.
MUSCICAPIDAE	**KINGLETS, GNATCATCHERS, BABBLERS**				
Polioptila californica californica	Coastal California gnatcatcher	FT, CSC	H	Occurs in coastal sage scrub vegetation on mesas, arid hillsides, and in washes and nests almost exclusively in California sagebrush.	Breeds in uplands around Upper Newport Bay.

Table 1-1 (Continued)
Listed Species Occurring or Potentially
Occurring at Upper Newport Bay in Orange County, California

Scientific Name	Common Name	Status	PFO	Habitat	Comments
LARIDAE	**SKUAS, JAEGERS, GULLS, & TERNS**				
Sterna antillarum browni	California least tern	FE, SE	H	Nests along the coast on bare or sparsely vegetated, flat substrates such as sandy beaches, alkali flats, land fills, or paved areas.	Breeds in Upper Newport Bay.
CHARADRIIDAE	**PLOVERS**				
Charadrius alexandrinus nivosus	Western snowy plover	FE, CSC	H	Inhabits sandy beaches on marine and estuarine shores, also salt pond levees, and the shores of large alkali lakes.	Doesn't currently breed in Upper Newport Bay but wintering birds would be expected.
RALLIDAE	**RAILS, GALLINULES & COOTS**				
Rallus longirostris levipes	Light-footed clapper rail	FE, SE	H	Inhabits salt marshes traversed by tidal sloughs, where cordgrass and pickleweed are the dominant vegetation.	Breeds in Upper Newport Bay.
CLASS MAMMALIA	**MAMMALS**				
HETEROMYIDAE	**POCKET NICE AND KANGAROO MICE**				
Perognathus longimembris pacificus	Pacific pocket mouse	FE, CSC	M	Occurs from the Mexican border to El Segundo in Los Angeles County along narrow coastal plains. It is typically found in fine alluvial sands near the ocean.	Might occur in uplands in surrounding area.

Status Codes

Federal
FE = Federally listed; Endangered
FT = Federally listed; Threatened
FSOC = Federal Species of Concern

State
ST = State listed; Threatened
SE = State listed; Endangered

CNPS = California Native Plant Society
1A Plants presumed extinct in California
1B Plants rare, threatened or endangered in California and elsewhere.
2 Plants rare, threatened, or endangered in California, but more common elsewhere.
3 Plants for which more information is needed - a review list.
4 Plants of limited distribution - a watch list.
*** Fully protected by State of California.**

Potential for Occurrence (PFO)

L = **Low potential for occurrence** - No recent or historical records exist of the species occurring in the project area or its immediate vicinity (within approximately 5 miles) and the diagnostic habitat requirements strongly associated with the species do not occur in the project area or its immediate vicinity.
M = **Moderate potential for occurrence** - Either a historical record exists of the species in the project area or its immediate vicinity or the diagnostic habitat requirements associated with the species do occur in the project area or its immediate vicinity.
H = **High potential for occurrence** - Both a historical record exists of the species in the project area or its immediate vicinity and the diagnostic habitat requirements strongly associated with the species do occur in the project area or its immediate vicinity.

Source:
California Natural Diversity Data Base (CNDDB), Newport Beach quad, 1999.

Federal Agencies

U.S. Department of Interior, U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency
U.S. Department of Commerce, National Oceanic, and Atmospheric Administration (NOAA), National Marine Fisheries Service
U.S. Department of Commerce, NOAA, National Ocean Service
U.S. Department of Transportation, Coast Guard

State Agencies

California Coastal Commission
CDFG
RWQCB

County of Orange Agencies

Public Facilities and Resources Department
Survey Division/Mapping Services and Applications
Parks and Recreation
Coastal Facilities
Flood Control
Sanitation District
Environmental Health

City of Newport Beach

Public Works
Utilities Department
Harbor Patrol
City Council
Attorney's Office
Executive Office

Local Committees/Groups

Newport Bay Water Quality Committee
Newport Bay Coordinating Council
Newport Bay/San Diego Creek Technical Advisory Committee
Dover Shores Homeowners
De Anza Bayside Marina
Newport Dunes Marina
Friends of Newport Bay
The Irvine Company
Newport Chapter of Surfriders
Defend the Bay
UNB Naturalists
Irvine Ranch Water District
Coastal Conservancy
Newport Harbor Boy Scout Sea Base
Stop Polluting Our Newport

Harbor Quality Committee
San Joaquin Freshwater Marsh Reserve

Universities

University of California, Irvine
Orange Coast College

To evaluate the benefits and constraints of habitat restoration a Habitat Evaluation Group (HEG) subcommittee of the TAG was formed. The HEG consists of members of USFWS, the California Department of Fish and Game (CDFG), the Corps, OCPFRD, the City of Newport Beach, the National Marine Fisheries Service, the USFWS, and the Regional Water Quality Control Board (RWQCB).

The HEG participated in the development of project alternatives and the selection of final alternatives that were analyzed in the Feasibility Study and Environmental Impact Statement/Environmental Impact Report.

1.5 COORDINATION WITH USFWS

In addition to coordinating with USFWS during the planning process through USFWS participation on the TAG and HEG, the USFWS has provided the Corps with two Planning Aid Reports for the Upper Newport Bay Environmental Restoration Project (October 1997 and March 2000) and a Draft Coordination Act Report in May of 2000. Discussions between the Corps and USFWS determined that a Section 7 consultation was appropriate considering the presence of listed species within the project area.

SECTION 2.0 - PROPOSED PROJECT

2.1 INTRODUCTION

Upper Newport Bay, one of the largest coastal wetlands remaining in southern California, is an ecological resource of national significance. The 1000-acre Upper Bay is characterized by development in its lower reach and a 752-acre undeveloped ecological reserve in its upper reach. Natural habitats within Upper Newport Bay include marine open water, intertidal mudflats, cordgrass dominated low saltmarsh, pickleweed dominated mid saltmarsh, high saltmarsh, salt panne, riparian, freshwater marsh and upland. Because of its diversity of habitats and its location on the Pacific Flyway, Upper Newport Bay supports an impressive number and diversity of birds particularly during fall and winter when shorebirds and waterfowl arrive from their northern breeding grounds. Upper Newport Bay also supports several endangered bird species and an endangered plant. The subtidal and intertidal waters of the Upper Bay provide important habitat for marine and estuarine fishes.

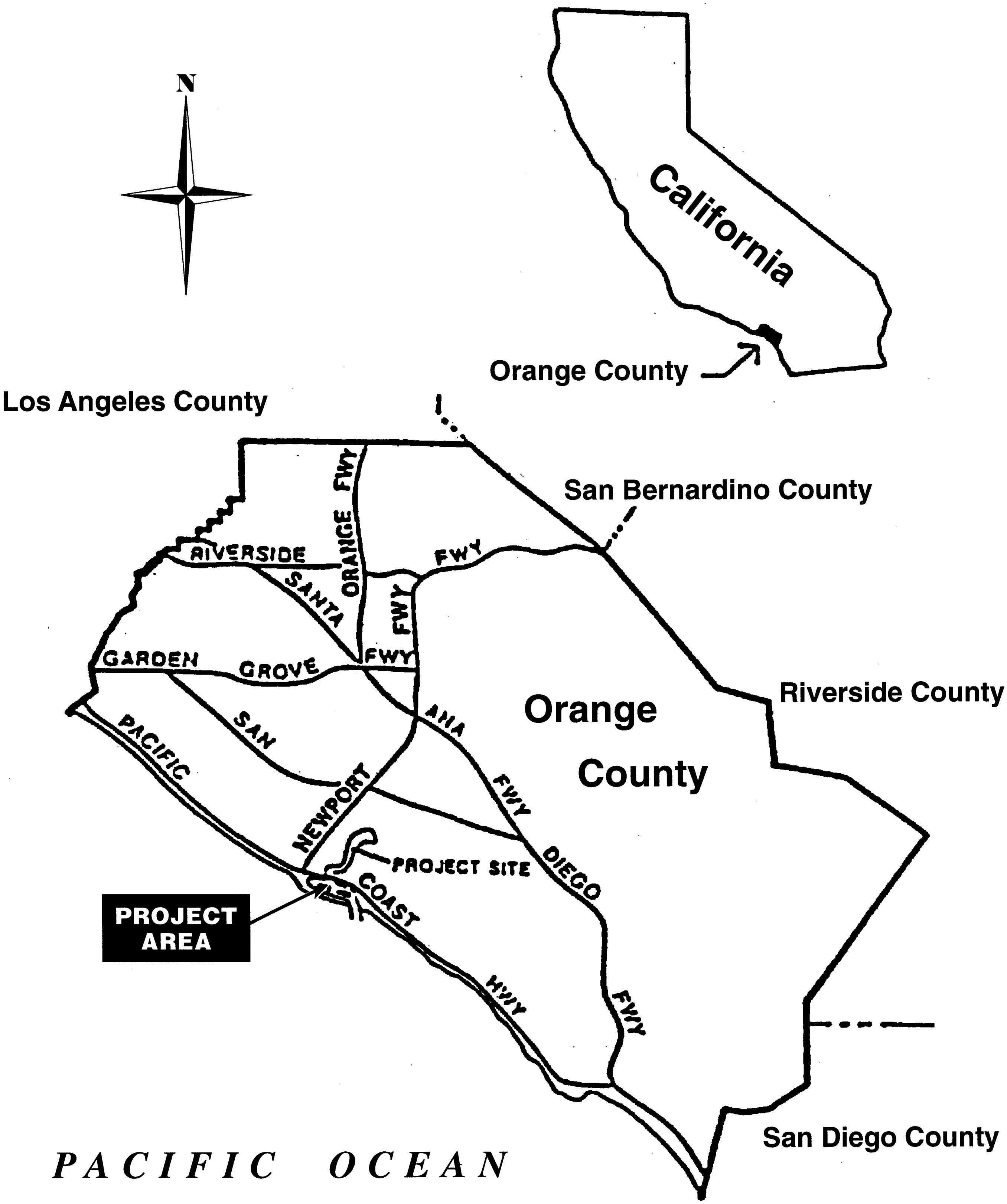
The ecological diversity and functionality of Upper Newport Bay has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport Bay is San Diego Creek which drains approximately 85 percent of the 98,500-acre watershed. Sediment from the San Diego Creek watershed has filled open water areas within the Bay. This sedimentation has decreased the extent of tidal inundation, diminished water quality, degraded habitat for endangered species as well as migratory water birds and marine and estuarine fishes, and resulted in navigation problems in the Upper Bay marinas and navigation channels. If sediment deposition within Upper Newport Bay is allowed to continue, open water areas will evolve into mudflats and eventually marsh or upland habitat resulting in a loss of ecological diversity.

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Sediment will continue to deposit in the Bay no matter what control measures are implemented in the watershed. Therefore, one of the most important components of this project is to develop a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediment will settle.

In addition to developing a plan for sediment control, the Upper Newport Bay Restoration project includes several other measures to improve habitat quality in the Upper Bay.

2.2 PROJECT LOCATION

Newport Bay is located along the coast of Orange County, California approximately 40 miles (64 kilometers [km]) south of Los Angeles and 75 miles (120 km) north of San Diego (Figure 2-1). The Bay is divided into the Lower and Upper Bay at the Pacific Coast Highway (PCH) Bridge (Figure 2-2). The 750-acre Lower Bay is a small boat harbor surrounded by residential development. The 1,000-acre Upper Bay is characterized by a diverse mix of development in its



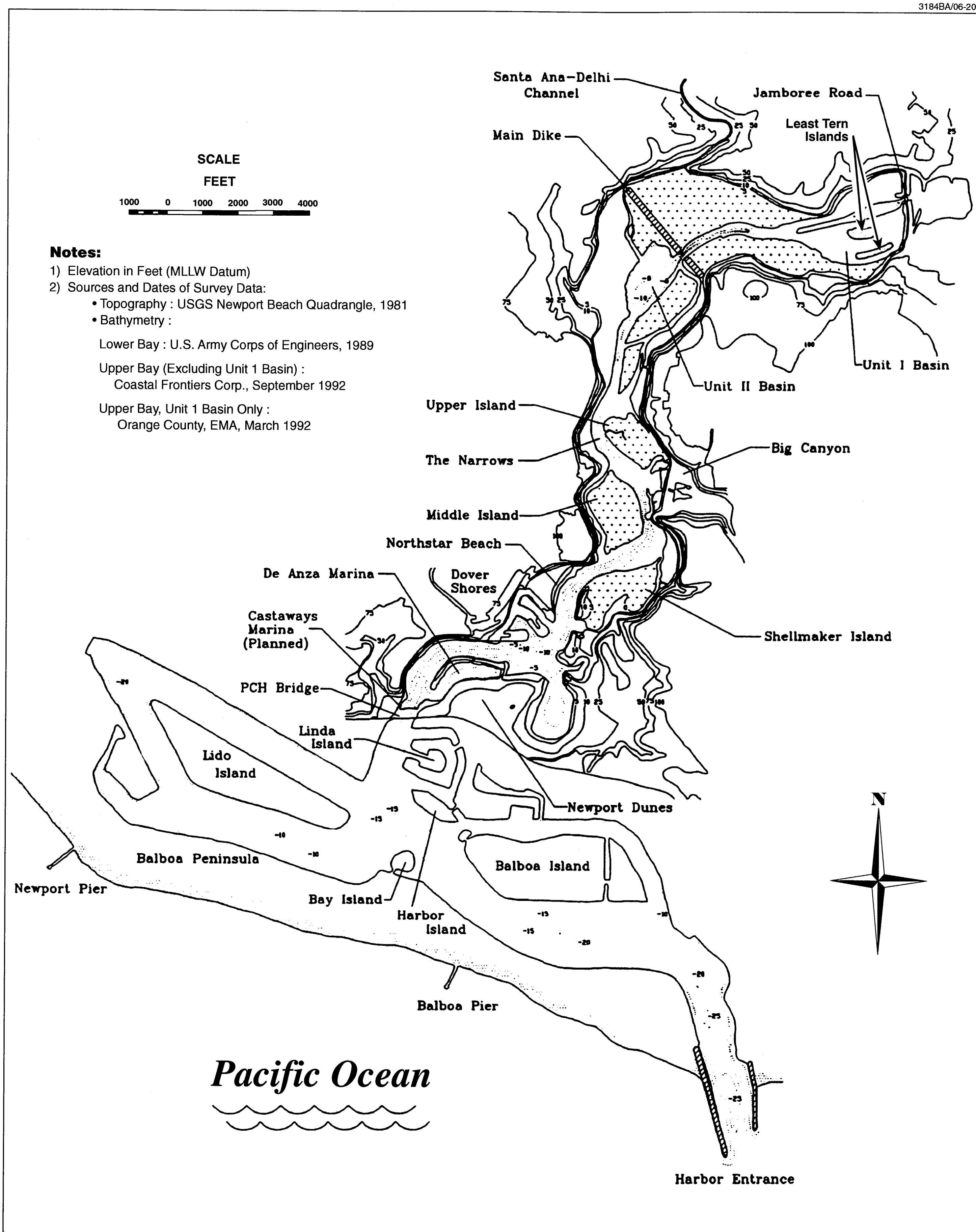
Chambers Group

SOURCE: CORPS 1998

NOT TO SCALE

PROJECT LOCATION
Figure 2-1

3184BA/06-2000



Chambers Group

Source: Corps 1993

LOCATION OF PLACES IN NEWPORT BAY
Figure 2-2

lower reach and an undeveloped ecological reserve in its upper reach. The 752-acre Upper Newport Bay Ecological Reserve, managed by the CDFG, is one of the last remaining southern California coastal wetlands that continue to play a significant role in providing critical habitat for a variety of migratory waterfowl and shorebirds as well as several endangered species of animals and plants. For this reason, Upper Newport Bay is an ecological resource of national significance.

2.3 PROJECT BACKGROUND

Sedimentation has been identified as the biggest problem within Newport Bay. Sediment from the San Diego Creek watershed fills open water areas within Newport Bay.

In response to the ongoing threat to Newport Bay from sediment deposition, a comprehensive study, "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan" (Boyle Engineering Corporation 1982) was sponsored by the cities of Irvine and Newport Beach, and the Southern California Association of Governments. This plan, known as the 208 Plan, called for a long-term sediment management strategy that would eventually shift sediment management from in-bay measures to upstream controls. In 1982, in response to the recommendations of the study, two sedimentation basins were constructed within the San Diego Creek channel upstream of its discharge into the Upper Bay and a 50-acre basin was constructed within the uppermost portion of the Bay. In the next six years, to further implement the recommendations of the "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan," two additional dredging projects were completed in Upper Newport Bay. In 1985, the Unit I sedimentation basin was constructed by enlarging the previously constructed in-bay sedimentation basin from 50 to 85 acres. A total of 890,000 cy (680,850 cu m) was dredged from the uppermost portion of the Bay to enlarge the basin by 35 acres and deepen it to -7 feet (ft.) (-2.1 meters [m]) Mean Sea Level (MSL). From 1987 to 1988, a second basin, the Unit II basin, was constructed within the Bay. The 14-ft. (4.2 m) deep Unit II basin is located just below the Main Dike at the southern end of the Unit I outlet channel. Side channels to the basin were created to support environmental enhancement. In addition, a 100-ft.-wide dredge access channel was constructed from the Lower Bay to the Unit II Basin. The dredged quantity for the project was 1,200,000 cy (918,000 cu m) of sediment. The location of the Unit I and Unit II basins are shown on Figure 2-2.

In 1995 and 1996, the County of Orange determined that the Unit I and Unit II basins were essentially full and that a severe storm event could jeopardize the safety and personal property of the residents living along the Lower Bay. As predicted, the winter storms of 1997 and 1998 deposited large volumes of sediment throughout the entire Bay, expanding mudflat areas and reducing open water areas in the ecological reserve. Shoaling occurred in navigation channels in the marinas in the lower portion of the Upper Bay. Vessels were running aground in this area, and in the federal channels below PCH Bridge. In response to the need to restore the capacity of the basins to trap sediment, in 1998 and 1999 the OCPFRD completed the Unit III dredging project. The Unit III project deepened a portion of the Unit I basin to -14 ft. (-4.2 m) MSL by removing 860,000 cy (657,900 cu m) of sediment. This dredging project also restored a channel for access to boat slips in the lower portion of the Upper Bay and a main channel for passage of the dredge and barge equipment from the PCH Bridge to the Unit III basin.

The 1997/98 Unit III dredging project was an interim measure to curb the loss of valuable open water habitat supporting a variety of sensitive species. Local funding for the project was very difficult to obtain. At present no funding or plan exists to maintain the Unit III basin in the future. Furthermore, the Unit II basin was not dredged as part of the Unit III dredging project, and is now in non-compliance with the Total Maximum Daily Load (TMDL) objectives of the RWQCB. Pursuant to Section 303(d) of the Clean Water Act, the RWQCB has identified Upper Newport Bay and San Diego Creek as water quality limited because beneficial uses and water quality objectives are not being maintained. For the sediment TMDL (RWQCB 1998), both the Unit III and Unit II basins are to be maintained to a minimum depth of -7 ft. (-2.1 m) MSL. Because existing depths in the Unit II basin are shallower than the required -7 ft. (-2.1 m) MSL depth, as specified in the sediment TMDL, this objective is not being met.

2.4 DEVELOPMENT OF ALTERNATIVES

During several meetings, the HEG identified potential sediment management measures and biological restoration features. These potential measures are shown in Table 2-1. For the purposes of developing a sediment control plan, the Upper Bay was divided into three segments: Upper (from the Unit III basin to the dike, Middle (from the dike to Upper Island), and Lower (from Upper Island to the PCH Bridge). The potential measures were then combined into six preliminary sediment management alternatives and a variety of habitat restoration measures. Through the screening process two of the initial six sediment control alternatives were eliminated primarily because those two alternatives proposed relocating both of the tern nesting islands from the Unit III basin to the Unit II basin. Relocating both islands was considered to have too great a potential to adversely affect the state and federal endangered California least tern. The remaining four sediment control alternatives and the No Project Alternative were analyzed in detail. As the result of this analysis, Alternative 6 was selected as the Recommended Plan. The environmental analysis identified Alternative 6 as the environmentally preferred plan because it had the fewest number of unavoidable significant adverse impacts, and because it provided the greatest benefits relative to impacts. Of the alternatives analyzed in detail, Alternative 6 was determined to best address the problems and opportunities and the objectives and constraints for the project and to provide a balance between sediment control and environmental restoration. Alternative 6 is described in Section 2.5 as the proposed project. The proposed project includes, in addition to maintaining the Alternative 6 basin configuration, six additional habitat restoration measures. Alternatives to the proposed project are discussed in Section 5.

2.5 DESCRIPTION OF PROPOSED PROJECT

2.5.1 Basin Configuration

Alternative 6 would involve deepening and expanding the Unit III basin, removing the northern, "kidney shaped" tern island and creating a new least tern island at the main dike, and widening and deepening the Unit II basin (see Figure 2-3-5 of the EIS/R).

Under Alternative 6, the mudflats in the northeast corner of the uppermost segment would be maintained. In addition, approximately 100 ft (30 m) of mudflats would be retained around the shoreline perimeter of the basin and the southern island to a depth of -3 ft. (-0.9 m) MSL. To create the new basin, the mudflats between -3 ft. (-0.9 m) MSL and -20 ft. (-6 m) MSL would be dredged to a depth of -20 ft. (-6 m) MSL with a 5:1 slope.

A trapezoidal channel with 20 ft. (6 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes would be dredged between the southern least tern island and the shore to restore tidal action to the area. An access channel with 20 ft. (6 m) bottom width, -6 ft. (-1.8 m) MSL depth and 3:1 slopes would be constructed along the southern tip of the island for maintenance of the tern island.

The channel between the Upper Basin and the Unit II basin would be maintained at its current design of -14 ft. (-4.2 m) MSL depth.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the new island to provide boat access to maintain the island. The access channel would have a bottom width of 20 ft. (6 m), a depth of -6 ft. (-1.8 m) MSL and 3:1 side slopes.

The Unit II basin footprint would be expanded west to the existing 0 MSL contour line from the relocated tern island to the southern end of New Island. The Unit II basin would be deepened to -20 ft. (-6 m) MSL with 5:1 slopes. Approximately 100 ft. (30 m) of mudflat to a depth of -3 ft. (-0.9 m) MSL would be retained around the shoreline perimeter of the basin and New Island.

A trapezoidal channel, with 50 ft. (15 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes, would be reconstructed along the eastern side of New Island. The Santa Ana-Delhi channel would be reconstructed to the same design dimensions.

2.5.2 Construction Methods for Alternative 6

Dredging is most likely to be done with a clamshell dredge. Dredging would be conducted from a floating barge by a crane equipped with a 5 cubic yards (cy) (3.8 cubic meters [cu m]) grab bucket or by a CAT 245 backhoe with a 5 cy (3.8 cu m) bucket. The grab bucket would be lowered to the bottom where its jaws are closed over a plug of sediment. The grab would be raised out of the water, and the sediment deposited into a disposal scow with 1,500 cy (1,147.5 cu m) capacity. The production rate is estimated to be about 4,000 cy (3,060 cu m) per day. The clamshell dredging method was used successfully for the 1987 to 1988 Unit I/II project and the recent Unit III project. A small tugboat would transport and hold an empty disposal scow near the dredge as another scow is filled while secured alongside the dredge barge. The filled scow would be pushed by the tug to a barge marshalling area adjacent to the south end of Shellmaker Island or elsewhere near the PCH Bridge. The full scow would be exchanged for an empty one for return to the dredge site in the Upper Bay. The filled scow would be pushed by ocean-going tug out of Newport Harbor to the ocean disposal site at LA-3. The round trip travel time to and from the LA-3 ocean disposal site is 4 hours. Approximately 3 round trips to the disposal site would be made per day. Dredge operations would be conducted 24 hours per day, 6 days per week. A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every two days. A quality control survey boat would be onsite during all dredging operations.

A total of 2,027,000 cy (1,550,655 cu m) of sediment would be dredged. The time to construct the project is estimated to be 21.7 months. The Unit III dredging operation was staged from Shellmaker Island. CDFG would prefer that staging be done elsewhere. Therefore, staging would probably occur at another site near the PCH Bridge.

Instead of a clamshell dredge, it is possible that dredging could be accomplished using a small hydraulic dredge.

Under this alternative, the dredging operations would be conducted using a floating hydraulic dredge of modest size. The small, lightweight, self-propelled dredge could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which would then be pumped through a 12-inch pipeline to a disposal scow, located at Shellmaker Island or at another site near the PCH Bridge. The pipeline would cross the marsh in both the Unit I/III and Unit II basin areas. Three booster pumps would be located along Back Bay Drive. The size of each booster pump would be about 400 horsepower (hp). The pumps may be either diesel or electric powered. The disposal scows would be filled adjacent to the south end of Shellmaker Island or at another site near the PCH Bridge. The rate of solids delivery through a 12-inch pipeline from the small dredge to the scow barges would be about 150 cy/hour (hr) (115 cu m/hr), or 3,000 cy (2,295 cu m) per 20-hour work day. The dredge would operate 24 hours per day, 6 days per week.

Because dredged material would be mixed with water for hydraulic transport through the pipeline under this alternative, solid content in the slurry mixture would be limited to about 20 percent. To avoid making approximately 5 times as many trips to the ocean disposal site as would be required under the clamshell dredge alternative, water would be removed from the disposal scow prior to leaving the dock for the ocean disposal site. This operation requires a manifold to allow partial filling of each scow barge while the sediment within the partially filled barge settles. A combination of barges would be used so that the dredge pipe discharge can alternately fill a barge and then be diverted to another barge to allow sediment settling and water decanting. Through progressive filling, settling, and decanting, the sediment content in each barge can be maximized. A total of three dump scows (1,500 cy capacity) would be used to allow continuous operations. Certain additives can be discharged into the filling barge in order to reduce sediment-settling time. A large water pump would be used to decant the excess water. Disposal scows would be filled with about 1,000 cy (765 cu m) of the consolidated dredge material and transported by tugboat to the LA-3 disposal site where the material would be discharged. Approximately 3 round trips of 4 hours each would be made per day.

The hydraulic dredge, which requires substantially less fuel than the clamshell dredge, would be fueled by truck at Jamboree Road. Like disposal scow trips, fuel barge trips along the Upper Bay Channel would be avoided.

If a hydraulic dredge were used, it would not be necessary to excavate an access channel for the dredge. Therefore the amount of material to be dredged would be 1,952,00 cy (1,493,280 cu m).

However, because the dredging production would be lower for a hydraulic dredge compared to a clamshell dredge the total construction time would be 27.8 months.

In addition, to dredging of the basins and channels, the proposed project would include relocation of the northerly tern nesting island to the Unit II basin near the salt dike.

Removal of the old island foundation would be accomplished during the upper basin dredging. Tern island relocation would occur during the non-breeding season.

The new tern island near the main dike would be constructed from material taken from the top of the "kidney shaped" island and material obtained elsewhere. Only the top 5 ft. of the existing island is expected to be suitable for the new island construction. The "kidney shaped" island would provide 40,000 cy (30,600 cu m) for the new island. An additional 23,000 cy (17,595 cu m) of sand would be imported to complete the construction of the new island. A total of 16 barges of 2,500 cy (1,912.5 cu m) capacity would be needed to transport the 40,000 cy (30,600 cu m) scavenged from the old island to the new island site. Rather than use sand from a distant source, it is believed that the 23,000 cy (17,595 cu m) of sand for the two-foot thick surface layer of the new island could be procured from within Newport Bay. Possible areas where good quality sand exists include the following: Interceptor Beach (at the Orange County Harbor Patrol Office, near the Bay entrance), Shellmaker Island, the Newport Aquatic Center (should wetland creation be undertaken there), the "In Channel" Basins of San Diego Creek, and in certain Upper Bay Channels where high sand content was found during the 1998-1999 dredge program.

2.5.3 Maintenance Dredging

Because sediment from San Diego Creek would continue to discharge to Upper Newport Bay, periodic maintenance dredging of the basins would be required. Several criteria were developed to determine when maintenance dredging would be needed. Intervals for maintenance dredging of study alternatives were determined by using the following three criteria in the order shown:

1) Maintenance dredging will be initiated if the cumulative percent of sediments trapped in the basins drop below 50 percent. Conversely, if more than 50 percent of cumulative sediments deposit beyond the basin(s), maintenance dredging will be required.

2) If greater than 30 percent of cumulative sediment deposits below PCH Bridge, maintenance dredging will be initiated.

3) Sediment accumulation will not be allowed to reach levels where there is a net change in habitat types, such as open water transitioning to mudflat.

Maintenance would be triggered if any of the criteria were exceeded. The maintenance frequency was based on long-term average sediment inputs. Because sediment input in the San Diego Creek watershed is highly variable, the actual requirements for maintenance dredging may vary. For example, a series of wet years such as occurred in the 1990s, might make maintenance dredging necessary more frequently. On the other hand, a series of dry years like the mid to late 1980s might result in less frequent dredging.

Based on an average annual inflow of 164,000 cy (125,460 cu m) of sediment from San Diego Creek into the Bay, it was estimated that for Alternative 6 maintenance dredging would be required every 21 years and would take about 20.3 months to accomplish with a clamshell dredge and 22.8 months to complete with a hydraulic dredge. Maintenance dredging methods would be similar to those employed for the initial basin dredging.

2.5.4 Habitat Restoration Measures

In addition to reconfiguration of the basins to the Alternative 6 basin footprint, the proposed project includes six additional habitat restoration measures. Each of these is described below. Figure 2-4 shows where each of the habitat restoration measures would occur.

2.5.4.1 Addition of Sand to the Southerly Least Tern Island

The erosion of sand and invasion of vegetation have degraded the existing least tern islands in the uppermost basin. The quality of the southerly nesting island could be improved by the addition of clean sand. Sand would be obtained from within the Bay as described above for relocation of the "kidney shaped" island from the upper basin to the main dike. Because least terns need unvegetated sand in which to construct their nests, any existing vegetation on the island would be removed by hand prior to the importation of sand to the top of the island. Sand would be excavated from the borrow site with a backhoe and loaded with two CAT 966 front-end loaders onto a barge with a capacity of 2,500 cy (1,912 cu m). The barge would be guided by tug to the upper basin where loaders would tram the material off the barge and spread on the tern island by a bulldozer. About 2 or 3 barge trips would be needed to move the material and the process would take 4 days. Sand would be added during the non-breeding season to avoid disturbance to nesting terns.

2.5.4.2 Construct Small Dendritic Channels through the Marsh

The purpose of this restoration measure would be to increase foraging habitat for aquatic-feeding birds, improve circulation, and restrict access for humans and terrestrial predators. Aerial photographs show evidence of small channels that already exist throughout the marsh. The concept is that these channels would be increased in area to improve their function.

Because of concerns by the resource agencies about the impacts of channel excavation on sensitive marsh species, only a small pilot program is proposed on Shellmaker Island. For this pilot program, a single channel would be dredged through Shellmaker Island. The channel would have a bottom width of 10 ft. (3 m) and 3:1 side slopes.

The excavation of the small channel would be done by a backhoe or other small piece of earthmoving equipment. Approximately 9,650 cy (7,382 cu m) of material would be dredged. Assuming about 3,000 cy (3,825 cu m) of material were excavated in a day, it would take about 3 days to complete the excavation. The backhoe would stockpile the material on Shellmaker Island where it would be loaded by a frontloader onto a disposal scow for discharge at LA-3.

2.5.4.3 Restoration of Wetlands in Filled Areas

Three areas of fill within the Upper Bay have been identified where the potential exists to restore the filled areas to wetlands. These areas are shown on Figure 2.3-8 of the EIS/R. Each of these wetlands restoration opportunities is discussed below

Northstar Beach. This habitat restoration alternative would create wetlands at Northstar Beach. The excavation would avoid impacting the existing rowing center. One island would be created that would contain an area of about 2.5 acres. The elevation of the island would be -2 ft. (-0.6 m) MSL. The island would be surrounded a shallow channel, with a depth of -5 ft. (-1.5 m) MSL. Approximately 36,800 cy (28,152 cu m) of material would be excavated to restore wetlands at Northstar Beach. It would take about 13 days to implement this alternative and about 37 scow trips to LA-3 would be required for disposal.

Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin. This alternative would excavate this section of land to -2 ft. (-0.6 m) MSL to restore wetlands function. If this area were restored to wetlands, about 42,000 cy (32,130 cu m) of material would be excavated for this alternative. Excavation of this material would take 14 days, and would require 42 scow trips to LA-3 for material disposal.

Dredge Spoil on Shellmaker Island. This alternative would restore wetlands function by excavating about 3 acres of dredge spoils on Shellmaker Island to an elevation of -2 ft. (-0.6 m) MSL. Approximately 34,000 cy (26,010 cu m) would be excavated to create this alternative. At a dredging rate of 3,000 cy (2,295 cu m) per day, it would take approximately 12 days to grade this area. Disposal would require about 34 trips to LA-3.

For any of these wetlands creation alternatives, the material would be excavated either with the clamshell dredge, backhoe, or the hydraulic dredge. Some of the material for some of these alternatives may be suitable for beneficial uses such as adding sand to tern islands or beach nourishment. If beneficial uses for dredged material were available at the time of project construction, suitable material would be used for those purposes. Because the suitability of material for beneficial uses is unknown at this time, the assumption is made that excavated material will be placed in a disposal scow and discharged at the LA-3 ocean disposal site.

2.5.4.4 Restoration of Side Channels

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Restoration of side channels would increase habitat for aquatic species, improve circulation, and isolate the islands from terrestrial predators such as dogs, cats and coyotes. For each of these alternatives the side channel would have a bottom width of 20 ft. (6 m), a depth of -5 ft. (-1.5 m) MSL, and 3:1 side slopes. The proposed channels are presently at a depth of about +0.5 to +1.5 ft. (+0.15 m to +0.45 m) MSL on Middle Island and +2.5 ft. (+0.7 m) MSL on Shellmaker Island. Portions of the Shellmaker Island side channel would have a bottom width of only 5 ft. (1.5 m) to avoid disturbing marsh.

About 19,500 cy (148,918 cu m) would need to be dredged to restore the Middle Island channel, and about 24,000 cy (18,361 cu m) would be dredged to restore the Shellmaker Island channel.

Dredging of the side channels would be done during dredging of the Unit II basin area using a hydraulic dredge. Material would be pumped to a disposal scow, dewatered, and transported to the LA-3 site for disposal. It would take about 20 barge trips to dispose of the material from Middle Island and about 24 barge trips to dispose of the Shellmaker Island material. Dredging the Middle Island Channel would add approximately an additional 7 days to the overall dredging program. Adding a side channel to Shellmaker Island would take about 8 days. If side channels were restored to both islands, a total of about 15 days would be added to the overall dredging program.

2.5.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

Beds of eelgrass (*Zostera marina*) are recognized as a particularly valuable type of marine habitat that enhances the physical and biological environment by stabilizing the substrate, increasing productivity, and providing structure to the otherwise monotonous soft bottom habitat (Phillips, 1988). Several studies have demonstrated that the marine life in eelgrass meadows is enhanced in numbers, species, and standing crop compared to unvegetated soft-bottom habitat (summarized in Ware 1993). The lower portions of the Upper Bay formerly supported eelgrass, but beds disappeared following wet years in the 1980s and 1990s. Eelgrass requires high light levels and its disappearance may have been related to turbidity created by sedimentation from San Diego Creek. The implementation of a sediment control plan will reduce sedimentation and may allow the re-establishment of eelgrass.

This restoration measure would restore eelgrass to about 0.6 acres of shallow/soft bottom adjacent to Shellmaker Island. Approximately 4 to 6 divers using SCUBA apparatus would collect eelgrass from existing eelgrass beds around Harbor Island and Balboa Island in the Lower Bay. Plants would be taken to an on-shore assembly station where they would be cleansed of sediment. The sediment-free individual eelgrass shoots would then be fabricated into planting units of 12 to 15 shoots each. About 4 persons would be responsible for the shore assembly of the planting units. The shore assembly station would probably be at Newport Dunes or the southern part of Shellmaker Island. A planting unit would be assembled by securing the shoots together with a loop of biodegradable twine that is connected to a biodegradable anchor such as a popsicle stick. The dive team then replants the bundles at spacing of about 2 to 3.3 ft. (0.6 to 1 m) apart throughout the planting area by placing the biodegradable anchors and root mass into a hand dug hole. Revegetating about 0.6 acres in the lower part of the Upper Bay would take about 3 to 4 days. The only mechanized equipment that would be used would be a small boat (about 25 ft. by 12 ft. by 6 ft.) with about a 50-horse power motor. The boat would travel to and from the donor bed areas near Harbor Island and Balboa Island to the lower part of the Upper Bay, a round trip distance of up to 5 mi (8 km) for the more distant donor beds.

2.5.4.6 Removal of Segments of the Main Dike

The main dike provides a means of human intrusion into the marsh as well as access for terrestrial predators such as dogs, cats, and coyotes. This alternative would improve habitat quality by removing this access route. A backhoe would travel along the dike and remove segments. The backhoe would be transported to and from the dike by a small barge. Approximately 500 cy (382.5 cu m) of material would be removed from the dike. If appropriate, the material would be used for beneficial uses such as constructing tern islands or beach nourishment within the Bay. Material not designated for beneficial uses would be barged to LA-3 for ocean discharge or trucked to a land disposal site. Implementation of this restoration alternative would take less than one day.

SECTION 3.0 - EXISTING CONDITIONS

3.1 INTRODUCTION

3.1.1 Federally Listed Species

Saltmarsh Bird's Beak (*Cordylanthus maritimus* spp. *maritimus*). This state- and federal-listed endangered plant species occurs at several sites in high marsh habitats within the lower reaches of Upper Newport Bay (CDFG 1997). It is the only listed plant species confirmed to occur in the study area (USFWS 1997).

Saltmarsh bird's beak is an annual herb that is hemiparasitic and in the Scrophulariaceae family. It occurs in the high marsh zone of coastal saltmarshes from San Luis Obispo County south to Baja California. It is listed as endangered at both the federal and state levels and is a California Native Plant Society (CNPS) List 1B species.

Quino Checkerspot Butterfly (*Euphydryas editha quino*). The Quino checkerspot butterfly, a federal-listed endangered species, is a geographic subspecies of *Euphydryas editha* and ranges from northern Baja California to Canada along the Pacific coast, and east to Colorado. Its historic range includes the coastal plains and inland valleys of southern California and northern Baja California. It once existed at many localities in San Diego, Orange, Los Angeles, and western Riverside Counties. The primary larval host plant of the Quino checkerspot butterfly is Western plantain (*Plantago erecta*). Purple owl's clover (*Castilleja exserta*) serves as an additional larval host plant for some colonies of Quino checkerspot located east of Temecula. The host plants tend to occur in clay or cryptogrammic soils in areas that are devoid of tall weedy growth or a dense cover of shrubs. Adult butterflies characteristically tend to patrol low hilltops, rocky outcrops, and ridges.

The host plants of the Quino checkerspot butterfly occur in the Upper Newport Bay area, but the habitat is not characteristic of this species. The Quino checkerspot butterfly has not been reported in the vicinity of Upper Newport Bay. The nearest known populations are in northern Orange County and to the south at Camp Pendelton. If this species did occur at Newport Bay, it would be in upland habitat outside any activities of the proposed project.

Tidewater Goby (*Eucyclogobius newberyi*). The tidewater goby, federally listed as endangered, is endemic to California and is distributed in brackish-water habitats along the California coast from Agua Hediona Lagoon, San Diego County to the mouth of the Smith River in Del Norte County. Tidewater gobies are found in shallow lagoons and lower stream reaches where the water is brackish to fresh and slow moving or fairly still but not stagnant. South of Point Conception, tidewater gobies are known to occur at only 14 locations (Swift et al 1993). Historically the species occurred in Aliso Creek and San Juan Creek in Orange County but those populations have been extirpated. The nearest extant population to Upper Newport Bay is San Onofre Creek. None of the extensive fish collections in Upper Newport Bay have ever collected tidewater gobies. Therefore, it is considered highly unlikely that this fish is present in the project area.

Arroyo Southwestern Toad (*Bufo microscaphus californicus*). There are no records of this species' occurrence in the study area. USFWS (1997) notes the existence of potential habitat in San Diego Creek. This species could only occur in freshwater upstream of tidal flows.

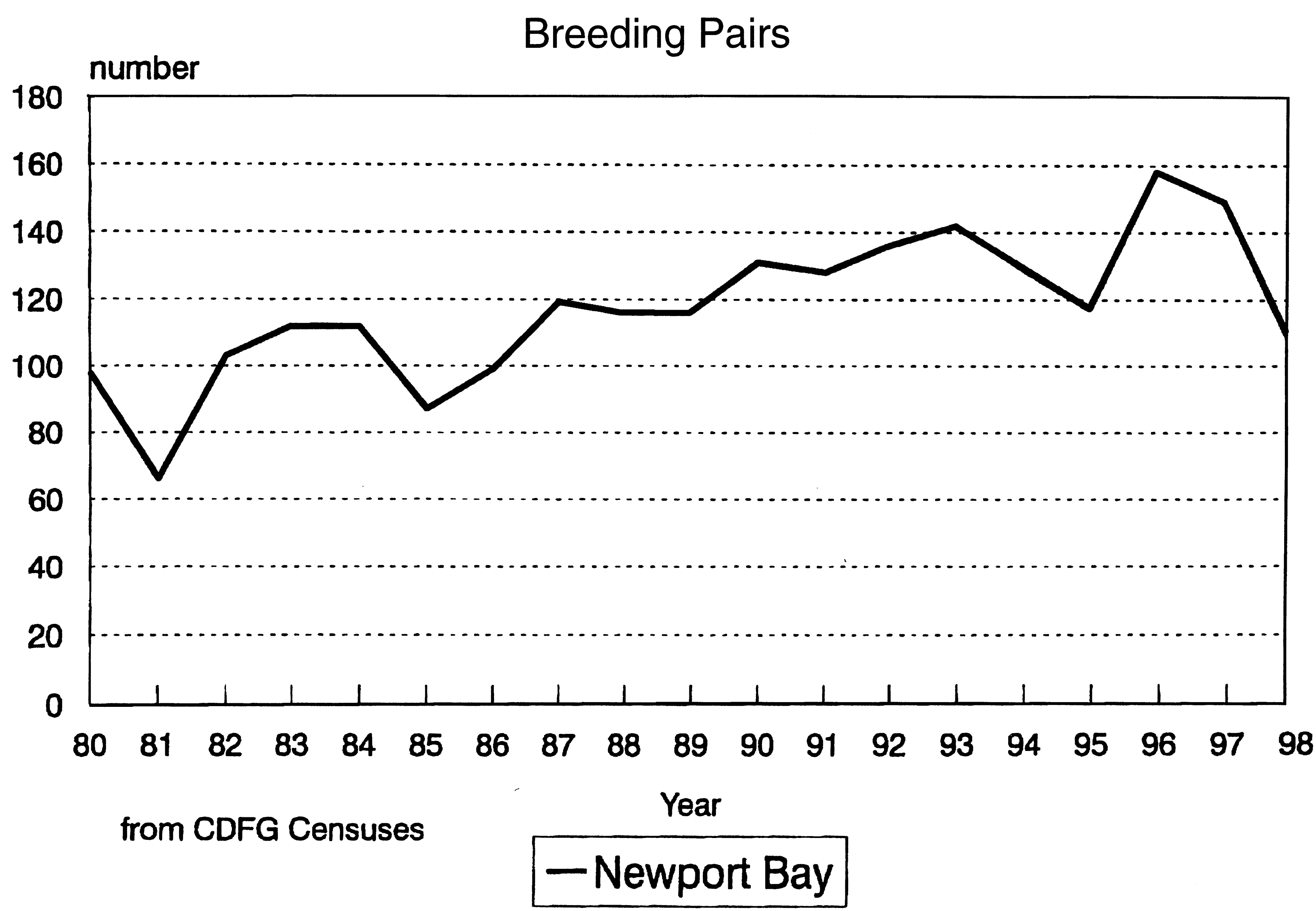
California Brown Pelican (*Pelecanus occidentalis californica*). The California brown pelican, a state- and federal-listed endangered species, occurs year-round in Upper Newport Bay. Numbers tend to be lower in late spring-early summer when the birds are nesting on offshore islands, and higher in late summer and fall, when flocks are augmented by young birds. The species can be observed in the area year round as a non-breeder. Numbers have ranged from 0 to 44 birds during census counts by Sea and Sage Audubon (Kust, unpublished data).

This species nests on the Channel Islands off the coast of southern California and Baja California during late winter through spring. As young fledge, the adults and young disperse along the California coast. The birds seen during the summer are for the most part non-breeding immatures. Habitats used by this species include open water, where it feeds on fish, and mudflat and salt panne for loafing.

Light-Footed Clapper Rail (*Rallus longirostris levipes*). The resident population at Upper Newport Bay represents about 65 percent of California's population of this state- and federally-listed endangered species. Extensive studies within the Bay over the past 15 years indicate that the population is increasing. Clapper rails are found throughout the Upper Bay, heavily utilizing cordgrass marsh for nesting at several locations, including Shellmaker Island, Middle Island, Upper Island, and in saltmarsh habitat above the Main Dike.

The clapper rail's nesting season is from March to July. Upper Newport Bay has consistently supported the highest numbers of rails of any southern California wetland, and is believed to be the only viable subpopulation remaining in the United States. Clapper rails' home ranges have been estimated from 0.9 to 4.2 acres. The subspecies inhabits saltmarsh and freshwater marsh where it feeds on small fish and aquatic invertebrates. Low elevation saltmarsh dominated by California cordgrass (*Spartina foliosa*) is the species' preferred nesting habitat, but it has been known to breed in brackish and even freshwater marsh (Gallagher 1997). The 1998 light-footed clapper rail census recorded 105 pairs in Upper Newport Bay (Zembal 1998) and the 1999 census recorded 104 pairs. This number is down from the 1990s high of 158 pairs in 1996 (Figure 3-1).

Western Snowy Plover (*Charadrius alexandrinus nivosus*). This subspecies of plover is federally threatened and a California species of special concern. Its present status in the Bay is as an uncommon fall/spring and winter migrant. The breeding status of Snowy Plover in Newport Bay is precarious with no current nesting records (Hamilton and Willick 1996; Gallagher 1997). The species has in the past bred in the Bay as well as numerous other places along the coast of Orange County. However, currently the only known breeding locations in the county is Bolsa Chica and the Santa Ana River mouth (Hamilton and Willick 1996; Gallagher 1997). The species requires open, undisturbed salt panne for nesting and surface-feeds on mudflats for aquatic invertebrates and very small fish. The reason for the decline of this species in the Bay is not entirely known but disturbance and predation may play a role. No snowy plovers were seen during recent surveys.



Chambers Group

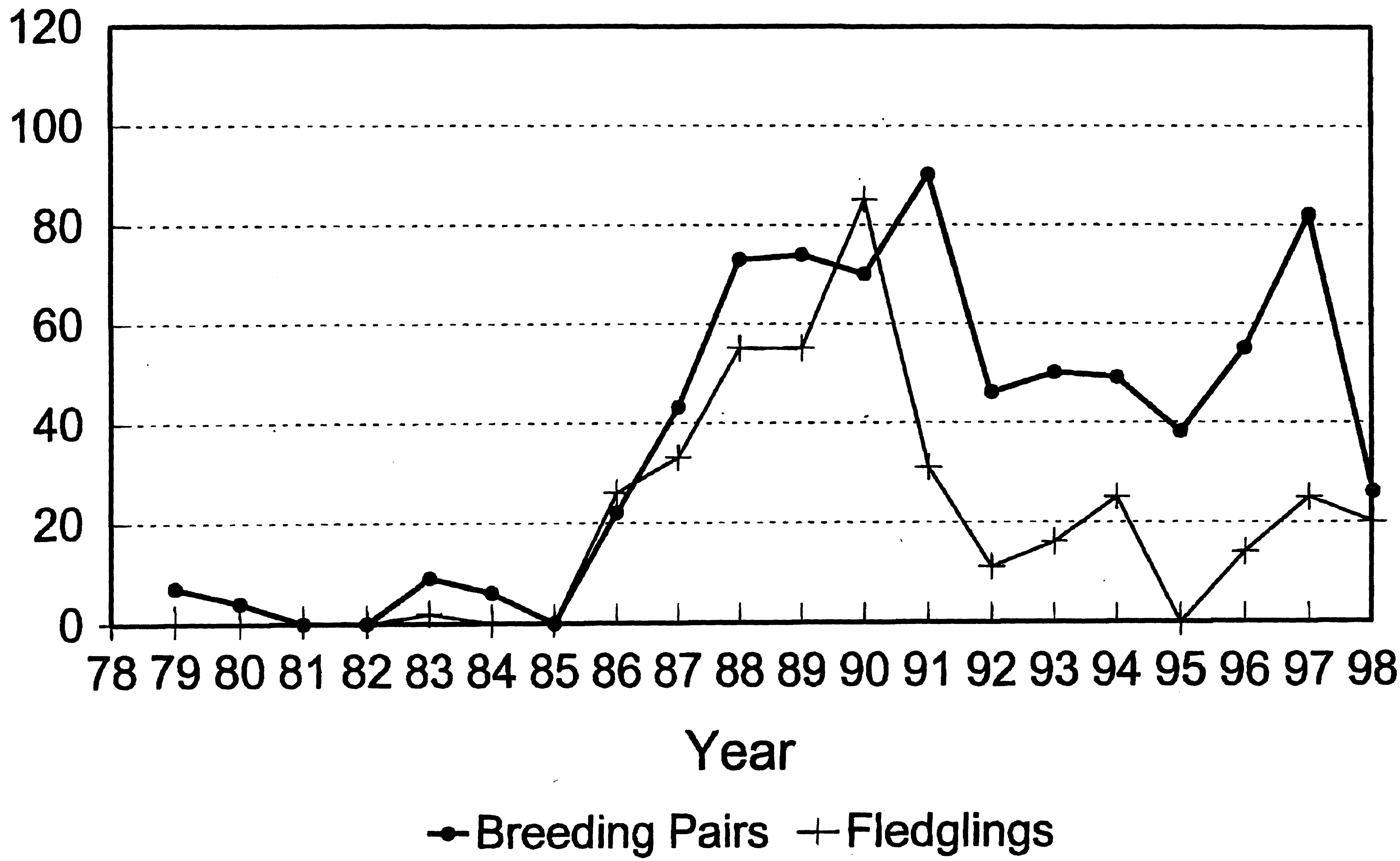
LIGHT-FOOTED CLAPPER RAIL POPULATIONS IN UPPER NEWPORT BAY
Figure 3-1

California Least Tern (*Sterna antiserum brownie*). The state- and federal-listed endangered California least tern is a seasonal resident from April through early September. Historical conditions were undoubtedly favorable to nesting by least terns, but subsequent residential development has eliminated potential nesting sites. Least terns typically forage on juvenile baitfish in the open waters within proximity of their nesting sites.

Two man-made islands were constructed within the Unit I sedimentation basin during wetland restoration in 1982 and 1985 to provide habitat for the least tern. The two islands encompass about 7 acres of breeding habitat above the influence of the tides. Nesting populations have been noted on one of the islands (the southerly, "hot dog" shaped island). As sedimentation has occurred within the Unit I basin; however, the channels that were originally formed to separate these islands from the mainland have become so shallow that the channels dry during low tide conditions. At these times, predators have ready access to the islands thereby decreasing protection for the least terns. Maintenance dredging efforts to reestablish the islands during all stages of the tide is necessary to support the safety of the least tern populations on these islands. Attempts to develop nesting habitat on Shellmaker Island have been unsuccessful. In 1990, the estimated population included 70 pairs and 85 fledglings (Figure 3.2). In1995, approximately 38 pairs nested with no productivity (Caffrey 1997). For the 1995 productivity loss, reduced food supply was speculated, although not easily confirmable (Caffrey 1997). Least terns rebounded in 1997 with 82 pairs and 24 fledgings, but in 1998, nesting was down again with only about 24 pairs. In 1999, 40 pairs of least terns nested on the southerly island.

Coastal California Gnatcatcher (*Polioptila californica californica*). This subspecies of California gnatcatcher is federally threatened and is a California species of special concern. It is a common breeding resident of coastal sage scrub where it feeds on arthropods. Although sage scrub is the preferred habitat for this species, particularly during the breeding season, post-breeding individuals can also be found foraging in ruderal and riparian areas. There are at least 10 pairs breeding in upland habitat surrounding Upper Newport Bay (Gallagher 1997).

Pacific Pocket Mouse (*Perognathus longimembris* ssp. *pacificus*). The Pacific pocket mouse is a Federal-listed endangered species that has only recently been rediscovered in coastal southern California. It occurs in coastal sage scrub and grassland habitats on fine sandy soils. It is not expected to occur in areas that could be affected by the project, but areas of native grassland-scrub adjacent to the Upper Bay provide possible habitat for this species.



Chambers Group

CALIFORNIA LEAST TERN POPULATIONS
IN UPPER NEWPORT BAY
Figure 3-2

SECTION 4.0 - IMPACTS OF THE PROPOSED PROJECT

4.1 IMPACT TO LISTED SPECIES

4.1.1 Salt Marsh Bird's-Beak

Salt marsh bird's-beak does not occur within the footprint for basin or side channel dredging for the proposed project. Therefore, basin and side channel dredging would not affect this species. Although areas for habitat restoration were selected to avoid impacts to this endangered plant, there is some potential that salt marsh bird's beak could be present at one of the dredge spoil areas to be restored to wetlands or in the area on Shellmaker Island where the dendritic channel would be excavated. A sensitive plant survey would be conducted prior to construction activities in these areas, and if salt marsh bird's-beak or other sensitive plants are found, the construction footprint would be altered to preserve the plants. With this precaution, the proposed project would not have an adverse impact on salt marsh bird's beak.

4.1.2 Quino Checkerspot Butterfly

This endangered butterfly species is unlikely to occur in the vicinity of Upper Newport Bay. It is an upland species and would not be affected by project activities.

4.1.3 Tidewater Goby

The tidewater goby does not occur in Upper Newport Bay, and, thus, would not be affected by the proposed project.

4.1.4 Arroyo Southwestern Toad

The arroyo southwestern toad does not occur at Upper Newport Bay and would not be affected by the proposed project.

4.1.5 California Brown Pelican

The endangered California brown pelican is present year-round in Upper Newport Bay although it does not breed there. This species uses the open water habitat in the Upper Bay and may be disturbed by the noise and activity of the dredging operations. Other dredging projects (i.e. Marina del Rey) have demonstrated that this species is very tolerant to noise disturbances. Disturbance is therefore expected to be negligible. Turbidity generated during dredging may interfere with foraging. Because silt curtains would be used to contain turbidity to within 100 ft. of the dredge and because the noise and activity of dredging would disturb a small portion (a little over 1 percent) of the open water habitat at any one time, impacts to California brown pelicans during dredging would not be significant.

When the dredging is completed, California brown pelicans would benefit from the expanded open water habitat in the Upper Bay, and the improved water quality, which may enhance forage fish populations.

4.1.6 Light-Footed Clapper Rail

The proposed project would not involve any construction in salt marsh habitat. Therefore, there would be no loss of breeding habitat, either permanent or temporary, for the endangered light-footed clapper rail. Noise from dredging could interfere with vocal communication or startle nesting birds and cause them to abandon their nests. Observations on clapper rails were made during the Unit III dredging project (Hoffman 1998), but the impact of dredging on clapper rail nesting success was inconclusive. Nesting success was lower than expected, but the reduced success was most likely related to the severe El Nino weather conditions rather than the dredging.

To minimize disturbance to clapper rails from dredging noise and activity, during the nesting season, dredging would be avoided near the highest density nesting area in the vicinity of the salt dike. For all dredging that occurs during the clapper rail nesting season between March and July, nests in the vicinity of the dredge would be monitored and the dredge would be required to cease operating if the rails appeared disturbed by the noise and activity.

In addition, clapper rail nests could be damaged by the wake of disposal scows and tugboats moving between the dredge and the Lower Bay. Damage to nests would be avoided by requiring that all project vessels maintain a slow speed in the Ecological Reserve and by placing floats along the channels near low salt marsh habitat to attenuate wave action. Again, nest monitoring would be required to confirm that nests are not damaged.

Noise during excavation of side channels at New Island, Middle Island, and Shellmaker Island as well as excavation of the dendritic channel and the wetlands at Shellmaker Island could disturb breeding clapper rails. Disturbance would be avoided by implementing these habitat restoration measures outside of the breeding season.

With the above-described actions to avoid and minimize adverse impacts to rails, construction of the proposed project would not have an adverse effect on light-footed clapper rails.

After project construction was completed, light-footed clapper rails would benefit from the improved water quality and decreased sedimentation. Excessive sedimentation has been implicated in decreases of fiddler crabs, a preferred prey species of clapper rails. Large sediment inputs can also drive clapper rails out of low salt marsh habitat into less preferred higher marsh areas. Restoration of side channels would benefit clapper rails by decreasing disturbance by terrestrial predators and humans and improving circulation and water quality around the islands. Restoration of the small dendritic channel on Shellmaker Island may benefit clapper rails by providing foraging opportunities close to protective vegetation.

Therefore, the proposed project would be expected to provide long-term benefits to clapper rails. Clapper rails potentially could be disturbed during periodic maintenance dredging. For Alternative 6, the proposed project, this dredging would only be necessary every 21 years.

Therefore, many generations of clapper rails could breed without the potential disturbance of dredging before dredging was again required. When maintenance dredging was necessary the same measures to avoid and minimize impacts to clapper rails would be taken as those described for the initial project construction.

4.1.7 Western Snowy Plover

Threatened western snowy plovers do not nest currently at Upper Newport Bay. The few wintering individuals that may be foraging on the mud flats during project construction could be disturbed by the noise of the dredge. Because the amount of habitat disturbed at any one time is small, this impact would not result in an adverse affect to snowy plovers.

After project construction, there will be a net decrease in intertidal mudflats although the prey base may be increased, especially in the Unit III basin, by the improved water quality. In addition, restoration of side channels would decrease access for humans and terrestrial predators to some of the mudflat areas. Because of the few snowy plovers that seasonally use Upper Newport Bay, the net loss of mudflat would not be expected to have a significant adverse affect. Snowy plovers may potentially benefit from nesting opportunities provided by creation of a new nesting island near the salt dike.

4.1.8 California Least Tern

The biggest concern for the endangered California least tern is that dredging near their nesting island might disturb the terns and cause birds to abandon their nests. This impact would be avoided by conducting dredging of the Unit III basin between September and mid-April when least terns are not present. Similarly, to avoid disturbance to terns, relocation of the northerly island and placement of clean sand on the southerly island would occur during the non-breeding season. Because least terns rarely breed on the northerly island, relocation of this island would not have an adverse effect. The California least tern has also shown the ability to be successfully relocated without impact (i.e. Port of Los Angeles nesting site). As long as no dredging or other construction work occurred near the tern islands during the breeding season, construction of the proposed project would not have an adverse effect on least terns. Least terns might avoid foraging in areas of turbid water created by the dredge. Because a silt curtain would be used to contain turbidity, a very small percentage of foraging habitat (less than 1 per cent) would be affected and loss of foraging opportunities would be insignificant.

After construction, the proposed project is expected to be beneficial for the California least tern. The increased open water habitat would increase the foraging area for the species. The improved water quality and lessened freshwater influence is expected to result in an increase in forage fish populations especially in the Unit III basin. Placement of clean sand on the new tern island and the southerly tern island would improve the quality of nesting habitat in the Upper Bay. Restoration of the side channel between the southerly tern island and shore would protect the terns from terrestrial predators. Restoration of an access channel would allow CDFG personnel access to keep the island free of vegetation and suitable for tern nesting.

Periodic maintenance dredging would have the potential impacts described above for the initial construction. Because activities near the tern islands would be avoided during the breeding season, adverse impacts would not be expected.

4.1.9 Coastal California Gnatcatcher

The threatened coastal California gnatcatcher is common in upland coastal sage scrub habitat surrounding Upper Newport Bay. It would not be affected by the proposed project.

4.1.10 Pacific Pocket Mouse

It is not known if Pacific pocket mice occur at Upper Newport Bay. If they do, they would be in upland habitat that would not be affected by the proposed project.

4.2 MITIGATION MEASURES

4.2.1 Avoidance Measures

4.2.1.1 Disturbance to Breeding California Least Terns

No construction activities will occur near the tern nesting islands during the breeding season.

4.2.1.2 Disturbance to Breeding Light-Footed Clapper Rails

No construction activities will occur near high density nesting habitat of this species during the breeding season.

4.2.1.3 Disturbance to Salt Marsh Bird's-Beak

A sensitive plant survey will be conducted prior to excavation of wetlands restoration areas or the dendritic channel on Shellmaker Island. If this species occurs in the excavation footprint, the excavation will be reconfigured to avoid the plants.

4.2.2 Minimization Measures

4.2.2.1 Interference with Foraging by Turbidity Created During Dredging

A silt curtain would be used to confine turbidity to a radius of 100 ft. (30 m) around the dredge.

4.2.2.2 Disturbance to Light-Footed Clapper Rails by Noise of the Dredge or Other Construction Equipment

Where construction activities occur near nests, a biological monitor will monitor the nesting activity. If equipment noise is observed to disturb nesting individuals, dredging near nests will cease until after the breeding season.

4.2.2.3 Damage to Nests of the Light-Footed Clapper Rail from the Wake of Project Vessels

All project vessels would be required to maintain a slow speed in the Ecological Reserve. In addition, floats would be placed between the navigation channel and the marsh to attenuate vessel wakes.

SECTION 5.0 - CONCLUSION AND DETERMINATION

Construction of the proposed project has the potential to adversely affect sensitive species including the federal endangered plant, salt marsh bird's-beak, and two federal endangered bird species, the California least tern and the light-footed clapper rail. Mitigation measures have been incorporated into the project to avoid impacts when possible and minimize impacts that cannot be avoided completely. With implementation of these measures, no adverse effects to sensitive species are expected from project construction.

After project construction, long-term benefits are expected to biological resources in Upper Newport Bay. Two federal endangered species, the California least tern and California brown pelican, would be expected to benefit directly from increased foraging habitat and an increased prey base. No direct change would be expected to the habitat of the federal endangered light-footed clapper rail, but the decrease in sedimentation and increase in water quality may indirectly benefit this species by increasing its prey base. Restorations of channels near marsh habitat would provide protection from predators and human disturbance.

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APPENDIX G

404(b)(1) ANALYSIS

THE EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO THE WATERS OF THE UNITED STATES FOR THE UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT

1.0 INTRODUCTION

The following evaluation of the Upper Newport Bay Ecosystem Restoration Project is provided in accordance with Section 404(b)(1) of the Federal Water Pollution Control Act of 1972 (Public Law 92-500), as amended by the Clean Water Act of 1977 (Public Law 95-217). This analysis evaluates information on the discharge of dredge and fill material into waters of the United States. The evaluation relies upon information provided in the Upper Newport Bay Ecosystem Restoration Project Environmental Impact Statement/Environmental Impact Report EIS/EIR) to which it is appended.

2.0 PROJECT DESCRIPTION

2.1 PROJECT HISTORY

Sedimentation has been identified as the biggest problem within Newport Bay. Sediment from the San Diego Creek watershed fills open water areas within Newport Bay.

In response to the ongoing threat to Newport Bay from sediment deposition, a comprehensive study, "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan" (Boyle Engineering Corporation 1982) was sponsored by the cities of Irvine and Newport Beach, and the Southern California Association of Governments. This plan, known as the 208 Plan, called for a long-term sediment management strategy that would eventually shift sediment management from in-bay measures to upstream controls. In 1982, in response to the recommendations of the study, two sedimentation basins were constructed within the San Diego Creek channel upstream of its discharge into the Upper Bay and a 50-acre basin was constructed within the uppermost portion of the Bay. In the next six years, to further implement the recommendations of the "Newport Bay Watershed, San Diego Creek Comprehensive Stormwater Sedimentation Control Plan," two additional dredging projects were completed in Upper Newport Bay. In 1985, the Unit I sedimentation basin was constructed by enlarging the previously constructed in-bay sedimentation basin from 50 to 85 acres. A total of 890,000 cy (680,850 cu m) was dredged from the uppermost portion of the Bay to enlarge the basin by 35 acres and deepen it to -7 feet (ft.) (-2.1 meters [m]) Mean Sea Level (MSL). From 1987 to 1988, a second basin, the Unit II basin, was constructed within the Bay. The 14-ft. (4.2 m) deep Unit II basin is located just below the Main Dike at the southern end of the Unit I outlet channel. Side channels to the basin were created to support environmental enhancement. In addition, a 100-ft.-wide dredge access channel was constructed from the Lower Bay to the Unit II Basin. The dredged quantity for the project was 1,200,000 cy (918,000 cu m) of sediment.

In 1995 and 1996, the County of Orange determined that the Unit I and Unit II basins were essentially full and that a severe storm event could jeopardize the safety and personal property of the residents living along the Lower Bay. As predicted, the winter storms of 1997 and 1998 deposited large volumes of sediment throughout the entire Bay, expanding mudflat areas and reducing open water areas in the ecological reserve. Shoaling occurred in navigation channels in the marinas in the lower portion of the Upper Bay. Vessels were running aground in this area, and in the federal channels below PCH Bridge. In response to the need to restore the capacity of the basins to trap sediment, in 1998 and 1999 the OCPFRD completed the Unit III dredging project. The Unit III project deepened a portion of the Unit I basin to -14 ft. (-4.2 m) MSL by removing 860,000 cy (657,900 cu m) of sediment. This dredging project also restored a channel for access to boat slips in the lower portion of the Upper Bay and a main channel for passage of the dredge and barge equipment from the PCH Bridge to the Unit III basin.

The 1997/98 Unit III dredging project was an interim measure to curb the loss of valuable open water habitat supporting a variety of sensitive species. Local funding for the project was very difficult to obtain. At present no funding or plan exists to maintain the Unit III basin in the future. Furthermore, the Unit II basin was not dredged as part of the Unit III dredging project, and is now in non-compliance with the Total Maximum Daily Load (TMDL) objectives of the RWQCB. Pursuant to Section 303(d) of the Clean Water Act, the RWQCB has identified Upper Newport Bay and San Diego Creek as water quality limited because beneficial uses and water quality objectives are not being maintained. For the sediment TMDL, both the Unit III and Unit II basins are to be maintained to a minimum depth of -7 ft. (-2.1 m) MSL. Because existing depths in the Unit II basin are shallower than the required -7 ft. (-2.1 m) MSL depth, as specified in the sediment TMDL, this objective is not being met.

The Corps also dredged federal navigation channels in the Lower Bay below PCH Bridge for the first time in 1999. About 277,000 cy (211,905 cubic meters) of material were dredged and disposed of at the LA-3 offshore disposal site. The need for this dredging project clearly shows that more storm in-flows will deposit sediment further down the Bay if the trapping efficiency of the existing in-bay basins declines significantly.

2.2 LOCATION/GENERAL DESCRIPTION

Newport Bay is located along the coast of Orange County, California approximately 40 miles (64 kilometers [km]) south of Los Angeles and 75 miles (120 km) north of San Diego. The Bay is divided into the Lower and Upper Bay at the Pacific Coast Highway (PCH) Bridge. The 750-acre Lower Bay is a small boat harbor surrounded by residential development. The 1,000-acre Upper Bay is characterized by a diverse mix of development in its lower reach and an undeveloped ecological reserve in its upper reach. The 752-acre Upper Newport Bay Ecological Reserve, managed by the CDFG, is one of the last remaining southern California coastal wetlands that continue to play a significant role in providing critical habitat for a variety of migratory waterfowl and shorebirds as well as several endangered species of animals and plants. For this reason, Upper Newport Bay is an ecological resource of national significance.

2.3 PURPOSE AND NEED

The purpose of the Upper Newport Bay Restoration project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Sediments will continue to deposit in the bay no matter what control measures are implemented in the watershed. Therefore, one of the most important components of this project is to implement a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediment will settle.

A sediment management plan is needed to meet the primary ecosystem restoration study objectives:

- Restore, enhance, optimize, and maintain the ecological values for fish and wildlife, including sensitive communities in and around the Upper Newport By Ecological Reserve, to provide a diversity of use for resident and migratory species, and

- Restore, maintain, and manage a healthy and productive mix of habitat types including subtidal marine, intertidal mudflat, cordgrass-dominated low-salt marsh, and pickleweed-dominated mid-salt marsh.

Although the emphasis of the Upper Newport Bay Restoration project is on developing a dredging program to remove sediment from Upper Bay waters, other restoration opportunities that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

2.4 STUDY AUTHORITY

Authorization of the Upper Newport Bay Restoration Project is based on Section 841 of the Water Resources Development Act of 1986 (WRDA 1986), Public Law 92-662.

2.5 GENERAL DESCRIPTION OF DREDGED AND FILL MATERIAL

The proposed project would result in dredging approximately 2 million cubic yards (mcy) (.1.8 million cubic meters [mcm]) of sediment from Upper Newport Bay. Based on a sediment evaluation for the 1998-1999 Unit III dredging project sediments are expected to meet unconfined ocean disposal criteria. Sediments will undergo full Green Book (USACE and USEPA, 1991) testing prior to the start of construction.

2.6 DESCRIPTION OF THE PROPOSED PROJECT

2.6.1 Basin Configuration

The proposed project (Alternative 6 in the EIS/EIR) would involve deepening and expanding the Unit III basin, removing the northern, "kidney shaped" tern island and creating a new least tern island at the main dike, and widening and deepening the Unit II basin.

The mudflats in the northeast corner of the uppermost segment would be maintained. In addition, approximately 100 ft (30 m) of mudflats would be retained around the shoreline perimeter of the basin and the southern island to a depth of -3 ft. (-0.9 m) MSL. To create the new basin, the mudflats between -3 ft. (-0.9 m) MSL and -20 ft. (-6 m) MSL would be dredged to a depth of -20 ft. (-6 m) MSL with a 5:1 slope.

A trapezoidal channel with 20 ft. (6 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes would be dredged between the southern least tern island and the shore to restore tidal action to the area. An access channel with 20 ft. (6 m) bottom width, -6 ft. (-1.8 m) MSL depth and 3:1 slopes would be constructed along the southern tip of the island for maintenance of the tern island.

The channel between the Upper Basin and the Unit II basin would be maintained at its current design of -14 ft. (-4.2 m) MSL depth.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the new island to provide boat access to maintain the island. The access channel would have a bottom width of 20 ft. (6 m), a depth of -6 ft. (-1.8 m) MSL and 3:1 side slopes.

The Unit II basin footprint would be expanded west to the existing 0 MSL contour line from the relocated tern island to the southern end of New Island. The Unit II basin would be deepened to -20 ft. (-6 m) MSL with 5:1 slopes. Approximately 100 ft. (30 m) of mudflat to a depth of -3 ft. (-0.9 m) MSL would be retained around the shoreline perimeter of the basin and New Island.

A trapezoidal channel, with 50 ft. (15 m) bottom width, -5 ft. (-1.5 m) MSL depth and 3:1 side slopes, would be reconstructed along the eastern side of New Island. The Santa Ana-Delhi channel would be reconstructed to the same design dimensions.

2.6.2 Construction Methods

Dredging is most likely to be done with a clamshell dredge. Dredging would be conducted from a floating barge by a crane equipped with a 5 cubic yards (cy) (3.8 cubic meters [cu m]) grab bucket or by a CAT 245 backhoe with a 5 cy (3.8 cu m) bucket. The grab bucket would be lowered to the bottom where its jaws are closed over a plug of sediment. The grab would be raised out of the water, and the sediment deposited into a disposal scow with 1,500 cy (1,147.5 cu m) capacity. The production rate is estimated to be about 4,000 cy (3,060 cu m) per day. The clamshell dredging method was used successfully for the 1987 to 1988 Unit I/II project and the recent Unit III project. A small tugboat would transport and hold an empty disposal scow near the dredge as another scow is filled while secured alongside the dredge barge. The filled scow would be pushed by the tug to a barge marshalling area adjacent to the south end of Shellmaker Island or elsewhere near the PCH bridge. The full scow would be exchanged for an empty one for return to the dredge site in the Upper Bay. The filled scow would be pushed by ocean-going tug out of Newport Harbor to the ocean disposal site at LA-3. The round trip travel time to and from the LA-3 ocean disposal site is 4 hours. Approximately 3 round trips to the disposal site would be made per day; each of the three scows would thus make one trip per day. Dredge operations would be conducted 24 hours per day, 6 days per week. A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every two days. A quality control survey boat would be onsite during all dredging operations.

A total of 2,027,000 cy (1,550,655 cu m) of sediment would be dredged. The time to construct the project is estimated to be 21.7 months. The Unit III dredging operation was staged from Shellmaker Island. CDFG would prefer that staging be done elsewhere to prevent potential impacts to their reserve operations. Therefore, staging would probably occur at another site near the PCH Bridge.

Instead of a clamshell dredge, it is possible that dredging could be accomplished using a small hydraulic dredge.

Under this alternative, the dredging operations would be conducted using a floating hydraulic dredge of modest size. The small, lightweight, self-propelled dredge could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which would then be pumped through a 12-inch pipeline to a disposal scow, located at Shellmaker Island or at another site near the PCH bridge. The pipeline would cross the marsh in both the Unit I/III and Unit II basin areas. Three booster pumps would be located along Back Bay Drive. The size of each booster pump would be about 400 horsepower (hp). The pumps may be either diesel or electric powered. The disposal scows would be filled adjacent to the south end of Shellmaker

Island or at another site near the PCH bridge. The rate of solids delivery through a 12-inch pipeline from the small dredge to the scow barges would be about 150 cy/hour (hr) (115 cu m/hr), or 3,000 cy (2,295 cu m) per 20-hour workday. The dredge would operate 20 hours per day, 6 days per week.

Because dredged material would be mixed with water for hydraulic transport through the pipeline under this alternative, solid content in the slurry mixture would be limited to about 20 percent. To avoid making approximately 5 times as many trips to the ocean disposal site as would be required under the clamshell dredge alternative, water would be removed from the disposal scow prior to leaving the dock for the ocean disposal site. This operation requires a manifold to allow partial filling of each scow barge while the sediment within the partially filled barge settles. A combination of barges would be used so that the dredge pipe discharge can alternately fill a barge and then be diverted to another barge to allow sediment settling and water decanting. Through progressive filling, settling, and decanting, the sediment content in each barge can be maximized. A total of three dump scows (1,500 cy capacity) would be used to allow continuous operations. The use of additives that can be discharged into the filling barge in order to reduce sediment-settling time are being investigated. A large water pump would be used to decant the excess water. Disposal scows would be filled with about 1,000 cy (765 cu m) of the consolidated dredge material and transported by tugboat to the LA-3 disposal site where the material would be discharged. There would be one four-hour round trip to LA-3 per day. The single trip has a tug towing all three scows. Dredging would cease during the four-hour round trip.

The hydraulic dredge, which requires substantially less fuel than the clamshell dredge, would be fueled by truck at Jamboree Road. Like disposal scow trips, fuel barge trips along the Upper Bay Channel would be avoided.

If a hydraulic dredge were used, it would not be necessary to excavate an access channel for the dredge. Therefore the amount of material to be dredged would be 1,952,00 cy (1,493,280 cu m). However, because the dredging production would be lower for a hydraulic dredge compared to a clamshell dredge the total construction time would be 27.8 months.

In addition, to dredging of the basins and channels, the proposed project would include relocation of the northerly tern nesting island to the Unit II basin near the salt dike. Relocation would be required in order to meet depth requirements with a stable slope and would be required for either method of construction (clamshell and hydraulic dredge).

Removal of the old island foundation would be accomplished during the upper basin dredging. Tern island relocation would occur during the non-breeding season.

The new tern island near the main dike would be constructed from material taken from the top of the "kidney shaped" island and material obtained elsewhere. Only the top 5 ft. of the existing island is expected to be suitable for the new island construction. The "kidney shaped" island would provide 40,000 cy (30,600 cu m) for the new island. An additional 23,000 cy (17,595 cu m) of sand would be imported to complete the construction of the new island. A total of 16 barges of 2,500 cy (1,912.5 cu m) capacity would be needed to transport the 40,000 cy (30,600 cu m) scavenged from the old island to the new island site. Rather than use sand from a distant source, it is believed that the 23,000 cy (17,595 cu m) of sand for the two-foot thick surface layer of the new island could be procured from within Newport Bay. Possible areas where good quality sand exists include the following: Interceptor Beach (at the Orange County Harbor Patrol Office, near the Bay entrance), Shellmaker Island, the Newport Aquatic Center (should wetland creation be undertaken there), the "In Channel" Basins of San Diego Creek, and in certain Upper Bay Channels where high sand content was found during the 1998-1999 dredge program.

2.6.3 Maintenance Dredging

Because sediment from San Diego Creek would continue to discharge to Upper Newport Bay, periodic maintenance dredging of the basins and channels would be required. Several criteria were developed to determine when maintenance dredging would be needed. Intervals for maintenance dredging of study alternatives were determined by using the following three criteria in the order shown:

1) Maintenance dredging will be initiated if the cumulative percent of sediments trapped in the basins drop below 50 percent. Conversely, if more than 50 percent of cumulative sediments deposit beyond the basin(s), maintenance dredging will be required.

2) If greater than 30 percent of cumulative sediment deposits below PCH bridge, maintenance dredging will be initiated.

3) Sediment accumulation will not be allowed to reach levels where there is a net change in habitat types, such as open water transitioning to mudflat.

Maintenance would be triggered if any of the criteria were exceeded. The maintenance frequency was based on long-term average sediment inputs. Because sediment input in the San Diego Creek watershed is highly variable, the actual requirements for maintenance dredging may vary. For example, a series of wet years such as occurred in the 1990s, might make maintenance dredging necessary more frequently. On the other hand, a series of dry years like the mid to late 1980s might result in less frequent dredging.

Based on an average annual inflow of 164,000 cy (125,460 cu m) of sediment from San Diego Creek into the Bay, it was estimated that for Alternative 6 (the proposed project) maintenance dredging would be required every 21 years and would take about 20.3 months to accomplish with a clamshell dredge and 22.8 months to complete with a hydraulic dredge. Maintenance dredging methods would be similar to those employed for the initial basin dredging. Maintenance of habitat restoration measures is not included at this time.

2.6.4 Habitat Restoration Measures

In addition to reconfiguration of the basins to the Alternative 6 basin footprint, the proposed project includes six additional habitat restoration measures. Each of these is described below. Figure 2-4 shows where each of the habitat restoration measures would occur.

2.6.4.1 Addition of Sand to the Southerly Least Tern Island

The erosion of sand and invasion of vegetation have degraded the existing least tern islands in the uppermost basin. The quality of the nesting islands could be improved by the addition of clean sand. Sand would be obtained from within the Bay as described above for relocation of the "kidney shaped" island from the upper basin to the main dike. Because least terns need unvegetated sand in which to construct their nests, any existing vegetation on the island would be removed by hand (since it is not possible to place construction equipment on the island) prior to the importation of sand to the top of the island. Sand would be excavated from the borrow site with a backhoe and loaded with two CAT 966 front-end loaders onto a barge with a capacity of 2,500 cy (1,912 cu m). The barge would be guided by tug to the upper basin where loaders would tram the material off the barge and spread on the tern island by a bulldozer. About 2 or 3 barge trips would be needed to move the material and the process would take 4 days. Vegetation would be removed and sand would be added during the non-breeding season to avoid disturbance to nesting terns.

2.6.4.2 Construct Small Dendritic Channels through the Marsh

The purpose of this restoration measure would be to increase foraging habitat for aquatic-feeding birds, improve circulation, and restrict access for humans and terrestrial predators. Aerial photographs show evidence of small channels that already exist throughout the marsh. The concept is that these channels would be increased in area to improve their function.

Because of concerns by the resource agencies about the impacts of channel excavation on sensitive marsh species, only a small pilot program is proposed on Shellmaker Island. For this pilot program, a single channel would be dredged through Shellmaker Island. The channel would have a bottom width of 10 ft. (3 m) and 3:1 side slopes.

The excavation of the small channel would be done by a backhoe or other small piece of earthmoving equipment. Approximately 9,650 cy (7,382 cu m) of material would be dredged. Assuming about 3,000 cy (3,825 cu m) of material were excavated in a day, it would take about 3 days to complete the excavation. The backhoe would stockpile the material on Shellmaker Island where it would be loaded by a frontloader onto a disposal scow for discharge at LA-3.

2.6.4.3 Restoration of Wetlands in Filled Areas

Three areas of fill within the Upper Bay have been identified where the potential exists to restore the filled areas to wetlands. Each of these wetlands restoration opportunities is discussed below:

Northstar Beach. This habitat restoration alternative would create wetlands at Northstar Beach. The excavation would avoid impacting the existing rowing center. One island would be created that would contain an area of about 2.5 acres. The elevation of the island would be -2 ft. (-0.6 m) MSL. The island would be surrounded a shallow channel, with a depth of -5 ft. (-1.5 m) MSL. Approximately 36,800 cy (28,152 cu m) of material would be excavated to restore wetlands at Northstar Beach. It would take about 13 days to implement this alternative and about 37 scow trips to LA-3 would be required for disposal.

Bull-nose Section of Land at Lower End of Northern Side of Unit I/III Basin. This alternative would excavate this section of land to -2 ft. (-0.6 m) MSL to restore wetlands function. If this area were restored to wetlands, about 42,000 cy (32,130 cu m) of material would be excavated for this alternative. Excavation of this material would take 14 days, and would require 42 scow trips to LA-3 for material disposal.

Dredge Spoil on Shellmaker Island. This alternative would restore wetlands function by excavating about 3 acres of dredge spoils on Shellmaker Island to an elevation of -2 ft. (-0.6 m) MSL. Approximately 34,000 cy (26,010 cu m) would be excavated to create this alternative. At a dredging rate of 3,000 cy (2,295 cu m) per day, it would take approximately 12 days to grade this area. Disposal would require about 34 trips to LA-3.

For any of these wetlands creation alternatives, the material would be excavated either with the clamshell dredge, backhoe, or the hydraulic dredge. Some of the material for some of these alternatives may be suitable for beneficial uses such as adding sand to tern islands or beach nourishment. If beneficial uses for dredged material are available at the time of project construction, suitable material would be used for those purposes. Because the suitability of material for beneficial uses is unknown at this time, the assumption is made that excavated material will be placed in a disposal scow and discharged at the LA-3 ocean disposal site.

2.6.4.4 Restoration of Side Channels

This alternative would restore side channels to the west side of Middle Island and/or the east side of Shellmaker Island. Restoration of side channels would increase habitat for aquatic species, improve circulation, and isolate the islands from terrestrial predators such as dogs, cats, and coyotes. For each of these alternatives the side channel would have a bottom width of 20 ft. (6 m), a depth of -5 ft. (-1.5 m) MSL, and 3:1 side slopes. The proposed channels are presently at a depth of about +0.5 to +1.5 ft. (+0.15 m to +0.45 m) MSL on Middle Island and +2.5 ft. (+0.7 m) MSL on Shellmaker Island. Portions of the Shellmaker Island side channel would have a bottom width of only 5 ft. (1.5 m) to avoid disturbing marsh.

About 19,500 cy (148,918 cu m) would need to be dredged to restore the Middle Island channel, and about 24,000 cy (18,361 cu m) would be dredged to restore the Shellmaker Island channel.

Dredging of the side channels would be done during dredging of the Unit II basin area using a small hydraulic dredge regardless of the type of dredge used for dredging the basins. Material would be pumped to a disposal scow, dewatered, and transported to the LA-3 site for disposal. It would take about 20 barge trips to dispose of the material from Middle Island and about 24 barge trips to dispose of the Shellmaker Island material. Dredging the Middle Island Channel would add approximately an additional 7 days to the overall dredging program. Adding a side channel to Shellmaker Island would take about 8 days. If side channels were restored to both islands, a total of about 15 days would be added to the overall dredging program.

2.6.4.5 Restore Eelgrass Beds in Lower Portions of Upper Bay

Beds of eelgrass (*Zostera marina*) are recognized as a particularly valuable type of marine habitat that enhances the physical and biological environment by stabilizing the substrate, increasing productivity, and providing structure to the otherwise monotonous soft bottom habitat (Phillips 1988). Several studies have demonstrated that the marine life in eelgrass meadows is enhanced in numbers, species, and standing crop compared to unvegetated soft-bottom habitat (summarized in Ware 1993). The lower portions of the Upper Bay formerly supported eelgrass, but beds disappeared following wet years in the 1980s and 1990s. Eelgrass requires high light levels and its disappearance may have been related to turbidity created by sedimentation from San Diego Creek. The implementation of a sediment control plan will reduce sedimentation and may allow the re-establishment of eelgrass.

This restoration measure would restore eelgrass to about 0.6 acres of shallow/soft bottom adjacent to Shellmaker Island. Approximately 4 to 6 divers using SCUBA apparatus would collect eelgrass from existing eelgrass beds around Harbor Island and Balboa Island in the Lower Bay. Plants would be taken to an on-shore assembly station where they would be cleansed of sediment. The sediment-free individual eelgrass shoots would then be fabricated into planting units of 12 to 15 shoots each. About 4 persons would be responsible for the shore assembly of the planting units. The shore assembly station would probably be at Newport Dunes or the southern part of Shellmaker

Island. A planting unit would be assembled by securing the shoots together with a loop of biodegradable twine that is connected to a biodegradable anchor such as a popsicle stick. The dive team then replants the bundles at spacing of about 2 to 3.3 ft. (0.6 to 1 m) apart throughout the planting area by placing the biodegradable anchors and root mass into a hand dug hole. Revegetating about 0.6 acres in the lower part of the Upper Bay would take about 3 to 4 days. The only mechanized equipment that would be used would be a small boat (about 25 ft. by 12 ft. by 6 ft.) with about a 50 horsepower motor. The boat would travel to and from the donor bed areas near Harbor Island and Balboa Island to the lower part of the Upper Bay, a round trip distance of up to 5 mi (8 km) for the more distant donor beds.

2.6.4.6 Removal of Segments of the Main Dike

The main dike provides a means of human intrusion into the marsh as well as access for terrestrial predators such as dogs, cats, and coyotes. This alternative would improve habitat quality by removing this access route. A backhoe would travel along the dike and remove segments. The backhoe would be transported to and from the dike by a small barge. Approximately 500 cy (382.5 cu m) of material would be removed from the dike. If appropriate, the material would be used for beneficial uses such as constructing tern islands or beach nourishment within the Bay. Material not designated for beneficial uses would be barged to LA-3 for ocean discharge or trucked to a land disposal site. Implementation of this restoration alternative would take less than one day.

2.7 TIMING AND DURATION OF DISCHARGE

Clamshell dredging is expected to take approximately 22 months. Hydraulic dredging is expected to take approximately 28 months. It is estimated that maintenance dredging would be required every 21 years and would take about 20 months to accomplish with a clamshell dredge and 23 months to complete with a hydraulic dredge. Dredging is tentatively scheduled 24 hours per day.

2.8 ALTERNATIVES AND PLAN DESCRIPTIONS

The environmental document and Feasibility Study discuss and evaluate a wide array of alternatives. Section 2 of the EIS/EIR contains a detailed discussion of alternatives.

3.0 FACTUAL DETERMINATION

3.1 PHYSICAL SUBSTRATE DETERMINATIONS

See Sections 3.2 and 4.2 of the EIS/EIR for a more detailed discussion of physical substrate.

3.1.1 Substrate Elevation and Slope

Impact:		N/A	X	Insignificant		Significant

Dredging activities would restore two sediment basins. The northerly tern island would be relocated near the dike resulting in an expanded Unit I/III basin. New slopes would be created at the edges of the restored basins and adjacent to fill sites. While there is a change to bottom elevations and a lesser extent slope on some areas, this is part of project design and restores historic patterns and is therefore considered insignificant.

3.1.2 Sediment Type

Impact:		N/A	X	Insignificant		Significant

Sediments from previous dredging, including the 1998-1999 Unit III dredging, were tested and found suitable for ocean disposal. It is anticipated that the bulk of materials to be dredged will be found suitable for ocean disposal. All fill materials to be used for the proposed project (i.e. relocation of the tern island and construction of habitat restoration measures) will be tested for compatibility and suitability for unconfined aquatic disposal prior to construction. The proposed project is not expected to result in significant sediment compatibility impacts.

3.1.3 Dredged/Fill Material Movement

Impact:		N/A	X	Insignificant		Significant

Dredged channel side-slope will be designed to withstand a contingency level seismic event. Fill material movement will be controlled as needed using graded rock, silt screens and/or geo-textile fabrics placed on the inside surface of the containment dikes to prevent loss of deposited materials through the dike. Movement of dredged material is not anticipated at either the dredge or fill sites.

3.1.4 Physical Effects on Benthos

Impact:		N/A	X	Insignificant		Significant

Changes in the physical characteristics of the bottom sediments might result in localized modification of the benthic community. Dredging and construction of disposal sites would result in the loss of the existing benthos followed by recolonization of the exposed substrate and recovery with time. The nature of the soft bottom substrate would vary by location within the harbor, but no major shift in the overall soft bottom benthic community is expected. No long-term significant impacts are expected.

3.1.5 Other Effects

Impact:	X	N/A		Insignificant		Significant

3.1.6 Actions Taken to Minimize Impacts

Needed?:		Yes	X	No

3.2 WATER CIRCULATION, FLUCTUATION AND SALINITY DETERMINATION

See Sections 3.3 and 4.3 of the EIS/EIR for a discussion of water quality issues.

3.2.1 Water

Salinity

Impact:		N/A	X	Insignificant		Significant

Freshwater inputs, tidal exchange with Lower Bay waters, and the effects of evaporation influence salinity. Strong salinity gradients from Upper Newport Bay towards the entrance channel occur during periods of heavy rainfall, while gradients during other months are less pronounced. Salinity values range from a minimum of approximately 1 part per thousand (ppt) in areas influenced by freshwater inputs to maximum values of 34 ppt, which reflects the effects of evaporation. Due to the ocean's major influence on harbor salinity, dredging and landfill operations would have little or no effect on salinity gradients in the harbors. Once completed, the sediment basins are expected to reduce fluctuations in salinity restoring the by to more marine-like conditions.

Water Chemistry

Impact:		N/A	X	Insignificant		Significant

The pH of the harbor waters is dominated by the ocean's influence. The pH values measured for Upper Newport Bay waters range from 7.1 to 8.1. The yearly temperature averages from Los Angeles Harbor vary between 13 and 27 C. Surface water temperature is lowest in the winter and rises through summer, with autumn being the warmest season. Dredging and landfill operations would not be expected to have either a short-term or a long-term effect on temperature or pH in the harbor. Once completed, the sediment basins are expected to reduce fluctuations in temperature restoring the bay to more marine-like conditions.

Clarity

Impact:		N/A	X	Insignificant		Significant

The clarity of Upper Newport Bay waters is affected by amounts of suspended sediments and floating algae. Suspended sediment concentrations reflect the magnitude of runoff-derived solids, and the effects of wave-induced sediment resuspension in shallow waters of the bay. Algal and plankton blooms can also reduce water clarity and light transmittance. Improved tidal flushing and circulation as a result of the proposed project are expected to reduce sediment loads and restrict algal and plankton blooms resulting in improved clarity.

Color

Impact:		N/A	X	Insignificant		Significant

The color of Outer Los Angeles Harbor waters ranges in hue from green, olive green, olive brown, to blue green depending on the season. Dredging and landfill operations will have a localized, short-term effect on the color of harbor waters associated with the resuspension of benthic materials (turbidity) into the water column. No long-term significant change to water color of the harbor is anticipated.

Odor

Impact:		N/A	X	Insignificant		Significant

Sediments present in the Outer Harbor waters are generally free of oily, musty, sulfide, chemical, or fishy odors. Dredging of inner portions of the harbor may result in temporary increases in odor where sulfide enriched sediments are disturbed by dredging. If this were to occur, it would be a localized and short term occurrence and is not considered significant.

Taste

Impact:	X	N/A	X	Insignificant		Significant

Dissolved Gas Level

Impact:		N/A	X	Insignificant		Significant

The concentration of dissolved oxygen (D.O.) varies in the harbors by area, depth, and season. Upper Newport Bay D.O. levels are seldom below 5.0 mg/l (one value below 5.0 measured between 1991 and 1996). Dissolved oxygen typically ranges from 0.4 to 13.9 mg/l. Reduction in the D.O. content of bay waters would be a concern associated with turbidity increases during dredge and landfill. Decreases in D.O., if they occurred, would be kept to within a couple of hundred feet of the dredging area or at the point of turbid water release from the landfill. It is anticipated that D.O. levels are unlikely to drop below 5 mg/l during the dredging, and that if values were to drop below this level, they would be localized and short-term in nature. Once completed, the sediment basins are expected to reduce fluctuations in D.O. restoring the bay to more marine-like conditions.

Nutrients

Impact:		N/A	X	Insignificant		Significant

Water quality in Upper Newport Bay is affected by excessive nutrient loadings associated with watershed inputs. The main sources of inorganic nutrients (nitrate, phosphates, silicates) are tail waters from irrigation of agricultural crops and from several commercial nurseries in the watershed. Dredging and landfill operations are expected to cause minor, short-term increases in water column nutrient levels due to the resuspension of surface sediments high in organic content. This is expected to be localized and of short duration.

Eutrophication

Impact:		N/A	X	Insignificant		Significant

High nutrient levels promote excessive growths of mats of green algae, which cause depressed D.O. levels. Once completed, the sediment basins are expected to reduce fluctuations in nutrient levels restoring the bay to more marine-like conditions and reducing the likelihood of future algal blooms.

Others

Impact:	X	N/A		Insignificant		Significant

3.2.2 Current Patterns and Circulation

Current Patterns and Flow

Impact:		N/A	X	Insignificant		Significant

Dredging of the Unit I/III and Unit II basins would improve tidal flushing and circulation compared to the 50-year without project condition. The larger tidal prism would exchange every tidal cycle resulting in higher current velocities and more stable physical conditions such as temperature and salinity.

Velocity

Impact:		N/A	X	Insignificant		Significant

Dredging of the Unit I/III and Unit II basins would improve tidal flushing and circulation compared to the 50-year without project condition. The larger tidal prism would exchange every tidal cycle resulting in higher current velocities and more stable physical conditions such as temperature and salinity.

Stratification

Impact:		N/A	X	Insignificant		Significant

Stratification results from the input of fresh water into a marine system. Stratification in Upper Newport Bay is in the form of a freshwater lens of runoff overlying more saline bay waters. Stratification is expected to continue following project construction, but is expected to be of shorter duration due to increased tidal flushing and circulation predicted as a result of dredging.

Hydrologic Regime

Impact:		N/A	X	Insignificant		Significant

Dredging of the Unit I/III and Unit II basins would improve tidal flushing and circulation compared to the 50-year without project condition. The larger tidal prism would exchange every tidal cycle resulting in higher current velocities and more stable physical conditions such as temperature and salinity.

3.2.3 Normal Water Level Fluctuations

Impact:		N/A		Insignificant		Significant

Numerical modeling of harbor circulation has shown that the proposed dredging and filling would create no change in tidal range.

3.2.4 Salinity Gradients

Impact:		N/A	X	Insignificant		Significant

Dredging of the Unit I/III and Unit II basins would improve tidal flushing and circulation compared to the 50-year without project condition. The larger tidal prism would exchange every tidal cycle resulting in higher current velocities and more stable physical conditions such as temperature and salinity.

3.2.5 Actions That Will be Taken to Minimize Impacts

Needed?:		Yes	X	No

3.3 SUSPENDED PARTICULATE/TURBIDITY DETERMINATION

See Section 3.3 and 4.3 of the EIS/EIR for additional information on the effects of turbidity.

3.3.1 Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

Impact:		N/A	X	Insignificant		Significant

Increases in suspended particulates and turbidity levels in the vicinity of the dredge and disposal sites are expected to be localized and temporary in nature and therefore, not significant.

3.3.2 Effects (Degree and Duration) on Chemical and Physical Properties of the Water Column

The duration of the turbidity plume would be short-lived, with suspended solids concentrations returning to background levels from an hour or less to 24 hours after dredging stops in any given area.

Light Penetration

Impact:		N/A	X	Insignificant		Significant

The turbidity generated by the proposed dredging and landfill will decrease the amount of light penetration in the water column impacting primary production levels in the harbors. While adverse this impact, will be localized and temporary in nature. There will be a long-term increase in light penetration, particularly in the lower bay as sediments are removed and stored in the basins.

Dissolved Oxygen

Impact:		N/A	X	Insignificant		Significant

The reduction in the D.O. content of harbor waters would be a concern associated with turbidity increases during dredging and landfills. Decreases in D.O., if they occurred, would be kept to within a couple of hundred feet of the dredging area or at the point of turbid water release from the landfill. It is anticipated that D.O. levels are unlikely to drop below 5 mg/l during the dredging, and that if values were to drop below this level, they would be localized and short-term in nature.

Toxic Metals and Organics

Impact:		N/A	X	Insignificant		Significant

Resuspension of sediments during dredging could cause the release of contaminants into the water column. Chemical analyses of bay sediments associated with the 1998-1999 Unit III dredging showed the sediments to be acceptable for in-bay or ocean disposal. Resuspension during dredging is therefore considered insignificant.

Pathogens

Impact:		N/A	X	Insignificant		Significant

Potential for release of pathogens during this project is considered insignificant.

Aesthetics

Impact:		N/A	X	Insignificant		Significant

There will be temporary changes in the color of harbor waters associated with the resuspension of benthic materials from dredging and landfill operations. Long-term impacts are considered to be beneficial as the current ecosystem is enhanced and protected by the proposed project.

3.3.2 Others

Impact:	X	N/A		Insignificant		Significant

3.3.3 Effects on Biota

See EIS/EIR Sections 3.4 and 4.4 for more detailed information of biota and habitats.

Primary Production, Photosynthesis

Impact:		N/A	X	Insignificant		Significant

Turbidity from the proposed landfill would be expected to lower light penetration into the water column. The decrease in available light could cause a decrease in photosynthesis in phytoplankton within the area of turbidity and a subsequent decrease in primary productivity in the water column. Turbidity would be expected to settle out within a day or two after completion of the landfill, and plankton would rapidly recolonize from immediately adjacent areas. It is in fact more likely that phytoplankton will increase in numbers with the release of nutrients from sediments during the dredging process. The impacts of the turbidity from dredging and filling activities on phytoplankton are expected to be adverse, but temporary and localized in nature. Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality.

Suspension/Filter Feeders

Impact:		N/A	X	Insignificant		Significant

Suspended solids from the proposed dredging and filling would clog the feeding mechanisms of suspension feeders and filter feeders. Organisms that would be affected would include zooplankters and benthic invertebrates. The impacts of turbidity on zooplankton, which are ubiquitous in the marine environment, would be expected to be adverse but temporary and insignificant. Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality.

Sight Feeders

Impact:		N/A	X	Insignificant		Significant

Turbidity from dredging and fill operations will potentially affect the quality of foraging habitat for birds from the reduced visibility which might reduce foraging success, as most fish-eating birds, including terns and pelicans, hunt by sight rather than by olfactory or tactile senses. The impact of turbidity caused by the proposed landfill on seabird foraging success will be dependent upon the extent of the turbidity. Shallow waters are an important foraging habitat for piscivorous birds including the endangered California least tern and brown pelican, and during certain periods of the landfill construction might be exposed to turbidity. The use of turbidity curtains, however, will keep impacts to an insignificant level.

3.3.4 Actions Taken to Minimize Impacts

Needed?:	X	Yes		No

The use of turbidity curtains and timing restrictions for construction activities will be used to minimize impacts of turbidity to the Upper Newport Bay.

3.4 CONTAMINATION DETERMINATIONS

Impact:		N/A	X	Insignificant		Significant

An evaluation of the appropriate information from prior sediment testing including bioassay and bioaccumulation tests indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants. Sediments will undergo full Green Book (USACE and USEPA, 1991) testing prior to the start of construction.

3.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

3.5.1 Effects on Plankton

Impact:		N/A	X	Insignificant		Significant

Planktonic communities would be affected by the direct impacts of loss of water column habitat from the proposed landfill, from the resuspension of contaminants and from the turbidity from the dredging and filling operations. Effects of plankton due to permanent loss of water column area from construction of disposal sites are insignificant. The majority of sediment in the bay is suitable for in-bay and ocean disposal and would not result in significant effects on planktonic organisms. Effects of turbidity on the ubiquitous plankton because of project activities would be localized and short term.

3.5.2 Effects on Benthos

Impact:		N/A	X	Insignificant		Significant

Benthic organisms would be lost due to turbidity and burial from dredging activity; they would also subjected to turbidity and burial because of construction of fill sites. Permanent loss of benthic invertebrates is insignificant. The areas subjected to this would be completely recolonized within two to three years and is considered a temporary impact.

3.5.3 Effects on Nekton

Impact:		N/A	X	Insignificant		Significant

Fishes would be impacted by turbidity, suspended contaminants, and temporary loss of habitat. Fishes could avoid locally turbid areas and the impacts of turbidity would be expected to be adverse, but insignificant. Similarly, because most of the sediments to be used for landfill have not exhibited evidence of toxicity in bioassay tests the exposure of fishes to contaminants in sediments during dredging are expected to be adverse, but insignificant. Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality and increased water surface area.

3.5.4 Effects on Aquatic Food Web

Impact:		N/A	X	Insignificant		Significant

Loss of planktonic organisms and benthic invertebrates at the base of the food web might have temporary impacts on higher trophic levels. However, these organisms would be expected to recover from losses so impacts on the aquatic food web would be short-term. There has been no evidence of reduction of prey items to piscivorous birds because of the 1998-1999 Unit III dredging.

3.5.5 Effects on Special Aquatic Sites

Vegetated Shallows (kelp beds and eel grass)

Impact:		N/A	X	Insignificant		Significant

Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality and the construction of habitat restoration measures. Habitat restoration measures include the planting of eelgrass.

Wetlands

Impact:		N/A	X	Insignificant		Significant

Marshes would be avoided during construction activities.

Mudflats

Impact:		N/A	X	Insignificant		Significant

The proposed project would result in the reduction of intertidal mudflat by 17% compared to the year zero condition. Because enhanced water quality would improve the quality of intertidal mudflat habitat, loss of mudflat habitat is considered an adverse but insignificant impact.

Riffle and Pool Complexes

Impact:	X	N/A		Insignificant		Significant

3.5.6 Threatened and Endangered Species

Impact:		N/A	X	Insignificant		Significant

The primary endangered bird species in the harbor are the California least tern, the brown pelican, the light-footed clapper rail, and the western snowy plover. In coordination with the U.S. Fish and Wildlife Service and California Department of Fish and Game, the Corps and the local sponsor are developing measures to ensure no harm to threatened and endangered species.

3.5.7 Other Wildlife

Impact:	X	N/A		Insignificant		Significant

3.5.8 Action to Minimize Impacts

Needed?:	X	Yes		No

A number of actions will be taken to minimize impacts to biological resources including threatened and endangered species. These include adherence to discharge requirements to control turbidity and timing to avoid impacts during nesting seasons. These measures have been fully coordinated with U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the California Department of Fish and Game.

3.6 PROPOSED DISPOSAL SITE DETERMINATIONS

3.6.1 Mixing Zone Determination

Impact:		N/A	X	Insignificant		Significant

The mixing zone at the disposal sites is very small due to the shallow depths in these areas. This will also be confined to the smallest practicable zone using measures to prevent leakage of fill materials.

3.6.2 *Determination of Compliance with Applicable Water Standards*

Impact:		N/A	X	Insignificant		Significant

Controlling water plans include the Water Quality Control Plan for the Los Angeles River Basin (Region 4). The Basin Plan designates beneficial uses of the basin's water resources and describes water quality objectives. Beneficial uses include water recreation, navigation, ocean commercial and sport fishing, preservation of rare and endangered species and marine water habitats. Implementation of measures described herein will insure that the project is in conformance with the Basin Plan.

The State Water Resources Control Board has also adopted a water quality control policy that provides principles and guidelines to prevent degradation, and to protect the beneficial uses of the waters of enclosed bays and estuaries (1974). Newport Bay is considered an enclosed bay under this policy. Waste discharge requirements developed by the RWQCB, among other requirements, must be consistent with this policy. The Corps/Port will conform to discharge requirements of the RWQCB and the project will be in conformance with this policy amd with TMDL requirements established by the RWQCB.

3.6.3 Potential Effects on Human Use Characteristics

Municipal and Private Water Supply

Impact:	X	N/A		Insignificant		Significant

Recreational and Commercial Fisheries

Impact:	X	N/A		Insignificant		Significant

Water Related Recreation

Impact:		N/A	X	Insignificant		Significant

Movement of dredged material in barges for offshore disposal could impact recreational vessel traffic in Lower Newport Bay. However, due to the movement of single barges at long intervals, this will not be a significant impact.

Aesthetics

Impact:		N/A	X	Insignificant		Significant

No noticeable long-term changes to harbor vistas are anticipated because of the proposed project.

Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

Impact:	X	N/A		Insignificant		Significant

3.6.4 Action to Minimize Impact

Needed?:	X	Yes		No

The project will conform to water quality policy/standards by adhering to discharge requirements and other measures (see Aquatic Ecosystem Determination) identified to protect beneficial uses. Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality.

3.7 DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

Impact:		N/A	X	Insignificant		Significant

There are no significant effects from the project and therefore, it is unlikely there will be significant cumulative effects from the proposed project. No other major dredging projects are anticipated in Newport Bay during this time frame. No significant cumulative effects are anticipated.

3.8 DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

Impact:		N/A	X	Insignificant		Significant

Overall, project impacts are expected to be beneficial resulting from improvements to circulation and water quality.

4.0 FINDINGS OF COMPLIANCE

4.1 ADOPTION OF THE SECTION 404(B)(1) GUIDELINES TO THIS EVALUATION

No significant adaptations of the guidelines were made relative to this evaluation.

4.2 EVALUATION OF THE AVAILABILITY OF PRACTICABLE ALTERNATIVES TO THE PROPOSED DISCHARGE SITE

The EIS/EIR and Feasibility Study have evaluated a wide range of alternatives (see EIS/EIR Section 5.0). Based on this analysis, there are no project alternatives or clear-cut alternative disposal sites available, which are more consistent with the project authorization, or will have a less environmentally damaging result.

4.3 COMPLIANCE WITH APPLICABLE STATE WATER QUALITY STANDARDS

The proposed project will comply with State of California water quality standards promulgated by the State Water Resources Board and the Los Angeles Regional Water Quality Control Board.

4.4 COMPLIANCE WITH APPLICABLE TOXIC EFFLUENT STANDARD OR PROHIBITION UNDER SECTION 307 OF THE CLEAN WATER ACT

The proposed project will comply with Section 307 of the Clean Water Act. Materials with elevated contaminant levels that are inappropriate for disposal in-bay/water or at an ocean disposal site will be placed in a Confined Disposal Facility or approved upland site.

4.5 COMPLIANCE WITH THE ENDANGERED SPECIES ACT OF 1973

Formal consultation is being carried out with the U.S. Fish and Wildlife Service, and measures/actions protective of endangered species have been incorporated into the project in conformance with previous projects in the Harbor. Based on this, the proposed project will comply with the Endangered Species Act.

4.6 COMPLIANCE WITH SPECIFIED PROTECTION MEASURES FOR MARINE SANCTUARIES DESIGNATED BY THE MARINE PROTECTION RESEARCH AND SANCTUARIES ACT OF 1972

No sanctuaries as designated by the marine Protection, Research and Sanctuaries Act of 1972 will be affected by this project.

4.7 EVALUATION OF EXTENT OF DEGRADATION OF THE WATERS OF THE UNITED STATES

No significant degradation of municipal or private water supplies, water quality parameters, special habitats, or marine resources is expected to occur. Any significant effects on Waters of the United States have been avoided or replaced in accordance with the Determinations provided above.

4.8 APPROPRIATE AND PRACTICABLE STEPS TAKEN TO MINIMIZE POTENTIAL ADVERSE IMPACTS OF THE DISCHARGE ON THE AQUATIC ECOSYSTEM

Specific environmental commitments have been provided in the EIS/EIR and in the Determinations provided above. These include adherence to waste discharge requirements including appropriate monitoring, and appropriate disposal of any contaminated sediment.

4.9 COMPLIANCE OF THE PROPOSED DISPOSAL SITE FOR THE DISCHARGE OF DREDGED MATERIAL

On the basis of the Guidelines, the disposal sites for discharge of dredged or fill material comply with Section 404(b)(1) guidelines, with the inclusion of appropriate measures/actions to minimize pollution or adverse effects on the aquatic ecosystem.

5.0 REFERENCES

Boyle Engineering Corporation. 1982. *Sediment Source Analysis and sediment Delivery Analysis*. Task II-A, II-C, and II-D.

Phillips, R. C. 1988. Keynote Address: General Ecology of Eelgrass with Special Emphasis on Restoration and Management. In K. W. Merkel and R. S. Hoffman ed. *Proceedings of the California Eelgrass Symposium*. May 27 and 28, 1988, Chula Vista, CA.: 1-5.

USACE and USEPA (U. S. Army Corps of Engineers and U. S. Environmental Protection Agency). 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal, Testing Manual*.

APPENDIX H

ASSESSMENT OF ESSENTIAL FISH HABITAT

ESSENTIAL FISH HABITAT ASSESSMENT
UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT

This assessment of Essential Fish Habitat (EFH) for the Upper Newport Bay Ecosystem Restoration Project is being provided in conformance with the 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act (see *Federal Register* 62(244): December 19, 1997). The 1996 amendments to the Magnuson-Stevens Act set forth a number of new mandates for the National Marine Fisheries Service (NMFS), eight regional fishery management councils (Councils), and other federal agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NMFS, are required to delineate EFH for all managed species. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to the fisheries service's recommendations.

PROPOSED ACTION

The County of Orange in conjunction with the U.S. Army Corps of Engineers (USACE) is examining the feasibility of an ecosystem restoration project in Upper Newport Bay. A joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses the benefits and potential environmental impacts of a habitat restoration plan for Upper Newport Bay. Because sedimentation is the biggest existing and future problem responsible for habitat degradation within Newport Bay, the habitat restoration plan focuses on sediment management through the design of sedimentation basins within Upper Newport Bay. Other restoration measures that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

Project Objectives

A sediment management plan is needed to meet the primary ecosystem restoration study objectives:

- Restore, enhance, optimize, and maintain the ecological values for fish and wildlife, including sensitive communities in and around the Upper Newport Bay Ecological Reserve, to provide a diversity of use for resident and migratory species, and
- Restore, maintain, and manage a healthy and productive mix of habitat types including subtidal marine, intertidal mudflat, cordgrass dominated low salt marsh and pickleweed dominated mid-salt marsh.

Although the emphasis of the Upper Newport Bay Restoration Project is on developing a dredging program to remove sediment from Upper Bay waters, other restoration opportunities that will improve the quality of habitats in the Upper Bay are also addressed in this plan.

Description of the Project

The recommended plan includes the expansion and deepening of the Unit I/III basin and the Unit II basin to –20 feet (-6 m) MSL, with an approach channel between the two basins dredged to -14 feet (-4.2 m) MSL; a 100-foot wide approach channel below the Unit II basin to PCH Bridge, dredged to -14 feet MSL; the removal of the existing 4-acre tern island from the Unit I/III basin and reconstruction of the tern island in the Unit II basin adjacent to the western segment of the salt dike; and habitat restoration measures that include side channels around the small tern island adjacent to the Unit I/III basin, New Island, Middle Island and Shellmaker Island; the capping of the small tern island with clean sand; the removal of old dredge spoil and restoration of the Bullnose area adjacent to the Unit I/III basin, Northstar Beach and Shellmaker Island; the creation of a small channel on Shellmaker Island adjacent to the eastern edge of the restoration area; the segmenting of the main dike to decrease potential terrestrial disturbances; the restoration of eelgrass beds along the southwestern edge of Shellmaker Island; and, the addition of education kiosks along Back Bay Drive and by the interpretive center.

PROJECT ALTERNATIVES

Sediment Control Alternatives. Table 1 highlights the key differences among the four sediment control alternatives. Habitat restoration measures would be the same for all alternatives. Alternative 1, which maintains the footprint and depth of the recently completed Unit III basin, has the smallest footprint for the uppermost basin. Alternative 1 is the only alternative that would not relocate the northern least tern island to the main dike. Alternatives 4 and 5 have the largest footprints for the uppermost basin. These alternatives would dredge all of the mudflats in the upper basin area with the exception of an approximately 100-ft. (30 m) band around the shore of the basin and the remaining least tern island. Although Alternatives 4 and 5 have the same upper basin footprint, they differ in basin depth. In Alternative 4, the uppermost basin would be deepened to -20 ft. (-6 m) MSL. In Alternative 5, the upper basin would be maintained at a depth of -14 ft. (-4.2 m) MSL. Alternative 6 would have a slightly smaller upper basin footprint than Alternatives 4 and 5. In Alternative 6, the mudflats in the northeast corner would be retained. Under Alternative 6, the upper basin would have a depth of -20 ft. (-6 m) MSL. All four alternatives would maintain the channel between the two basins at its current depth of -14 ft. (-4.2 m) MSL.

The four alternatives differ in the configuration of the Unit II basin. Alternative 1 restores the footprint and depth (-14 ft. MSL) of the Unit II basin created in the 1988 dredging project. Alternative 4 creates the largest footprint for the Unit II basin by expanding the 1988 footprint to the south and west. The basin in Alternative 4 would have a depth of -20 ft. (-6 m) MSL. Alternative 5 does not restore the Unit II basin at all but only maintains the current dredge/barge access channel through the basin. Alternative 6 expands the original Unit II basin footprint but not as extensively as Alternative 4. In Alternative 6, the footprint is expanded to the west but not to the south. In Alternative 6, the basin is deepened to -20 ft. (-6 m) MSL. Alternatives 4, 5 and 6 would relocate the northern tern island to the main dike.

Dredging Alternatives

Large Clamshell Dredge. Under the clamshell dredge alternative, dredging would be conducted from a floating barge by a crane equipped with a 5 cubic yards (cy) (3.8 cubic meters [cu m]) grab bucket or by a CAT 245 backhoe with a 5 cy (3.8 cu m) bucket. The grab bucket would be lowered to the bottom where its jaws are closed over a plug of sediment. The grab would be raised out of the water, and the sediment deposited into a disposal scow with 1,500 cy (1,147.5 cu m) capacity. The production rate is estimated to be about 3,000 cy (2,295 cu m) per day. For Alternative 6, which would dredge a deep basin footprint, the clamshell dredge would be more efficient because less time would be expended moving the dredge. For Alternative 6, the production rate is estimated to be 4,000 cy (3,060 cu m) per day. The clamshell dredging method was used successfully for the 1987 to 1988 Unit I/II project and the recent Unit III project. A small tugboat would transport and hold an empty disposal scow near the dredge as another scow is filled while secured alongside the dredge barge. The filled scow would be

Table 1
Key Differences Among Sediment Control Alternatives

Alternative	Uppermost Basin	Unit II Basin	Least Tern Islands
1	Unit III basin footprint and depth (-14 ft. MSL), creates channel between tern islands.	Original Unit II footprint (-14 ft. MSL) restores side channel around New Island.	Unchanged
4	Expands basin footprint to include all but an approximately 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -20 ft. MSL, creates channel between hot dog island and shore.	Expands Unit II basin to south and west, deepens basin to -20 ft. MSL, restores side channel around New Island.	Relocates northern least tern island to main dike.
5	Expands basin footprint to include all but approximately a 100-ft. mudflat perimeter around shoreline and northern perimeter of "hot dog" island, basin -14 ft. MSL, creates channel between hot dog island and shore.	No restoration or expansion of Unit II basin, only dredging in Unit II basin is -14 ft. MSL barge access channel through the basin and maintenance access channel to tern island.	Relocates northern least tern island to main dike.
6	Deepens basin to -20 ft. MSL, expands Unit III basin footprint but retains mudflats in northeast corner, creates channel between hot dog island and shore.	Expands Unit II basin to the west, deepens basin to -20 ft. MSL and restores side channel around New Island.	Relocates northern least tern island to main dike.

pushed by the tug to a barge marshalling area adjacent to the south end of Shellmaker Island. The full scow would be exchanged for an empty one for return to the dredge site in the Upper Bay. The filled scow would be pushed by ocean-going tug out of Newport Harbor to the ocean disposal site at LA-3. The round trip travel time to and from the LA-3 ocean disposal site is 4 hours. Approximately 3 round trips to the disposal site would be made per day; each of the three scows would thus make one trip per day. Dredge operations would be conducted 24 hours per day, 6 days per week. A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every two days. A quality control survey boat would be onsite during all dredging operations.

Equipment would be refueled every 2 to 3 days from a fuel barge maintained at Shellmaker Island. The dredging contractor would maintain an office with 2 trailers accommodating approximately 7 persons on Shellmaker Island. Approximately 9,000 square feet (sq ft) (810 square meters [sq m]) on Shellmaker Island would be needed for equipment storage. To provide access for the dredge and barge, the channel between the Unit II basin and PCH Bridge would need to be maintained at -14 ft. (-4.2 m) MSL.

The advantage of the clamshell dredging method is that the dredged sediments placed within the disposal scow contain only incidental quantities of water. Thus, as soon as a scow is filled, it can depart immediately for the ocean disposal site fully loaded with dredged material. The primary disadvantage of the clamshell dredging method is that a relatively deep draft channel is required to allow free movement of the barges. In 1987 and in 1998-99, the operational depth that was specified and achieved was -14 ft. (-4.2 m) MSL. To allow passage of the clamshell dredge equipment and scows to the Unit II basin site, a channel with a width of 100 ft. (30 m) and bottom elevation of -14 ft. (-4.2 m) MSL was dredged from just south of the PCH Bridge to the Unit II basin, a total distance of 2.4 miles (3.8 km) necessitating additional dredging requirements of about 400,000 cy (306,000 cu m).

Small Hydraulic Dredge. Under this alternative, the dredging operations would be conducted using a floating hydraulic dredge of modest size. The small, lightweight, self-propelled dredge could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which would then be pumped through a 12-inch pipeline to a disposal scow located at Shellmaker Island. The pipeline would cross the marsh in both the Unit I/III and Unit II basin areas. Three booster pumps would be located along Back Bay Drive. The size of each booster pump would be about 400 horsepower (hp). The pumps may be either diesel or electric powered. The disposal scows would be filled adjacent to the south end of Shellmaker Island. The rate of solids delivery through a 12-inch pipeline from the small dredge to the scow barges would be about 150 cy/hour (hr) (115 cu m/hr), or 3,000 cy (2,295 cu m) per 20-hour workday. The dredge would operate 20 hours per day, 6 days per week.

Because dredged material would be mixed with water for hydraulic transport through the pipeline under this alternative, solid content in the slurry mixture would be limited to about 20 percent. To avoid making approximately 5 times as many trips to the ocean disposal site as would be required under the clamshell dredge alternative, water would be removed from the disposal scow prior to leaving the dock for the ocean disposal site. This operation requires a manifold to allow partial filling of each scow barge while the sediment within the partially filled barge settles. A combination of barges would be used so that the dredge pipe discharge can alternately fill a barge and then be diverted to another barge to allow sediment settling and water decanting. Through progressive filling, settling, and decanting, the sediment content in each barge can be maximized. A total of three dump scows (1,500 cy capacity) would be used to allow continuous operations. Additives that can be discharged into the filling barge in order to reduce sediment-settling time are being investigated. A large water pump would be used to decant the excess water at Shellmaker Island. Disposal scows would be filled with about 1,000 cy (765 cu m) of the consolidated dredge material and transported by tugboat to the LA-3 disposal site where the material would be discharged. There would be one four-hour round trip to LA-3 per day. The single trip has a tug towing all three scows. Dredging would cease during the four-hour round trip.

The hydraulic dredge, which requires substantially less fuel than the clamshell dredge, would be fueled by truck at Jamboree Road. Like disposal scow trips, fuel barge trips along the Upper Bay Channel would be avoided.

Several small hydraulic dredges are available. The Model J-30-32 Wide Hull Dredge manufactured by W & S Development was picked for this analysis. If another small hydraulic dredge were ultimately used, the specifications might be slightly different. This small dredge alternative has a number of advantages relative to the more conventional clamshell dredge methods. The advantages include the following:

- Low cost (procurement, operations, maintenance);
- Lower level of disturbance in the marsh areas;
- Lack of need for scow barges to transit into the Upper Bay;

- Lack of need to dredge access channel for scow barge access in Upper Bay; and
- Ability to perform fine dredge cuts and maneuver in narrow channels.

The disadvantage of hydraulic dredging is the low solids content of the material and the need to decant excess water to avoid an excessive number of disposal scow trips to the ocean disposal site.

Comparison of Dredging Volumes, Schedule, and Maintenance Requirements. For both the large ocean-going dredge and the small land-based dredge, volumes and dredging frequencies have been estimated for both the Initial and Maintenance events for each of the sediment control alternatives. Table 2 shows the initial dredging volumes and time required to complete the initial dredging. For each alternative, the volumes to be removed are presented for the Unit I/III Basin, Unit II Basin, Channel between Units I and II, the area bordering the Unit II Basin, and the Access Channel Dredging (necessary only for the large clamshell dredge). In addition, the expected duration of dredging is estimated assuming an average output of 3,000 cy per day, a six-day work week, 24-hour operations each day, and a 90 percent efficiency when working (i.e., one day in ten work days would create no dredge output). For the clamshell dredge, Alternative 6 is assumed to have a production rate of 4,000 cy per day.

Table 2 shows the maintenance dredging requirements for each of the sediment control alternatives for the clamshell dredge method and the small hydraulic dredge method. The timeframes are based on the assumption of 164,000 cy (125,460 cu m) average annual inflow of sediment to the Bay. The earliest dredging year for any of the criteria is selected as the representative maintenance interval. Intervals for maintenance dredging of study alternatives were determined by using the following three criteria in the order shown:

1. Maintenance dredging will be initiated if the cumulative percent of sediments trapped in the basins drop below 50 percent. Conversely, if more than 50 percent of cumulative sediments deposit beyond the basin(s), maintenance dredging will be required.

2. If greater than 30 percent of cumulative sediment deposits below PCH Bridge, maintenance dredging will be initiated.

3. Sediment accumulation will not be allowed to reach levels where there is a net change in habitat types, such as open water transitioning to mudflat. Analysis of this criterion is limited to Segments 1 and 2 at this time, and is based on the storage capacity of the basins below -3 ft. MSL.

Maintenance would be triggered if any of the criteria were exceeded. The maintenance frequency is based on long-term average sediment inputs and was estimated for the purposes of comparing the relative frequency of dredging for the alternatives. Because sediment input in the San Diego Creek watershed is highly variable, the actual requirements for maintenance dredging may vary. For example, a series of wet years such as occurred in the 1990s, might make maintenance dredging necessary more frequently than shown in Table 2. On the other hand a series of dry years like the mid to late 1980s might allow the time between maintenance dredging to be extended. Table 3 shows that with the deeper uppermost basin (20 ft. [6 m]), as proposed for Alternatives 4 and 6, the time between maintenance dredging is more than double that for Alternatives 1 and 5 in which the upper most basin is 14 ft. (4.2 m) deep. Table 4 shows the total number of dredging days predicted for each alternative in the next 50 years.

Table 2

Upper Newport Bay

Initial Dredging Requirements

(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge										
	Dredge Area							Time Required		Start
Alternative	**Unit I/III**	**Unit II**	**Channel Between Units I & II**	**Channel Bordering Unit II**	**Dredge Access Channel**	**Other Channels***	**Total**	**Work Days**	**Months****	**Relative to 1999**
No Project	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	100,000	100,000	**828,000**	276	11.8	Year 4
4	1,118,000	1,297,000	20,000	8,000	75,000	100,000	**2,618,000**	873	37.3	Year 4
5	616,000	77,000	20,000	8,000	75,000	100,000	**896,000**	299	12.8	Year 4
6	958,000	866,000	20,000	8,000	75,000	100,000	**2,027,000**	507	21.7	Year 4

Table 2 (cont'd)

Dredge Method: Small, Land-based Hydraulic Dredge										
	Dredge Area							Time Required		Start
Alternative	**Unit I/III**	**Unit II**	**Channel Between Units I & II**	**Channel Bordering Unit II**	**Dredge Access Channel**	**Other Channels***	**Total**	**Work Days**	**Months****	**Relative to 1999**
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	219,000	382,000	19,000	8,000	-	100,000	**728,000**	243	10.4	Year 4
4	1,118,000	1,297,000	20,000	8,000	-	100,000	**2,543,000**	848	36.2	Year 4
5	616,000	77,000	20,000	8,000	-	100,000	**821,000**	274	11.7	Year 4
6	958,000	866,000	20,000	8,000	-	100,000	**1,952,000**	651	27.8	Year 4

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.

*** Other Channels include: East Side, New Island (42,000 cy), West Side, Middle Island (24,000 cy), East Side, Shellmaker Island (34,000 cy).**

**** Work Days are converted to Months by assuming 6 workdays per week with 90% efficiency.**

Table 3

Upper Newport Bay

Maintenance Dredging Requirements

(Volumes in Cubic Yards)

Dredge Method: Large, Ocean-going Clamshell Dredge									
	Dredge Area						Time Required		
Alternative	**Unit I/III**	**Unit II**	**Channel Between Units I & II**	**Channel Bordering Unit II**	**Dredge Access Channel**	**Total**	**Work Days**	**Months****	**Maintenance Frequency Years**
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	200,000	**861,000**	287	12.3	7
4	1,118,000	814,000	52,000	28,000	300,000	**2,312,000**	771	32.9	24
5	616,000	131,000	27,000	14,000	200,000	**988,000**	329	14.1	10
6	958,000	554,000	53,000	37,000	300,000	**1,902,000**	476	20.3	21

Table 3 (cont'd)

Dredge Method: Small, Land-based Hydraulic Dredge									
	Dredge Area						Time Required		
Alternative	Unit I/III	Unit II	Channel Between Units I & II	Channel Bordering Unit II	Dredge Access Channel	Total	Work Days	Months**	Maintenance Frequency Years
No Project	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	364,000	232,000	36,000	29,000	-	**661,000**	220	9.4	7
4	1,118,000	814,000	52,000	28,000	-	**2,012,000**	671	28.7	24
5	616,000	131,000	27,000	14,000	-	**788,000**	263	11.2	10
6	958,000	554,000	53,000	37,000	-	**1,602,000**	534	22.8	21

Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day given due to greater basin depths.

**** Work Days are converted to Months by assuming 6 work days per week with 90% efficiency.**

Table 4

Total Dredge Days

50-Year Project Life

Dredge Method: Clamshell Dredge						
		Maintenance				
	Initial	Interval, Years	Cycles	Days/Cycle	Days	Total Days
Alternative 1	276	7	7	287	2,009	2,285
Alternative 4	873	24	2	771	1,542	2,415
Alternative 5	299	10	5	330	1,650	1,949
Alternative 6	507	21	2	476	952	1,459
Dredge Method: Small, Hydraulic Dredge						
		Maintenance				
	Initial	**Interval, Years**	**Cycles**	**Days/Cycle**	**Days**	**Total Days**
Alternative 1	243	7	7	221	1,547	1,790
Alternative 4	848	24	2	671	1,342	2,190
Alternative 5	274	10	5	263	1,315	1,589
Alternative 6	651	21	2	534	1,068	1,719
Dredge productivity is 3,000 cy/day for Alts. 1, 4, and 5. For Alt.6, the clamshell dredge rate is 4,000 cy/day due to greater basin depths.						

Schedule

Project construction is scheduled to begin in the fall of 2003. Duration varies depending both on the sediment control alternative and the type of dredge equipment selected. See Table 2 for anticipated durations. All construction activities are scheduled to avoid impacts to sensitive species during nesting seasons. The primary species of concern are the California least terns and clapper rails. A field biologist will monitor construction activities to ensure that dredging operations do not disturb sensitive species during nesting seasons, and sensitive marsh habitats throughout the year.

EFFECTS OF THE PROPOSED ACTION ON EFH

Historic and Existing Conditions. Historical data on fishes are not available for detailed comparison, but long-term habitat changes have undoubtedly changed the character of fish communities in the Bay. MEC (1997) used percent of total catch by species to compare the major fisheries studies conducted in Upper Newport Bay since 1980. This historical comparison indicates that over 40 fish species have been collected and utilize some part of UNB (Allen 1988, Horn and Allen 1981). In general, two species (deepbody anchovy and topsmelt) were numerically dominant among all surveys. Deepbody anchovy and topsmelt accounted for over 86% of the catch in April and September 1997. Topsmelt was the overwhelming dominant in the 1978 through 1980 surveys and in the 1986-87 surveys, and other species including deepbody anchovy, California killifish, and gobies were moderately abundant. One notable difference in the fish assemblage of earlier years was the occurrence of freshwater species such as mosquitofish, striped bass, bluegill, black bullhead, and threadfin shad. At least some of the freshwater species; e.g., striped bass, were released in the Bay (Allen 1988). Marine subtidal habitats have diminished in acreage and have been increasingly subjected to freshwater influence, sedimentation, and disturbance associated with dredging and filling of the Bay. As a result of harbor development and other disturbances, subtidal habitats have lost productive eelgrass beds.

At present, Newport Bay (including Upper Newport Bay) supports a diverse assemblage of pelagic and demersal (bottom-orientated) fishes that occupy several different habitat types, including marsh channels and pools, mudflats, shallow subtidal channels and slopes, deeper channels, and marinas. Although species composition in these habitats can be significantly different, a general description of fishes of the Bay is provided below, with habitat notes where appropriate.

Fish abundance, number of species, and biomass in Upper Newport Bay are highly variable due to changes in temperature, salinity, and productivity (Horn and Allen 1981, Allen 1988, CDFG 1989). In general, the lowest abundances occur in late fall and winter when transient species such as California halibut leave the Bay for more coastal and offshore locations (USACE 1993). In contrast, the greatest number of species and abundances usually occur in spring and summer when these same transient species re-enter the Bay, adding to the resident species of the fish community. Thus, although general species composition patterns are generally predictable, abundance and biomass patterns are less consistent and more difficult to accurately predict.

At least 78 fish species have been identified from previous studies of UNB (Hardy 1970; Allen 1976; MBC and SCCWRP 1980; Horn and Allen 1981; Allen 1988). More recent studies (MBC 1997; MEC 1997) collected a total of 20 and 14 fish species, respectively at sites throughout the Bay using beach and purse seines, otter trawls, and beam trawls, with beach and purse seines collecting the greatest number of individuals and species (MEC 1997). The Bay also is important habitat not only for its resident species, but as a spawning ground for at least 10 species, including California halibut (*Paralichthys californicus*), yellowfin croaker (*Umbrina roncador*), white seabass (*Atractoscion nobilis*), and barred sand bass (*Paralabrax nebulifer*), and a nursery ground for the juveniles of 33 fish species (White 1977).

Pelagic assemblages have consistently been dominated by a few species, including topsmelt (*Antherinops affinis*), slough anchovy (*Anchoa compressa*), and deepbody anchovy (*A. delicatissima*). Topsmelt have been the most abundant fish collected by seines in 1974-75 (Allen 1976), in 1978 (Horn and Allen 1981), and in 1986-87 (Allen 1988). Recent studies by MBC (1997) and MEC (1997) using beach and purse seines indicated deepbody anchovy and topsmelt were the dominant pelagic fishes in several areas of Upper Newport Bay. Moreover, topsmelt are one of the most commonly collected pelagic fishes in bays and harbors in southern California (MBC 1997).

Common bottom-dwelling or demersal fishes in Upper Newport Bay include California halibut, diamond turbot (*Hypsopsetta guttulata*), yellowfin goby (*Acanthogobius flavimanus*), and California killifish (*Fundulus parvipinnis*). Pipefishes (*Sygnathus spp.*) also are commonly collected in many areas of UNB, especially at vegetated sites. Recent beam trawl and beach seine surveys by MBC (1997) and MEC (1997) collected 16 and 11 demersal fish species, respectively. California killifish and yellowfin goby were the most abundant species collected in all samples. Other commonly collected demersal fish species included arrow goby (*Clevlandia ios*), bay goby (*Lepidogobius lepidus*), spotted turbot (*Pleuronichthys ritteri*), staghorn sculpin (*Leptocottus armatus*), California halibut (*Paralichthys californicus*), and longjaw mudsucker (*Gillichthys mirabilis*) (MBC 1997; MEC 1997).

A high diversity of fish species are found in marina and boat dock areas of Newport Bay (USACE 1993), where fishes utilize hard substrates (i.e., pilings) for cover. Common marina fishes include pile perch (*Damalichthys vacca*), pipefishes (*Syngnathidae spp.*), kelpfishes (*Heterostichus spp.*), opaleye (*Girella nigricans*), halfmoon (*Medialuna californiensis*), and kelp bass (*Paralabrax clathratus*).

Future Without-Project Conditions (50 Years). Under the future without-project conditions, the quantity and quality of habitats for most fish species in Upper Newport Bay will decline. According to the sediment model, within 20 years, approximately 81.2 acres of subtidal habitat in the Upper Bay will be converted to mudflat. By Year 50, approximately 173.9 acres of subtidal habitat will be lost. Thus, 81 percent of the open water habitat in the Upper Bay will be lost within the next 50 years. The increased sediment and freshwater influence would result in a degradation of the quality of the Upper Bay subtidal habitat for marine fishes. The increased freshwater influence predicted by the salinity model (USACE 1998) would be expected to reduce the populations of many fish species in the Upper Bay. Allen (1988) found that the distribution of most marine and estuarine fish species in Upper Newport Bay was positively correlated with salinity. The increased freshwater influence under the without-project future conditions also suggests that contaminants and sediments in San Diego Creek waters will degrade water quality for fishes. The smaller body of open water and reduced tidal influence under future without-project conditions would also lead to more extreme fluctuations in temperatures which would reduce the populations of sensitive fish species.

Under the future without-project conditions, the modified HEP analysis (see Appendix A of the Draft EIS/EIR for details) predicted substantial losses in HUs for California halibut, the indicator species for benthic fishes, and deepbody anchovy, the indicator species for water column fishes. Within 20 years, the HEP model predicted that halibut would suffer a 23 percent loss of HUs and deepbody anchovy a 25 percent loss. By Year 50, the percent loss of HUs was 52 percent for halibut and 51 percent for anchovy.

Construction. Initial dredging to construct the basins in Alternative 6 would require 21.7 months if a clamshell dredge were used and 27.8 months if a hydraulic dredge were used.

Clamshell Dredge. Dredging to remove sediment from the Unit III and Unit II basins and the various channels would destroy most of the benthic invertebrates in the sediments that would be dredged. Some individuals of mobile species such as crabs may escape the dredge. In addition to organisms directly destroyed by dredging, invertebrates living adjacent to the dredging area may suffer lethal or sublethal effects from burial and turbidity from sediments disturbed by the dredge. Once dredging in an area is ended, recolonization would be expected to occur rapidly. The Upper Newport Bay benthic invertebrate community is dominated by opportunistic species, many of them hardy species that have been introduced to southern California from other parts of the world (MBC and SCCWRP 1980). Therefore, it is expected that within a year the community composition would be similar to the pre-dredging condition. However, some species such as large clams are slow growing and recruit irregularly. Some of these species may take many years to re-establish. Therefore, re-establishment to a fully diverse benthic community may take as long as 10 years.

Planktonic organisms would be subjected to impacts from the turbidity plumes that would be generated by the resuspension of sediments during dredging. Turbidity can impact plankton populations in a variety of ways including lowering the light available for phytoplankton photosynthesis and by clogging the filter feeding mechanisms of zooplankton. Turbidity curtains would be placed around the dredge and disposal scow to contain turbidity. Therefore, the impacts of turbidity would be temporary and localized. Turbidity impacts on biological resources would be adverse but insignificant.

Most fishes would leave the dredging area as soon as the dredge started working. The dredge may kill individuals of some small, burrowing species such as gobies. Fishes in areas adjacent to the dredge could be impacted by turbidity. Fishes exposed to suspended sediments in the laboratory have been shown to suffer mortality as well as sublethal signs of stress (Soule and Oguri 1976; O'Conner et al. 1977). In addition to the turbidity, the noise and disturbance associated with the dredging would be expected to cause fishes to avoid the dredging area. Fish surveys following dredging projects in Marina del Rey have recorded an unusually low number of fishes right after dredging ended, but fish abundances returned to normal within months (Soule et al. 1993). Therefore, project dredging would be expected to cause a temporary drop in fish use of the dredging areas but the fish community would rapidly re-establish once dredging was completed in an area. Impacts of dredging on fishes would be adverse but insignificant.

Hydraulic Dredge. The impacts of using a small hydraulic dredge would be similar to the impacts of using a clamshell dredge but many of the potential impacts would be reduced in magnitude. The hydraulic dredge would be expected to create less turbidity at the dredging site than the clamshell dredge. Because the dredged material would be sucked into a pipe rather than lifted to the surface, little surface turbidity would be expected. Dislodging of the sediments by the cutterhead would create a plume near the sea bottom. This plume would be contained by a turbidity curtain. The impacts of dredging and associated turbidity on benthic invertebrates would be the same as for the clamshell dredge. However, because there would be less turbidity in the upper water column, turbidity impacts on plankton and water column fishes would be less than for the clamshell dredge. Birds would probably still avoid the area contained by the turbidity curtain. Therefore, disturbance to birds would be similar to the clamshell dredge alternative. No significant turbidity would be created by overflow from the disposal scow located at Shellmaker Island because a flocculating agent would be used to clarify the overflow water. This flocculating agent would not be discharged at concentrations that could affect aquatic life.

Because it would not be necessary to deepen the main channel between the PCH Bridge and the Unit II basin to provide an access channel for the dredge, less area would be impacted by dredging for the hydraulic dredge alternative compared to the clamshell dredging alternative. Thus, benthic invertebrates, plankton, fishes and birds would not be disturbed by any dredging activities below the Unit II basin.

Post Construction. Like the other sediment control alternatives, Alternative 6 would prevent the loss of marine open water habitat and the degradation of water quality that would occur under the No Project Alternative. The significant losses in biological diversity, California least tern foraging habitat, and net habitat value of the Upper Newport Bay Ecological Reserve described for the No Project Alternative would not occur.

Alternative 6 would increase the amount of marine open water habitat by 19 percent and decrease the amount of intertidal mudflat by 17 percent compared to the Year 0 condition. The loss of 17 percent of the intertidal mudflat in the Upper Bay represents a substantial decrease in this habitat. It is not known at what critical threshold loss of mudflat would result in a decrease in the population of any of the bird species that depend on the habitat. Because the enhanced water quality under Alternative 6 would improve the quality of intertidal mudflat habitat and the diversity of the food base for shorebirds and dabbling ducks, loss of mudflats under Alternative 6 would be partially compensated by an improved forage base in the mudflats that remain. Therefore, loss of mudflat habitat under Alternative 6 is considered an adverse but insignificant impact. An increase in marine open water habitat of 19 percent would be a substantial beneficial impact for fishes, aquatic invertebrates, and bird species that depend on open water habitat.

The increased basin footprint under Alternative 6 and deeper basins would result in an increase in tidal prism and a substantial improvement in water quality compared to the existing condition. The increased marine influence and decrease in influence of San Diego Creek would be expected to support a relatively diverse fish and invertebrate fauna in both the Unit II and Unit III basins. Demersal fishes and benthic invertebrates might find a refuge from freshwater at the bottom of the deep Alternative 6 basins during smaller storms. During major storm events the entire Upper Bay would be expected to go nearly fresh.

SUMMARY

Direct impacts to fish in Upper Newport Bay will be minor and short-term and are expected to be more than offset by habitat improvements resulting from the proposed project.

The proposed project is located within an area designated as EFH for the Pacific Groundfish Fishery Management Plan (NMFS 1998). Of the 81 species, which are federally managed under this plan, none appear to occur in Upper Newport Bay.

We have determined therefore that the proposed pilot project will not result in any significant, adverse impacts to any species on the Fishery Management Plans or their associated habitat.

PROPOSED MITIGATION

Impacts to water quality associated with dredging activities are considered temporary and would be minimized through implementation of requirements associated with established Waste Discharge Requirements/401 Certification of the Regional Water Quality Control Board. The proposed use of turbidity curtains will minimize turbidity impacts throughout Newport Bay during dredging. No mitigation measures are proposed.

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APPENDIX I

RESPONSE TO COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Larry Smith (CESPL-PD-RN)
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box532711
Los Angeles, CA 90053-2325

Dear Mr. Smith:

The U.S. Environmental Protection Agency (EPA) has reviewed the Upper Newport Bay Ecosystem Restoration Feasibility Study Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS). Our comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementation Regulations at 40 CFR 1500-1508, and Clean Air Act Section 309.

The DEIS evaluates alternatives for developing a long-term management plan to control sediment deposition in Upper Newport Bay to preserve the health of its habitats. In addition to the No Action Alternative, four sediment control alternatives are evaluated. Various dredging and habitat restoration alternatives are also considered for implementation with the sediment control alternatives.

We have rated this DEIS as EC-2 – "Environmental Concerns-Insufficient Information (see enclosed "Summary of Rating Definitions and Follow Up Action"). We are concerned that the Corps of Engineers (COE) did not evaluate some alternatives that would result in a more self-sustaining, naturalist environment, such as alternatives involving reduced dredging and controlling sediment before reaching Upper Newport Bay, as well as beneficial re-use of dredged material. 1-1 We are also concerned that the project would result in significant impacts to air quality in the South Coast Air Quality Management District, but a conformity determination has not been made. We recommend that additional information be provided in the Final Environmental Impact Statement (FEIS) regarding other reasonable project alternatives, including disposal alternatives; baseline assumptions and evaluation criteria; and conformity with the State Implementation Plan. 1-2

We appreciate the opportunity to review this DEIS. Please send two copies of the FEIS to this office when it is officially filed with our Washington, D.C., office.

If you have any questions, please call me at (415) 744-1584, or call Jeanne Geselbracht at (415) 744-1576.

Sincerely,

David J. Farrel, Chief
Federal Activities Office

#003191
Enclosures

cc: Connie Day, South Coast AQMD
Geoffrey Smith, Southern California Association of Governments

Baseline Assumptions

The DEIS/Feasibility Study does an excellent job of describing the existing biotic resources and inventorying the different habitats in the project area. It is unclear, however, whether the assumptions used for the 50-year projection of the No Action are accurate. In particular, the assumption that sediment volumes to the Bay during storm events will remain constant over the next 50 years (Feasibility Study, p. 2-16) is unsubstantiated. Changes in sediment characteristics have occurred in the watershed due to increases in development and are expected to change due to preparation of a TMDL. It may be more accurate to have a range of sediment volumes anticipated (a sensitivity analysis). What was the sediment delivery 30 years ago and how has that changed over time? The FEIS should address this. 1-3

Purpose and Need

The DEIS examines a range of criteria for evaluating different alternatives. One of the constraints includes a limit of 10% change of any habitat type in the ecological reserve. In essence, this means that to meet the criteria any project must maintain the status quo. However, there is no justification explaining why the status quo (existing acreage of habitat types) is preferable. Typically, such a limit would be supported by a full habitat analysis examining the historical range of habitat types, identification of the habitat types suffering the most significant loss and/or gain and the need for future restoration efforts based on the percentage change. For example, the San Diego Creek watershed has lost a significant amount of its freshwater wetlands due to urbanization. This could be a justification for allowing a conversion from tidal to fresh (or brackish) marsh. However, these issues were not fully discussed and the alternatives were unnecessarily constrained as a result. The FEIS should include a historical habitat analysis and re-evaluate the habitat needs upon which selection among the alternatives would be based. 1-4

The overall purpose of the project is ecosystem restoration of Upper Newport Bay. According to the Feasibility Study (p. 1-2),

> "The purpose of Civil Works ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. Ecosystem restoration efforts involve a comprehensive examination of the problems contributing to the system degradation and the development of alternative means for their solution. The intent of restoration is to partially and/or fully reestablish the attributes of a naturalistic, functioning and self-regulating system."

However, except for the no action alternative, the alternatives evaluated in the DEIS are not self-regulating or naturalistic. The action alternatives all assume the sediment delivery system will need to be regularly managed (through sediment basins and dredging) and that the acreage of each habitat type (open water, mudflat, salt marsh, etc.) is a number that will be highly regulated 1-5 and pre-determined. As discussed below, there appear to be other options that were not considered in the document that would better meet the restoration goal.

Alternatives Analysis

The following two alternatives were not examined in the DEIS and appear to have environmental merit and could meet the overall project purpose. We recommend they be considered more fully in the FEIS or additional justification provided for why they are not reasonable.

Minimal Dredging Alternative: The EIS examines what appears to be a worst case scenario for Upper Newport Bay if no action is taken. We believe a non-dredging alternative worth examining would include restoration efforts, pollution prevention, exotic species control, and other such measures that would offset the impacts of not dredging. These types of adaptive management approaches were not examined. Additionally, would it be possible to create smaller slough channels throughout the marsh as sediment was filling in to create increased tidal circulation? Could some of the funding used for dredging be used to purchase some of the developed areas and restore them to open water or some other habitat? While this option would not meet the 10% criteria (which, as discussed above, appears arbitrary) it would meet the overall purpose of a more naturalistic, self-sustaining restoration project. Also, while allowing increased sedimentation in the Bay might impact recreational boating, this is a secondary objective and should be evaluated only after the overall environmental benefits have been considered and fully realized. 1-6

Out-of-Bay Basin: EPA appreciates that the emphasis of the restoration project in Newport Bay and that it would be too difficult to evaluate and control all of the watershed activities that are degrading Upper Newport Bay. However, one obvious alternative that was not considered is to try to trap the sediment upstream (and outside) of the Bay. In particular, would it be possible to expand the San Diego Creek basin? Would it be possible to identify land currently in upland areas and convert that to a sediment detention basin? Could portions of Peters Canyon Wash, a major tributary to San Diego Creek, have detention basins? EPA has several concerns with use of the 208 plan (water quality) to guide management of San Diego Creek watershed. The plan was done in the late 1970's and is more single objective (flood control) rather than multi-objective. The proposal to channelize most of the watershed and put detention basins in the foothills and Upper Newport Bay ignores natural sedimentation process and importance of in-stream vegetation. While EPA does not necessarily agree with the 208 Plan, we do acknowledge the importance of Newport Bay and the Plan's attempt to manage Newport Bay to protect its beneficial uses. Removing the sediment basins from the Bay proper would allow a greater area for restoration. This is particularly important given the scarcity of aquatic resources in Southern California. 1-7

EPA strongly recommends that COE and Orange County plan for beneficial re-use of their periodic large volumes of dredged material, to the maximum extent practicable. EPA will not approve ocean disposal for any material, at either LA-3 OR LA-2, if we believe there is a re-use option available and feasible. To this end, the FEIS should discuss a range of re-use options from beach nourishment (for predominantly sand material), to other possible habitat uses (aquatic or otherwise) or non-habitat uses for the finer-grained material (fill for other projects - especially projected new landfill creation at the Ports of Long Beach and LA - in addition to roadbeds, landfill daily cover, etc). Specifically, you should develop a long-term "Dredged Material Management Plan" for the proposed project and include it in the FEIS. 1-8

On page 5-13, the DEIS indicates that Alternative 6 provides a balance between sediment control and environmental restoration. However, it is unclear from the DEIS which dredging and habitat restoration alternatives are proposed for implementation with Sediment Control Alternative 6. The FEIS should clarify all of the components of the preferred alternative. 1-9

Marine Protection, Research and Sanctuaries Act

The proposed action alternatives for ecosystem restoration of Upper Newport Bay involve removal of accumulated sediments, with the dredging volumes for the various project alternatives ranging from 728,000 to 2,618,000 cubic yards of material. Over the anticipated 50 year life of the project, maintenance dredging operations, ranging from 661,000 to 2,312,000 cubic yards, would occur with a frequency of every 7 to 24 years. Total maintenance dredging volumes range from 3,204,000 to 6,022,000 cubic yards of materials. The DEIS anticipates the disposal of the project and maintenance dredged materials at the LA-3 ocean disposal site.

Dredged materials to be disposed of in ocean waters under the Marine Protection, Research and Sanctuaries Act (MPRSA) must be evaluated through the use of criteria provided at 40 CFR Parts 220-228. Testing guidance is provided in the joint EPA/Corps of Engineers manual Evaluation of Dredged Materials Proposed for Ocean Disposal. As noted in the DEIS (§3.3.3) earlier evaluations on materials dredged from Upper Newport Bay indicate that sediments accumulating in this portion of the bay tend to have low to moderate levels of contaminants of concern. These previous dredged materials were found to meet the regulatory evaluation criteria for sediment toxicity and to be suitable for ocean disposal.

While the prior evaluations of sediment quality are useful to anticipate the types and levels of contamination likely to be present in the current accumulated sediments proposed for dredging and disposal, direct evaluation of these materials – as well as of any subsequent maintenance dredging materials – will be necessary. As EPA will base its conclusions about the suitability of the proposed dredged materials for ocean disposal on these evaluations, we will work with the Corps of Engineers and the County of Orange to ensure that the dredged materials testing programs meet the MPRSA and testing manual requirements. 1-10

The DEIS considers ocean disposal of suitable dredged materials at the EPA approved LA3 site. The FEIS should acknowledge that the LA-3 ocean disposal site currently has an interim designation that will lapse January 1, 2003. While EPA and the Corps of Engineers are in the process of considering whether this site should have a permanent designation, it should be noted in the FEIS that the LA-3 site may not be available or that there might be restrictions or control measures imposed on disposal at this site that could limit its availability to accept dredged materials from Upper Newport Bay. The FEIS should include a summary of potential alternative disposal sites for these dredged materials. 1-11

The FEIS should also provide a substantive analysis of the impacts associated with using alternative disposal sites. If any of the alternatives would not be feasible for this project, the FEIS should discuss how that would affect the project overall. The FEIS should discuss the existing LA-2 disposal site, with respect not only to impact *on* the County (increased disposal costs due to increased haul distance to LA-2), but *by* the County as well. Impacts to air quality are especially important. In any case, the FEIS should note that the appropriate air quality conformity determination would have to be done based on the final disposal site chosen. Selection of a disposal site is not merely an ancillary issue to the overall alternatives analysis in the EIS; it can materially affect both the feasibility of the project and the overall degree of impacts - especially air quality. See our Air Quality comments below. 1-12

Air Quality

Under Section 176(c) of the Clean Air Act, no federal agency may approve or support in any way any activity that does not conform to an air quality implementation plan. The 1990 Clean Air Act Amendments further define conformity to mean that the activity will not "(i) cause or contribute to any new violation of any standard in any area; (ii) increase the frequency or severity of any existing violation of any standard in any area; or (iii) delay timely attainment of any standards or any required interim emission reductions or other milestones in any area."

The proposed project is located within the South Coast Air Quality Management District (AQMD), a non-attainment area for Nitrogen Dioxide (NOx) and an extreme non-attainment area for ozone. The Clean Air Act conformity regulations at 40 CFR 93.150 initially require a federal agency to determine if the estimated emissions from a project are above the de minimus levels stated in the regulations. For example, in an ozone extreme non-attainment area, that level is ten tons per year. If the projected emissions are below de minimus levels, the project is presumed to conform by law. It appears from the information presented in the DEIS that the estimated project emissions are above the de minimus level for ozone (as measured by NOx). The project's emissions, therefore, will be subject to the General Conformity Rule, and COE must make a conformity determination for the project using the criteria delineated in the regulation. We recommend that you coordinate with the Southern California Association of Governments (SCAG) and South Coast AQMD in order to ensure a positive conformity determination. If you have questions regarding conformity, you may call Doris Lo in Region 9 EPA's Air Division at (415) 744-1287, or Bob Moyer in Region 9 EPA's Office of Regional Council at (619) 584-2258. 1-13

Pursuant to 40 CFR 1502.16(h), the EIS must include a discussion of means to mitigate adverse environmental impacts. The FEIS should include the conformity determination and discuss what measures will be required to offset the impacts from project emissions. Any commitments COE 1-14 must make (such as purchasing offsets) in order to demonstrate conformity should be included in the FEIS and Record of Decision. For future projects, we recommend that COE issue the draft conformity determination concurrent with the DEIS so that any necessary modifications to the proposed project needed for conformity purposes can be addressed at the DEIS stage. In light of the omission of a draft conformity determination in this DEIS, we recommend that COE issue its draft conformity determination concurrent with the FEIS. In accordance with 40 CFR 93.156(b), the comment period for the draft conformity determination is 30 days. Running the FEIS and conformity determination comment periods concurrently would allow for the public to properly consider the air impacts and mitigation measures along with the rest of the project before the close of the FEIS comment period.

SUMMARY OF EPA RATING DEFINITIONS

This rating system was developed as a means to summarize EPA's level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the EIS.

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

ADEQUACY OF THE IMPACT STATEMENT

Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Letter #1: Response to the United States Environmental Protection Agency

1-1 A Corps and Orange County watershed feasibility study for the Newport Bay/San Diego Creek watershed will investigate, among other issues, measures to reduce sediment input to Newport Bay. However, even if additional upstream structural and non-structural sediment control measures are implemented, large volumes of more fine-grained sediments will be delivered to Newport Bay during major storm events. Therefore, the construction of in-bay basins are necessary to protect and preserve a healthy mix of open water, intertidal mudflat and marsh habitats within the bay. Previous dredging activities in the Upper Bay, including the recent Unit III dredging project (1999), indicate that the majority of the material to be dredged is not appropriate for beneficial re-use. However, the EIS/R describes the potential re-use of the coarse grained sand from the excavation and restoration activities associated with Shellmaker Island, Northstar Beach, and the Bullnose. This material could be used for re-capping Tern (hotdog) Island in the upper basin and to cap the new tern island constructed in the second basin.

1-2 The final EIS includes an air quality conformity analysis after discussions with SCAQMD. Additional information regarding changes made to the FEIS is included in the following comments.

1-3 Page 2-16 of the main report summarizes the assumptions used for the baseline conditions analysis, and includes reference to the use of the 25-year historic storm flow record for San Diego Creek. This record was repeated to form a 50-year future record. We concur that continued watershed changes will likely result in changes to sediment volumes. Page 2-48 describes the reasons why a decision was made to take a conservative approach and use the historical storm flow record. The complexity, and time and cost constraints associated with the numerical modeling required us to make several simplifying assumptions, including the use of an average annual storm inflow when comparing the modeling results of the alternatives, including the No Action plan. Figure 2.6 on page 2-26 of the main report shows what the sediment inflow was to the bay approximately 30 years ago, and the annual variations over a 25-year timeframe. No additional changes to the FEIS have been made to address this comment.

1-4 The constraint of limiting changes in habitat type to 10% of the post-Unit III dredging conditions was developed in consultation with the resource agencies. The constraint was based on the recognition that, whatever its historical configuration, the status-quo condition of Upper Newport Bay has great biological value. There was a reluctance to improve habitat values for some species at the expense of existing values for other species. The California Regional Water Quality Control Board and EPA approved Sediment TMDL establishes a much more stringent constraint specifying that sediment deposition shall not cause significant changes (no more than 1%) in the acreage of various habitat types in the Reserve (see CRWQCB letter), based on the Department of Fish and Game's management plan for the Reserve. Therefore, the current management plan and the basin plan also seem to justify why the status quo of existing habitat types is preferable.

1-5 The Corps does not consider the No Action alternative as a self-regulating or naturalistic option either. All of the alternatives, including the No Action plan, will require regular management of the deposited sediments. One of the most significant differences between the No Action and the other alternatives is the location of the dredging activities. For the No Action plan, the navigation channels in the Lower Bay and the lower portion of the Upper Bay will have to be dredged more frequently in order to maintain safe navigation, and some of the existing habitat types in the ecological reserve will significantly degrade. Many options were not deemed acceptable to the resource agencies, based on agency feedback, the management plan and the sediment TMDL (see comment 1-4).

Letter #1 (Continued)

1-6 Sediments delivered by winter storms to Newport Bay would soon degrade any restoration areas without any sediment basins in the ecological reserve. Pollution prevention measures are being addressed in the watershed feasibility study (Comment 1-1). A variety of additional restoration measures such as converting uplands habitat to wetlands and restoring channels were investigated in the EIS/EIR and several of these measures were incorporated as part of the recommended plan. Other measures such as exotic species control and smaller slough channels were eliminated from further consideration for this project at the request of the resource agencies (CDFG, USFWS, NMFS, CRWQCB). The CDFG will address these management issues in the revised management plan for the Ecological Reserve. It is not known where there is interest in purchasing developed areas for restoration purposes in the study area, but funding for this project could not be used for this purpose. The minimal dredging alternative evaluated for this study was Alternative 1. This alternative was based on the design of the past sediment basins.

1-7 As discussed in response to Comment 1-1, upstream sediment controls are being addressed in the watershed feasibility study, and other studies. An out-of-Bay basin, or other watershed features to better control sediment before it enters the bay will be addressed by these other studies.

1-8 As discussed in response to Comment 1-1, based on the analysis done for the Unit III dredging project and past dredging projects (i.e., the construction of the two in-bay basins) most of the material to be dredged is not suitable for beneficial re-use, especially for beach nourishment or nearshore disposal. An LA-3 site designation study is currently underway, and includes the analysis of depositing dredged material from this Upper Bay project at this site. The fine-grained material is also not marketable for re-use as roadbed or landfill cover. Lands adjacent to the Bay would be required to dry the material before hauling it to an upland disposal site. Disposal of dredged material is addressed on page 5-9 of the main report. A "Dredged Material Management Plan" has not been developed for the proposed project based on the information discussed in this response.

1-9 Paragraphs have been added to Section 5.6 and the Executive Summary to clearly identify the habitat restoration measures that are proposed as part of the recommended plan.

1-10 Dredged material will be analyzed during the detailed design phase (PED), prior to the implementation of project dredging.

1-11 Page 1-15 of the main report acknowledges the interim site designation of the LA-3 ocean disposal site. This section also discusses the potential use of the LA-2 site if LA-3 is not available, although this site would be much more costly to use.

1-12 Section 2.4.2.3 discusses disposal of dredged material at the LA-2 site. Disposal at the LA-2 site was not carried forward for detailed analysis for several reasons: (1) annual disposal of sediments at the LA-2 site is already at or beyond its designated capacity, (2) the cost of disposing of material at the LA-2 site would most likely make the Upper Newport Bay Restoration Project infeasible from a cost perspective, and (3) the air quality impacts, significant for disposal at LA-3, would be greater for disposal at LA-2.

1-13 A draft conformity determination is included in the FEIS.

1-14 Section 5.3 of the FEIS/R discusses adverse environmental impacts. Measures to offset project impacts are discussed in Section 4.5.3.6 of the EIS/R.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

AUG 9 2000

F/SWR4:RSH

Colonel John P. Carroll
District Engineer
Los Angeles District
U.S. Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Colonel Carroll:

Thank you for the opportunity to review the draft Environmental Impact Statement/Environmental Impact report for the Upper Newport Bay Ecosystem Restoration Project. The purpose of the project is to develop a long-term management plan to control sediment deposition in the Upper Bay.

This letter is provided in accordance with the Fish and Wildlife Coordination Act and PL 94-265 - the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

The proposed dredging and disposal areas are located within areas designated as Essential Fish Habitat (EFH) for the Coastal Pelagics and Pacific Groundfish Management Plans. However, we concur with your assessment that impacts to species cover by either of these plans is likely to be short-term and more than offset by habitat improvements resulting from the proposed project. 2-1

Should you have any questions, please contact Mr. Robert Hoffman at 562-980-4043 or via email at: bob.hoffman@noaa.gov.

Sincerely,

for J J Slawson

Rodney R. McInnis
Acting Regional Administrator

Letter #2: Response to National Marine Fisheries Service

2-1 Thank you for the comments. The recommended plan assessment of effects on Essential Fish Habitat is located in Appendix H of the EIS/R.

United States Department of the Interior
Fish and Wildlife Service
Ecological Services
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, California 92008

JUL 21 2000

Colonel John P. Carroll
District Engineer
Los Angeles District
U.S. Army Corps of Engineers
911 Wilshire Boulevard
Los Angeles, California 90017

Attn: Larry Smith, Project Environmental Coordinator

Re: Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County, California

Dear Colonel Carroll:

We have reviewed your June 29, 2000, letter requesting concurrence that the Upper Newport Bay Ecosystem Restoration Feasibility Study located in Orange County, California, is not likely to adversely affect a federally endangered plant, the salt marsh bird's-beak (*Cordylanthus maritimus maritimus*, "bird's-beak") and two federally endangered birds, the light footed-clapper rail (*Rallus longirostris levipes*, "clapper rail") and California least tern (*Sterna antillarum browni*, "least tern"). The project entails dredging of in-bay sediment detention basins, relocating a least tern nesting island, and other ecosystem restoration measures within Upper Newport Bay. Informal consultation between the Corps and this office has been ongoing during the project development, especially in the form of Technical Advisory Group meetings attended by Jack Fancher and Jill Terp of this office.

The project is located within the Upper Newport Bay Ecological Reserve, which is managed by the California Department of Fish and Game. Surveys of the area, including those conducted for this project, have identified the presence of the listed species noted above as well as the federally endangered brown pelican (*Pelecanus occidentalis*, "brown pelican") and the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*, "snowy plover"). As outlined in your public draft report, biological assessment, and draft environmental impact statement/report dated May 2000, measures will be undertaken to avoid impacts to these listed species during project construction and maintenance. Following is a summary of those actions:

1. Shellmaker Island would be surveyed for bird's-beak prior to construction of the dendritic channel and wetlands creation. If found, the project footprint would be altered to avoid the species. 3-1

2. Turbidity that might affect foraging for least terns and brown pelicans will be controlled and contained to within 100 feet of the dredge. 3-2

3. No salt marsh habitat will be altered during construction and maintenance dredging. 3-3

4. Construction will be timed to avoid work adjacent to nesting habitat for clapper rails and least terns during nesting season. Relocation of the least tern nesting island, cutting of the dendritic channel and side channel dredging at Shellmaker Island, creation of wetlands at Shellmaker Island, and side channel dredging at Middle and New islands and the "hot dog" least tern island will be done during non-breeding season between September 16 and February 28. 3-4

5. A qualified biologist will be on site to monitor construction. Where work would occur during nesting season, nests in the vicinity of the dredge would be monitored and work would cease if the birds appeared to be disturbed by dredge noise and activity. 3-5

6. Vessels will be required to maintain a slow speed within the Ecological Reserve to reduce wake that might affect nests within the marsh. Floats would be placed along channels near low salt marsh habitat to attenuate wave action. 3-6

7. Construction equipment will be equipped with noise abatement devices such as mufflers or baffles to minimize noise disturbance. 3-7

The Corps and the local sponsor, the County of Orange, shall be responsible for ensuring that the above measures are successfully executed.

We raised concerns regarding the loss of mudflat habitat associated with this project during Technical Advisory Group meetings and in our Draft Fish and Wildlife Coordination Act Report dated May 2000. Per your letter to us dated May 9, 2000, we understand that further refinement of the project will take place during the preconstruction, engineering, and design (PED) phase. We encourage the Corps to reduce the initial loss of intertidal mudflats to approach the maximum 10 percent loss of any habitat type that the Technical Advisory Group outlined in their meetings during the PED phase. 3-8

Based upon information provided in your public draft report, biological assessment, and draft environmental impact statement/report dated May 2000, and with the implementation of the above measures, we concur that the ecosystem restoration project will not adversely affect bird's-beak, clapper rail, least tern, brown pelican, or snowy plover. Therefore, formal consultation pursuant to section 7 of the Endangered Species Act is not warranted.

We appreciate your efforts to avoid impacts to endangered and threatened species. If you have any questions, please contact Jack Fancher or Jill Terp of my office at (760) 431-9440.

Sincerely,

Jim A. Bartel
Assistant Field Supervisor

1-6-00-I-79

cc: Robert Hoffman, NMFS
Terri Stewart, CDFG

Letter #3: Responses to U.S. Fish and Wildlife Service

3-1 Sensitive plants surveys are included in the EIS/R as a mitigation measure at Shellmaker Island prior to restoration activities. Surveys will be conducted during PED phase and the project footprint will be modified in this area if bird's-beak is found to occur in these areas.

3-2 A silt curtain will be placed around the dredge to confine turbidity to a radius of 100 feet around the dredge. Turbidity beyond 100 feet will address the objective in the Water Quality Control Plan for the San Diego Basin. Turbidity will not be elevated more than 20% over the natural (ambient) levels at that distance from the dredge and other support equipment.

3-3 Concur.

3-4 Mitigation measures have been included in the EIS/EIR to schedule dredging in these sensitive areas to avoid the least tern island and high-density clapper rail nesting habitat during the nesting season. The understanding from prior consultation was the non-breeding season was from September 16 to April 14, not September 16 to February 28. The FEIS/R uses the date April 14th. Clarification is requested during PED phase.

3-5 A mitigation has been included in the EIS/EIR that specifies that nests of light-footed clapper rails near dredging will be monitored during the nesting season and that work will cease if the birds appear disturbed by dredging activities.

3-6 A mitigation measure has been included in the EIS/EIR to specify that floats will be placed along the channel near low salt marsh habitat to reduce damage to clapper rail nests from boat wakes. Project vessels will maintain a slow speed in the Ecological Reserve.

3-7 A mitigation measure has been included in the EIS/EIR that specifies that the project equipment use various methods including mufflers to reduce noise.

3-8 Additional opportunities to reduce the net loss of intertidal mudflat will be investigated during PED phase, including the resizing of the Unit II basin and the possibility of restoring additional areas from degraded upland to intertidal mudflat habitat.

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse

Gray Davis
GOVERNOR

Steve Nissen
ACTING DIRECTOR

August 16, 2000

Larry Smith
U.S. Army Corps of Engineers
911 Wilshire Boulevard
Los Angeles, CA 90018

Subject: Upper Newport Bay Ecosystem Restoration Project
SCH#: 2000064010

Dear Larry Smith:

The State Clearinghouse submitted the above named Joint Document to selected state agencies for review. The review period closed on August 14, 2000, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

4-1

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Terry Roberts

Terry Roberts
Senior Planner, State Clearinghouse

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
916-445-0613 FAX 916-323-3018 WWW.OPR.CA.GOV/CLEARINGHOUSE.HTML

Document Details Report
State Clearinghouse Data Base

SCH#	**2000064010**
Project Title	Upper Newport Bay Ecosystem Restoration Project
Lead Agency	U.S. Army Corps of Engineers

Type **JD** Joint Document

Description Develop a long-term management plan to control sediment deposition in Upper Newport Bay to preserve the health of its habitats.

Lead Agency Contact

Name	Larry Smith		
Agency	U.S. Army Corps of Engineers		
Phone	213-452-3846	***Fax***	
email			
Address	911 Wilshire Boulevard		
City	Los Angeles	***State*** CA	***Zip*** 90018

Project Location

County	Orange
City	Newport Beach
Region	
Cross Streets	Pacific Coast Highway and Jamboree Road
Parcel No.	

Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways	1
Airports	Orange County
Railways	
Waterways	Upper Newport Bay
Schools	
Land Use	State Ecological Reserve

Project Issues Air Quality; Archaeologic-Historic; Coastal Zone; Geologic/Seismic; Noise; Traffic/Circulation; Vegetation; Water Quality; Wetland/Riparian; Wildlife; Landuse; Cumulative Effects

Reviewing Agencies Resources Agency; Department of Boating and Waterways; California Coastal Commission; Department of Conservation; Department of Fish and Game, Marine Region; Office of Historic Preservation; Department of Parks and Recreation; Caltrans, District 12; Regional Water Quality Control Board, Region 8; State Lands Commission

Date Received 06/28/2000 ***Start of Review*** 06/28/2000 ***End of Review*** 08/14/2000

Note: Blanks in data fields result from insufficient information provided by lead agency.

Letter #4: State Clearinghouse

4-1 Thank you for your response.

STATE OF CALIFORNIA – THE RESOURCES AGENCY GRAY DAVIS, *Governor*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

August 10, 2000

Robert E. Koplin, Chief
Planning Division
U.S. Army Corps of Engineers
ATTN: Larry Smith, CESPL-PD-RN
P.O. Box 532711
Los Angeles, CA 90053-2325

Re: **CD-72-00,** Army Corps, Restoration of Upper Newport Bay through various dredging and habitat modification activities, Upper Newport Bay, Newport Beach, Orange County

Dear Mr. Koplin:

On August 9, 2000, by a unanimous vote, the California Coastal Commission concurred with the above-referenced consistency determination for a restoration project for Upper Newport Bay in Orange County. The Commission conducted a "phased" review, because, in its Feasibility study, the Corps had not made final design decisions and several project elements were not finalized, including: (1) final detailed habitat configurations; (2) sediment testing for suitability for open ocean disposal at LA-3; (3) the biological, water quality, and other monitoring plans; and (4) access and recreation improvements. After the project receives funding from Congress, the Corps will develop a Pre-Construction Engineering and Design (PED) document, which will address these issues. 5-1

For this first phase, the Commission reviewed the concept, goals and objectives of the proposed project, evaluating the appropriateness of restoring Upper Newport Bay resources in a manner that includes the elements provided in the project description. The Commission's determination that the proposed project was consistent with the California Coastal Management Program (CCMP) was contingent on the Corps' commitment to submit a subsequent consistency determination before finalizing its PED. With this commitment, the Commission found the project to be consistent to the maximum extent practicable with the CCMP.

Sincerely,

Mark Delaplaine

Mark Delaplaine
Federal Consistency Supervisor

cc: Long Beach Area Office
Governor's Washington D.C. Office
OCRM

Letter #5: California Coastal Commission

5-1 Thank you for your concurrence on the consistency determination. The Corps will provide additional information in a future consistency determination for the four project elements listed in the response letter during the PED phase, after more detailed testing and design of the project has been completed.

STATE OF CALIFORNIA-THE RESOURCES AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF FISH AND GAME

South Coast Region
4949 Viewridge Avenue
San Diego, California 92123
(858) 467-4201
FAX (858) 467-4239

August 14, 2000

Mr. Larry Smith
U.S. Army Corps of Engineers
911 Wilshire Blvd.
Los Angeles, CA 90018

Dear Mr. Smith:

**Draft Environmental Impact Statement/Report (DEIS/EIR)
for the Upper Newport Bay Ecosystem Restoration Feasibility Study, Orange County
(SCH Number 2000064010)**

The Department of Fish and Game (Department) has reviewed the Draft Environmental Impact Statement/Report for the Upper Newport Bay Ecosystem Restoration Feasibility Study. The subject of this feasibility report is the Upper Newport Bay Ecological Reserve managed by the Department. We have been attending Technical Advisory Group (TAG) meetings on this study and are being considered as a Co-sponsor for the project in collaboration with the County of Orange and City of Newport Beach.

The Department supports both this feasibility study and the actual construction that will begin in a few years. The project will include dredging to remove sediment deposited in the Bay and development of a long-term management plan to control further sedimentation. The project will also restore, maintain and, where possible, enhance ecological values in the Bay. The benefits will be significant to the fish and wildlife resources that utilize the Upper Newport Bay Ecological Reserve, and to the public as a place for nature study, education and scientific research.

The Department considers that, of the alternatives addressed in the draft EIS/EIR, a hybrid design would be the most beneficial. This was discussed in the U.S. Fish and Wildlife Service's Coordination Act Report (CAR), with which the Department has concurred. The proposed modified alternative described in the CAR will produce a restoration product which achieves the goals set forth by the TAG. The Department and other agencies have been working on identifying potential restoration areas within Upper Newport Bay where mud-flat habitat can be incorporated into the restoration plan. Three of the Department's main concerns include: 1) implementing the dredging to a depth necessary to achieve maximum protection of the least tern 6-1 island in the upper reach of the Bay; 2) maximizing the interval between maintenance dredging; and, 3) reducing impacts from proposed staging area(s) and dredging operations on the Reserve's public outreach and education programs. We ask that these topics be fully addressed with regards to the selected alternative in the Final document. We are committed to being involved in every aspect of the Design and Engineering Phase of this project and to operating and managing the Reserve in perpetuity. 6-2 6-3

Please see our attached specific comments regarding the draft document. We request these comments be addressed in the Final EIS/EIR and that the modified alternative be selected as the design to be engineered for the restoration project.

If you have any questions, please contact Ms. Terri Stewart, Senior Biologist for the Department's South Coast Region Land Management and Monitoring Program. She can be reached at the letterhead address, or by telephone at (858)467-4209.

Sincerely,

C. F. Raysbrook
Regional Manager

cc: Terri Stewart, DFG, San Diego
Erick Burres, DFG, Huntington Beach
Jack Fancher, FWS, Carlsbad

TS

File:Chron
file :acoe letter.wpd

1-1 Section in Quotes :....Upper Newport Bay State Ecological Preserve....
Should read...Upper Newport Bay Ecological Reserve.... 6-4

1-9 Map is missing information and is incorrect for others.
See legend 6-5

Terns Islands	Should be labeled Tern Island (nearest shore) and Skimmer Island
Main Dike	Should be Salt Dike
Narrows	Mentioned in text but absent from map

2-15 Table 2.3, 1999 Condition for Segment 1 should include salt panne 6-6

2-28 Lat sentence, HEP should have included salt panne. Change to the salt pannes has been observed. 6-7

2-35 Fourth paragraph.
Urbanization has also caused an increase in "wild predators as well". 6-8

2-36 Fourth paragraph Fourth sentence
The Bay is a part of the flyway for some species which may migrate to the Continent of South America or possibly the State of Hawaii. 6-9

Sixth paragraph First sentence
UNB is home to three additional endangered bird species; black rail, snowy plover, California gnatcatcher. 6-10

Seventh paragraph Last full sentence
El Nino brought in a new predator, arched swimming crab, that may have competed with the clapper rail and contributed to the decline. 6-11

2-37 Paragraph on California least tern Last paragraph
The last sentence is incorrect. The tern nesting islands are maintained each year with some level of vegetation removal. 6-12

2-42 Third paragraph
First sentence is incorrect as there is a boat launch in Huntington Harbor. 6-13

3-9 Channels should be restored as to prevent access from native quadrupeds such as coyote. 6-14

4-3 Change names of the tern islands, see above. 6-15

5-1 Second paragraph Second sentence
Contrary to what is said, the recommended plan will affect existing recreation in that boating will become restricted. 6-16

Third paragraph
The channel will be -5MSL? It reads -3MSL 6-17

5-11 UNB Ownership map

The State of California, State Lands Commission, owns the land in the basin adjacent to Jamboree which is identified as being owned by Irvine Company. Also the land identified as being owned by De Anza Bayside Village is owned by the State of California, Department of Fish and Game. 6-18

Letter #6: Response to the California Department of Fish and Game

6-1 Under the recommended plan, a channel will be dredged between the least tern island and shore. This channel will be at a depth of -5 feet MSL in order to restore the channel to open water for the entire tidal cycle. Restoration of this channel will deter terrestrial predators from accessing the island from the mainland to the maximum extent practicable.

6-2 The project would increase the interval between maintenance dredging to once every 21 years, on average.

6-3 The text of Section 2 of the EIS/EIR has been revised to reflect the concerns of CDFG about using the traditional staging area at Shellmaker Island. The text now specifies that staging will be at Shellmaker Island or at an alternative location such as Newport Dunes. The text also states that if it is not feasible to stage dredging operations anywhere but Shellmaker Island, coordination will be conducted with CDFG to insure that dredging does not obstruct CDFG's public outreach and education programs.

6-4 Concur that this revision should be made, but the referenced language is directly quoted from the Water Resources Development Act of 1986.

6-5 Figure 1.1 revisions have been made in the main report. The text has been revised to clarify that least terns nest on the southerly but not the northerly island and that CDFG refers to the northerly island as "Skimmer Island." The text also specifies that the main dike is also called the salt dike.

6-6 Salt panne has been added to Table 2.3.

6-7 The HEP was focused on wetlands habitats, especially open water and intertidal mudflat. None of the project alternatives including the No Action alternative would affect salt panne.

6-8 Revisions have made to the text to include "wild predators."

6-9 Revisions have been made to include the stated references.

6-10 The endangered species have been added to the list in this paragraph.

6-11 Revisions have been made to include the arched swimming crab.

6-12 The last sentence has been modified to reflect some level of vegetation removal.

6-13 The correction to include Huntington Harbour has been made.

6-14 The last sentence has been revised to include native quadrupeds.

6-15 The revised names of the tern islands are shown in parentheses.

6-16 Do not concur. The Corps is not modifying boating activities in the ecological reserve as part of this project. This is a decision that will be implemented by CDFG in their management plan.

6-17 This paragraph refers to the design of the basin, not the depth of the channel in the upper basin. Intertidal mudflats will occur from 0 feet MSL to -3 feet MSL. From -3 feet MSL to -20 feet MSL, the basins will be dredged on a 5:1 slope.

6-18 The Metroscan Property Profile database shows that the Irvine Company owns the parcel in question, not the State of California, State Lands Commission. The report documentation still reflects this. The database also shows private ownership of the De Anza Bayside Village.

California Regional Water Quality Control Board

Santa Ana Region

Winston H. Hickox
Secretary for Environmental Protection

Internet Address: http://www.swrcb.ca.gov
3737 Main Street, Suite 500, Riverside, California 92501-3339
Phone (909) 782-4130 ∃ FAX (909) 781-6288

Gray Davis
Governor

August 14, 2000

Mr. Robert E. Koplin, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
ATTN: Mr. Larry Smith, CESPL-PD-RN
P.O. Box 532711
Los Angeles, California 90053-2325

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE UPPER NEWPORT BAY ECOSYSTEM RESTORATION FEASIBILITY STUDY, ORANGE COUNTY (SCH #2000064010)

Dear Mr. Koplin:

Staff of the Regional Water Quality Control Board, Santa Ana Region (RWQCB-8) have reviewed the Draft Environmental Impact Report (DEIR) for the Upper Newport Bay Ecosystem Restoration Feasibility Study (May 2000) and have the following comments:

The DEIR assesses alternative plans to address sediment problems and habitat needs within Upper Newport Bay. We would like to acknowledge the extensive efforts by the US Army Corps of Engineers to formulate a restoration plan that complies with the requirements of the Regional Board's sediment TMDL for the Newport Bay/San Diego Creek Watershed. Based on our review of the DEIR in the context of the TMDL requirements, we are in support of alternative 6 as the preferred dredging/restoration project for the Upper Bay.

As you know, the Regional Board adopted a sediment Total Maximum Daily Load (TMDL) in 1998 to address sediment problems and maintain the health of the aquatic ecosystem in the Newport Bay/San Diego Creek Watershed. The sediment TMDL states that a minimum depth of 7 feet below mean sea level (MSL) shall be maintained in the two in-bay basins and that the long-term maintenance interval for these basins should be extended to once every 20 to 30 years. Alternative 6 is consistent with these requirements since the two in-bay basins would be dredged to 20 feet below MSL, resulting in an estimated average maintenance period of 21 years. (We recognize that this maintenance frequency was estimated by hydraulic and sediment transport models of Upper Newport Bay, using historical storm events of the last 25 years for data on sediment loading to the Bay. Future conditions may not reflect the historic data, and the maintenance frequency may therefore differ from that predicted.)

The sediment TMDL specifies that sediment deposition shall not cause significant changes (no more than 1%) in the acreage of various habitat types in the Upper Newport Bay Ecological Reserve. The specific habitat acreages identified in the TMDL were based on the California Department of Fish and Game's management plan for the Reserve. The TMDL recognizes that the Department of Fish and Game may wish to modify the management plan and the desired mix and size of habitats in the Reserve. The TMDL specifies that in that case, the habitat acreages identified in the TMDL would be revised accordingly.

(The sediment TMDL is a part of the Santa Ana Region Basin Plan, and, therefore, any changes to the TMDL must be accomplished through the Basin Plan amendment process.) Alternative 6 would result in significant (i.e., greater than 1%) changes in the size of certain habitat types. For example, intertidal mudflat area would be reduced by 14%, while open water habitat would be increased by about 19%. We recognize that these changes would occur not because of sediment deposition, which is proscribed by the TMDL, but rather as part of a coordinated effort to restore the Ecological Reserve. It is our understanding that the Corps has been coordinating its feasibility study efforts with work by the Department of Fish and Game to update the management plan for the Reserve. We also understand that the Corps is working with both the Department and the U.S. Fish and Wildlife Service to resolve differences among those agencies concerning the desirable types and amounts of habitat in the Reserve. If those agencies were satisfied with respect to the habitat configuration proposed in Alternative 6, then we would recommend that the acreages specified in the sediment TMDL be amended accordingly. (Please note that we do not regard the differences in habitat acreages (Alternative 6 versus the sediment TMDL) as a bar to the implementation of Alternative 6. We would wish simply to update the TMDL to reflect the latest management plan for the Reserve.) 7-1

We are aware that you have requested Water Quality Certification (Section 401, Clean Water Act) from the Regional Board for the restoration project. Please contact Kelly Schmoker at (909) 782-4990 for information regarding the status of our consideration of this request.

Regional Board staff will be happy to work with your staff to protect the watershed. If you have any questions, please call Wanda Smith at (909) 782-4469 or Lance Lin at (909) 782-4241.

Sincerely,

G J Thibeault

Gerard J. Thibeault
Executive Officer
Santa Ana Regional Water Quality Control Board

cc: Regional Board
Scott Morgan – State Clearinghouse

Letter #7: Response to California Regional Water Quality Control Board
Santa Ana Region

7-1 The Corps concurs with the recommendations to update the habitat acres specified in the Sediment TMDL. Additional investigations will be conducted during PED phase to reduce the loss of intertidal mudflat.

NEWPORT BAY PUBLIC HEARING COMMENT CARDS
July 18, 2000

Dani Gold – Earth Resource Foundation

(1) How will the dredging effect the water quality of the bay (chemicals that have been absorbed by the soil, etc…)? 8-1

(2) How will they reduce the deposits of sedimentation as a preventative action? Or will maintenance be the only course of action? 8-2

Jean Whitaker – Newport Bay Naturalists & Friends

(1) I would like to be sure that you are retaining Tern Island. I don't believe the Least Terns will nest anywhere else. 9-1

Gale Whitaker – Upper Newport Bay Ecological Reserve Naturalists

(1) The reason for the Tern Islands is to protect the nesting birds. The islands are so close to the mainland, it is easy for swimming predators (coyotes, foxes & raccoons) to gain access. Why aren't the islands in the middle of the basins? 10-1

Francie Greanias

(1) I hope alternative #6 will be approved so we can maintain a high quality upper bay. Thanks for all the good work! 11-1

Jacki Coates

(1) I am in support of plan #6. I'd like to see the upper back bay open – minus mud etc… 12-1

Laura Bekeart Dietz – Newport Bay Environmental Quality Citizens Advisory Committee

(1) Good work! Looking forward to 2003 – Laura Dietz EQCAC City Committee appointed by Council Members 13-1

Response to Public Hearing Comment Cards

Dani Gold:

8-1 No, water quality will not be adversely affected during dredging operations due to the measures being taken to control turbidity levels, similar to what was done during the Unit III project. Silt curtains will be used to ensure that turbidity levels will not increase by more than 20% beyond ambient levels within 100 feet of the dredge. The release of chemicals into the water column has not been a problem in past dredging projects in the bay. By confining most of the future sediment deposition to the two upper basins, and increasing circulation in the upper bay, the project is expected to improve overall water quality within the bay.

8-2 Methods to reduce the loads of sediment to the bay from upstream sources are being investigated in a separate watershed feasibility study. The larger storms will still transport fine sediments to the Bay no matter what measures are taken in the watershed to better control sediments at their source. The saline or brackish water conditions in the estuary cause the fine sediments to coagulate together and settle on the bottom. Therefore, some maintenance dredging will always be necessary in the Bay.

Jean Whitaker:

9-1 The southerly island where the least terns nest will be retained. The island that is being relocated is the northerly island where predominantly black skimmers nest. The relocated island will be designed to be more attractive to the least terns.

Gale Whitaker:

10-1 Placing the islands in the middle of the basins significantly reduces the storage capacity for sediments to deposit in the basins. Islands in the center of basins may also be more susceptible to storm erosion and may require greater slope protection. A small channel will be restored around Tern Island to better protect nesting birds. The depth of the channel will ensure that the channel remains open water throughout the entire tidal cycle. The relocated tern island (Skimmer Island) will be constructed adjacent to the Salt Dike. The Salt Dike will be segmented to deter similar potential predator problems.

Francie Grenias:

11-1 Thank you for the comment.

Jacki Coates:

12-1 Thank you for the comment.

Laura Dietz:

13-1 Thank you for the comment.

E-Mail from Nicholas Todd Young

Hi Jim

I noticed that you addressed the conflict of circulation between the motor vehicles and bicycles, rollerbladers, and pedestrians in the "report". I think that the cars should be restricted from accessing the road to insure the safety of the recreational users and to preserve the integrity of the bay 14-1

How can I get involved in promoting the restriction of cars from Back Bay Road? 14-2

Are there any other groups pushing for such an action?

Who decides how to resolve this conflict? 14-3

Are there any claims from the Department of Fish and Game that the presence of automobiles (trash, oil, antifreeze, rubber, gasoline) are having an adverse impact on the wildlife? If so, wouldn't the Endangered Species Act require the City of Newport Beach to address the problem? 14-4

I really want to get involved so all information that you can send to me will be very helpful.

Thanks, Nick

Letter #14: Response to Nicholas Todd Young's E-Mail

14-1 The access issues in the ecological reserve are supposed to be addressed by the Department of Fish & Game, the managers of the reserve. They're updating their management plan for the reserve and should have a draft available soon, but the release status is unknown. The name of the reserve manager for the Department of Fish & Game is Erick Burres at (714) 337-1422, or eburres@compuserve.com.

14-2 It is not specifically known what other groups are supporting the restriction of cars along Back Bay Drive. The Newport Bay Naturalists may have more information. They can be reached at (714) 640-6746.

14-3 The Department of Fish & Game, the City of Newport Beach and Orange County will likely be involved in the resolution of whether or not cars are allowed along Back Bay Drive. Ultimately, the State will likely make the decision, although the City currently owns the right-of-way along Back Bay Drive.

14-4 No claims are known about the automobiles having adverse impacts on the wildlife.

100 E. Pacific Coast Highway
Newport Beach, CA 92660
(949) 675-6771 Phone

Pearson's Port

August 11, 2000

Jim Hutchison
U.S. Army Corps of Engineers
Watershed Studies Group, CESPL-PDD-WWW
P.O. Box 532711
Los Angeles, CA 90053-2325

Dear Mr. Hutchison:

I am writing to you regarding the public hearing notice that was circulated regarding the Upper Newport Bay Ecosystem Restoration Feasibility Study. I did not receive this notice until today. As our business is directly affected by the water quality in Newport Bay, I find it necessary to voice some concerns regarding this issue.

We are a family owned business that has operated on the Newport Bay for almost thirty years. Pearson's Port is a live fish market that floats directly north of the PCH bridge. We have live fish tanks that are directly fed by the water from the bay. Therefore, any disruption of the ecosystem within the bay directly affects our livelihood and our community.

This action will negatively affect our business by contaminating the water in the bay that is fed directly into our live fish tanks. This water is the sole source of water supply to our business. Therefore, this brings the follow issue that must be addressed. We understand that there will be a significant change in the water quality while this process is taking place that will adversely affect our business. During the deepening and expansion of the existing in-bay sediment basins, how will our business continue to be fed with clean ocean water? 15-1

I am disappointed that we did not receive this notice until today, but will look forward to your reply regarding this important issue. Your reply will be most appreciated. Please forward your response to our mailing address below.

Sincerely,

Terese Pearson

Terese Pearson
Owner

Mr. & Mrs. Tom Pearson • 10182 Cynthia Drive • Huntington Beach, CA 92646
(714) 962-1323

Letter #15: Response to Pearson's Port

15-1 The water in the bay will not be contaminated by this project. The dredging for this project is similar to what was done for the Unit III dredging project. Section 4.3 of the EIS/R describes the use of a silt curtain during dredging operations to control turbidity levels around the dredge. All of the dredging operations will take place within the ecological reserve, well away from the vicinity of the PCH Bridge. The channel will only be used for the transport of dredged material to the offshore disposal site. In the long-term, the expansion of the upper bay basins will increase the entrapment of fine sediments in the uppermost portions of the bay and improve water quality throughout the bay.

APPENDIX J

AIR QUALITY CONFORMITY DETERMINATION

DRAFT CLEAN AIR ACT CONFORMITY DETERMINATION
UPPER NEWPORT BAY CHANNEL RESTORATION

1.0 INTRODUCTION

Clean Air Act Conformity Rule Overview

In the *Federal Register* of November 30, 1993 (58 FR 63214-63259), the U.S. Environmental Protection Agency (EPS) published the final General Conformity Rule to implement Section 176(c) of the Clean Air Act. The rule became effective on January 31, 1994. The General Conformity Rule applies to federal actions that occur within nonattainment and maintenance areas (attainment areas that have been reclassified from a previous nonattainment status and are required to prepare an air quality maintenance plan). The rule requires that federal agency actions be consistent with the Clean Air Act and with any approved air quality management plan SIP.

The following analysis presents the Clean Air Act conformity determination for the Upper Newport Bay wetlands restoration project as proposed by the United States Army Corps of Engineers (USACE) in the Draft Environmental Impact Statement/Environmental Impact Report for the Upper Newport Bay Ecosystem Restoration Project (DEIS/R). This analysis shows that the proposed action does not meet "de minimus" levels that trigger the requirements for a full, formal conformity determination. As such, the emissions estimates are of a minimal impact and would not cause or contribute to new violations of federal air quality standards; increase the frequency or severity of existing violations of federal air quality standards; or delay the timely attainment of federal air quality standards.

Proposed Action Overview

Upper Newport Bay, one of the largest coastal wetlands remaining in southern California, is an ecological resource of national significance. The 1,000-acre Upper Bay is characterized by development in its lower reach and a 752-acre undeveloped ecological reserve in its upper reach. Natural habitats within Upper Newport Bay include marine open water, intertidal mudflats, cordgrass dominated low saltmarsh, pickleweed dominated mid saltmarsh, high saltmarsh, salt panne, riparian, freshwater marsh and upland. Because of its diversity of habitats and its location on the Pacific Flyway, Upper Newport Bay supports an impressive number and diversity of birds particularly during fall and winter when shorebirds and waterfowl arrive from their northern breeding grounds. Upper Newport Bay also supports several endangered bird species and an endangered plant. The subtidal and intertidal waters of the Upper Bay provide important habitat for marine and estuarine fishes.

The ecological diversity and functionality of Upper Newport Bay has been threatened by sedimentation from the surrounding watershed. The primary source of freshwater and sediment loads to Upper Newport Bay is San Diego Creek which drains approximately 85 percent of the 98,500-acre watershed. Sediment from the San Diego Creek watershed has filled open water areas within the Bay. This sedimentation has decreased the extent of tidal inundation, diminished water quality, degraded habitat for endangered species as well as migratory water birds and marine and estuarine fishes, and resulted in navigation problems in the Upper Bay marinas and navigation channels. If sediment deposition within Upper Newport Bay is allowed to continue, open water areas will evolve into mudflats and eventually marsh or upland habitat resulting in a loss of ecological diversity.

The purpose of the Upper Newport Bay Restoration Project is to develop a long-term management plan to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Sediment will continue to deposit in the Bay no matter what control measures are implemented in the watershed. Therefore, one of the most important components of this project is to develop a plan to control sediments by designing one or two in-bay basins in which the bulk of the sediment will settle.

In addition to developing a plan for sediment control, the Upper Newport Bay Restoration project includes several other measures to improve habitat quality in the Upper Bay.

The proposed action would involve deepening and expanding the Unit III basin, removing the northern, "kidney shaped" tern island and creating a new least tern island at the main dike, and widening and deepening the Unit II basin.

Under the proposed action, the mudflats in the northeast corner of the uppermost segment would be maintained. In addition, approximately 100 feet of mudflats would be retained around the shoreline perimeter of the basin and the southern island to a depth of -3 feet MSL. To create the new basin, the mudflats between -3 feet MSL and -20 feet MSL would be dredged to a depth of -20 feet MSL with a 5:1 slope.

A trapezoidal channel with 20-foot bottom width, -5 foot MSL depth and 3:1 side slopes would be dredged between the southern least tern island and the shore to restore tidal action to the area. An access channel with 20-foot bottom width, -6 foot MSL depth and 3:1 slopes would be constructed along the southern tip of the island for maintenance of the tern island.

The channel between the Upper Basin and the Unit II basin would be maintained at its current design of -14 feet MSL depth.

The western portion of the main dike would be removed. A portion of the dike would be used to construct a new least tern island to compensate for the removal of the island in the upper basin. An access channel would also be constructed along the eastern tip of the new island to provide boat access to maintain the island. The access channel would have a bottom width of 20 feet, a depth of -6 feet MSL and 3:1 side slopes.

The Unit II basin footprint would be expanded west to the existing 0 MSL contour line from the relocated tern island to the southern end of New Island. The Unit II basin would be deepened to -20 feet MSL with 5:1 slopes. Approximately 100 feet of mudflat to a depth of -3 feet MSL would be retained around the shoreline perimeter of the basin and New Island.

A trapezoidal channel, with a 50-foot bottom width, -5 foot MSL depth and 3:1 side slopes, would be reconstructed along the eastern side of New Island. The Santa Ana-Delhi channel would be reconstructed to the same design dimensions.

Dredging is most likely to be done with a clamshell dredge. A grab bucket would be lowered to the bottom where its jaws are closed over a plug of sediment. The grab would be raised out of the water, and the sediment deposited into a disposal scow with 1,500 cubic yard (cy) capacity. The production rate is estimated to be about 4,000 cy per day. The clamshell dredging method was used successfully for the 1987 to 1988 Unit I/II project and the recent Unit III project. A small tugboat would transport and hold an empty disposal scow near the dredge as another scow is filled while secured alongside the dredge barge. The filled scow would be pushed by the tug to a barge marshalling area adjacent to the south end of Shellmaker Island or elsewhere near the PCH bridge. The full scow would be exchanged for an empty one for return to the dredge site in the Upper Bay. The filled scow would be pushed by ocean-going tug out of Newport Harbor to the ocean disposal site at LA-3. The round trip travel time to and from the LA-3 ocean disposal site is 4 hours. Approximately three round-trips to the disposal site would be made per day. Dredge operations would be conducted 24 hours per day, 6 days per week. (When down time is considered, yearly operations are estimated at 280 days.) A guide boat would accompany all tug and barge movements to improve the safety of the barge transport through the Bay. A survey boat would survey the operations every two days. A quality control survey boat would be onsite during all dredging operations.

Approximately 2,122,000 cy of sediment would be dredged. Of this value, approximately 732,000 cy consists of maintenance dredging to reestablish previous bottoms depths. The time to construct the project is estimated to be 21.7 months. The Unit III dredging operation was staged from Shellmaker Island.

CDFG would prefer that staging be done elsewhere. Therefore, staging would probably occur at another site near the PCH Bridge.

Instead of a clamshell dredge, it is possible that dredging could be accomplished using a small hydraulic dredge. Under this alternative, the dredging operations would be conducted using a floating hydraulic dredge of modest size. The small, lightweight, self-propelled dredge could be launched from shore at Jamboree Road. The hydraulic dredge uses a cutterhead to mechanically dislodge the sediment, which would then be pumped through a 12-inch pipeline to a disposal scow located at Shellmaker Island or at another site near the PCH bridge. The pipeline would cross the marsh in both the Unit I/III and Unit II basin areas. Three booster pumps would be located along Back Bay Drive. The size of each booster pump would be about 400 horsepower (hp). The pumps may be either diesel or electric powered. The disposal scows would be filled adjacent to the south end of Shellmaker Island or at another site near the PCH bridge. The rate of solids delivery through a 12-inch pipeline from the small dredge to the scow barges would be about 150 cy/hour (hr), or 3,000 cy per 20 hour work day. The dredge would operate 24 hours per day, 6 days per week, or approximately 280 days per year.

Because dredged material would be mixed with water for hydraulic transport through the pipeline under this alternative, solid content in the slurry mixture would be limited to about 20 percent. To avoid making approximately 5 times as many trips to the ocean disposal site as would be required under the clamshell dredge alternative, water would be removed from the disposal scow prior to leaving the dock for the ocean disposal site. This operation requires a manifold to allow partial filling of each scow barge while the sediment within the partially filled barge settles. A combination of barges would be used so that the dredge pipe discharge can alternately fill a barge and then be diverted to another barge to allow sediment settling and water decanting. Through progressive filling, settling and decanting, the sediment content in each barge can be maximized. A total of three dump scows (1,500 cy capacity) would be used to allow continuous operations. Certain additives can be discharged into the filling barge in order to reduce sediment settling time. A large water pump would be used to decant the excess water. Disposal scows would be filled with about 1,000 cy of the consolidated dredge material and transported by tugboat to the LA-3 disposal site where the material would be discharged. Approximately three round trips of 4 hours each would be made per day.

The hydraulic dredge, which requires substantially less fuel than the clamshell dredge, would be fueled by truck at Jamboree Road. Like disposal scow trips, fuel barge trips along the Upper Bay Channel would be avoided.

If a hydraulic dredge were used, it would not be necessary to excavate an access channel for the dredge. Therefore, the amount of material to be dredged would be approximately 1,952,00 cy. However, because the dredging production would be lower for a hydraulic dredge compared to a clamshell dredge the total construction time would be 27.8 months.

In addition, to dredging of the basins and channels, the proposed project would include relocation of the northerly tern nesting island to the Unit II basin near the salt dike.

Removal of the old island foundation would be accomplished during the upper basin dredging. Tern island relocation would occur during the non-breeding season.

The new tern island near the main dike would be constructed from material taken from the top of the "kidney shaped" island and material obtained elsewhere. Only the top five feet of the existing island is expected to be suitable for the new island construction. The "kidney shaped" island would provide 40,000 cy for the new island. An additional 23,000 cy of sand would be imported to complete the construction of the new island. A total of 16 barges of 2,500 cy capacity would be needed to transport the 40,000 cy scavenged from the old island to the new island site. Rather than use sand from a distant source, it is believed that the 23,000 cy of sand for the two-foot thick surface layer of the new island could be procured from within Newport Bay. Possible areas where good quality sand exists include the following: Interceptor Beach (at the Orange County Harbor Patrol Office, near the Bay entrance), Shellmaker Island, the Newport Aquatic Center (should wetland creation be undertaken there), the "In Channel" Basins of San

Diego Creek, and in certain Upper Bay Channels where high sand content was found during the 1998-1999 dredge program.

In addition to the expansion of the Unit III and Unit II basins and the relocation of the northerly tern island, the recommended plan includes the following habitat restoration measures:

- Addition of sand to the least tern island.
- Construction of a small dendritic channel through the marsh on Shellmaker Island
- Restoration of wetlands in filled areas at Northstar Beach, the bull-nose section of land at the lower end of the northern side of the Unit I/III basin, and in a dredge spoil area on Shellmaker Island
- Restoration of side channels on the west side of Middle Island and the east side of Shellmaker Island
- Restoration of eelgrass adjacent to Shellmaker Island
- Removal of segments of the Main Salt Dike
- Addition of education kiosks along Back Bay Drive and by the interpretive center.

2.0 CLEAN AIR ACT CONFORMITY REQUIREMENTS

Purpose of the General Conformity Rule

The EPA General Conformity Rule requires federal agencies to analyze proposed actions according to standardized procedures and to provide a public review and comment process. The conformity determination process is intended to demonstrate that the proposed federal action will not:

- Cause or contribute to new violations of federal air quality standards;
- Increase the frequency or severity of existing violations of federal air quality standards; and
- Delay the timely attainment of federal air quality standards.

Applicability of the General Conformity Rule

The General Conformity Rule applies to federal actions within nonattainment and maintenance areas. Conformity requirements apply only to nonattainment and maintenance pollutants. Emissions of attainment pollutants are exempt from conformity analysis.

Analysis required by the General Conformity Rule focuses on the net increase in emissions compared to ongoing historical conditions. Existing SIPs are presumed to have accounted for routine, ongoing federal agency activities. Conformity analyses are further limited to those direct and indirect emissions over which the federal agency has responsibility and control. General Conformity analyses are not required to analyze emissions sources that are beyond the responsibility and control of the federal agency. Conformity determinations are not required to address emissions that are not reasonably foreseeable or reasonably quantifiable.

Highway or mass transit projects that require FHWA or FTA funding or approval are subject to transportation conformity rule requirements rather than the EPA General Conformity Rule requirements. The General Conformity rule also excludes five additional categories or actions and projects (40 CFR 93.153[d]; 40 CFR 51.853[d]). These include:

- Stationary sources requiring New Source Review (NSR) or Prevention of Significant Deterioration (PSD) permits;
- Direct emissions from remedial actions at Superfund (CERCLA) sites when the substantive requirements of NSR/PSD programs are met or when the action is otherwise exempted under provisions of CERCLA;
- Initial and continuing actions in response to emergencies or disasters;

- Alterations and additions to existing structures as specifically required by applicable environmental legislation or regulations; and
- Various special studies and research investigation actions.

Additionally, conformity determinations are not required when the annual direct and indirect emissions from an action remain below the applicable pollutant "de minimus" thresholds set forth on sections 40 CFR 93.153[b]; 40 CFR 51.853[b]. The de minimus threshold for ozone nonattainment/maintenance areas applies separately to both volatile organic compounds (VOCs) and nitrogen oxides (NOx) emissions. For the South Coast Air Basin (in which the project is located) the de minimus levels are 10 tons per year for VOCs and NOx, 100 tons per year for carbon monoxide (CO), and 70 tons per year for particulate matter less than 10 microns in diameter (PM_{10}).

Numerous other actions are also excluded under 40 CFR 93.153[c][2]; 40 CFR 51.853[c][2]). These types of activities are primarily concerned with routine operations, maintenance actions, and administrative, planning, financial, and property transfer/disposal. Those relevant to the project at hand include;

- (1) Actions where the total of direct and indirect emissions are below the emissions levels specified in paragraph [b] of this section (i.e., de minimus levels),
- (2) The following actions which would result in no emissions increase or an increase in emissions that is clearly de minimus:
  - (ix) Maintenance dredging and debris removal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site.
  - (xiii) Routine operation of facilities, mobile assets, and equipment.

Note that 40 CFR 93.153; 40 CFR 51.852 define total of direct and indirect emissions as the sum of direct and indirect emissions increases and decreases caused by the federal action (i.e., the net emissions considering all direct and indirect emissions. The portion of emissions which are exempt or presumed to conform under §93.153, [c],[d],[e], or [f]; §51.853, [c],[d],[e], or [f] are not included in the "total of direct and indirect emissions."

Regardless of the applicable de minimus level, conformity determinations are required for nonexempt "regionally significant" actions whose direct and indirect emissions exceed 10 percent of the applicable SIP emissions inventory for a nonattainment/maintenance pollutant.

The proposed action must demonstrate conformity for the following time periods: (1) the Clean Air Act mandated attainment year, or if applicable, the farthest year for which emissions are projected in the maintenance plan, (2) the year when the total annual emissions from the proposed action are the greatest, and (3) any year for which the applicable SIP specifies an annual emissions budget. For long-term actions the appropriate years to consider for analysis would be (1) the 2010 attainment year for extreme ozone areas (VOCs and NOx emissions), any year beyond the 2000/2001 attainment deadlines for serious CO/PM_{10} areas, and (3) the project year with maximum annual emissions

Responsibility for Conformity Determinations

The federal agency undertaking the action is responsible for preparing and issuing the conformity determination under the EPA conformity rules. Other federal, state, and local agencies have review and comment responsibility, but no agency has approval/denial authority over the conformity determination.

Options for Demonstrating Conformity

If a federal action exceeds de minimus threshold for a nonattainment/maintenance pollutant, there are two types of technical analyses that can be used to demonstrate Clean Air Act conformity:

- Dispersion modeling demonstrations for primary (i.e., directly emitted) pollutants to show that there will be no violations of the National Ambient Air Quality Standards(NAAQS); or

- Emissions analyses that demonstrate that there will be no net emissions increase and that emissions will not interfere with the timely attainment and maintenance of the NAAQS.

Dispersion modeling demonstrations of conformity are not typically recommended nor allowed for ozone nonattainment areas and will seldom be feasible for other secondary pollutants (nitrogen dioxide and particulate matter). In addition, modeling may not be possible for some types of emission sources due to the lack of appropriate dispersion models. In general, dispersion modeling is most useful for carbon monoxide, lead, and sulfur dioxide nonattainment areas. Dispersion modeling may be useful in some PM_{10} nonattainment areas if secondary PM_{10} is not a significant contributor to nonattainment conditions.

If dispersion modeling is not used for the conformity demonstration, then the conformity demonstration requires either consistency with emissions forecasts in the SIP documents or identification of concurrent or prior emission reductions that will compensate for emission increases associated with a proposed action.

If EPA has not yet approved a SIP document submitted pursuant to the Clean Air Act Amendments of 1990, there are two basic options for demonstrating conformity.

- Conformity will be demonstrated if direct and indirect emissions from the action are fully offset through compensating emission reductions implemented through a federally enforceable mechanism (40 CFR 93.158[a][2]; 40 CFR 51.858[a][2]).
- Alternatively, conformity can be demonstrated by showing that the total direct and indirect emissions with the federal action do not exceed estimated future baseline scenario emissions. Future baseline scenario emissions are total direct and indirect emissions that would occur in future years if baseline (1990 or the nonattainment designation year) emission source activity levels remain constant in the geographic area affected by the federal action. The future baseline scenario represents a "no action" scenario projected to the maximum emission year for the proposed action, to the attainment year mandated by the Clean Air Act, and to any other "milestone" years identified in the existing SIP (40 CFR 93.158[a][5][iv][A]; 40 CFR 51.858[a][5][iv][A]).

If EPA has approved SIP revisions pursuant to the 1990 Clean Air Act Amendments, any one of several options can be used to demonstrate conformity.

- Conformity is presumed if direct and indirect emissions from the activity are specifically identified and accounted for in an attainment or maintenance demonstration of a SIP approved after 1990 (40 CFR 93.158[a][1]; 40 CFR 51.858[a][1]).
- Conformity will be demonstrated if direct and indirect emissions from the action are fully offset through compensating emission reductions implemented through a federally enforceable mechanism (40 CFR 93.158[a][2] and 40 CFR 93.158[a][5][iii]; 40 CFR 51.858[a][2] and 40 CFR 51.858[a][5][iii]).
- Conformity can also be demonstrated if the agency responsible for SIP preparation provides documentation that direct and indirect emissions associated with the federal agency action are accommodated within the emission forecasts contained in an approved SIP (40 CFR 93.158[a][5][i][A]; 40 CFR 51.858[a][5][i][A]).
- Finally, if SIP conformity cannot be demonstrated by the procedures noted above, a conformity determination is possible only if the relevant air quality management agency notifies EPA that appropriate changes will be made to the SIP documents. The air quality management agency must commit to a schedule for preparing an acceptable SIP amendment that accommodates the net increase in direct and indirect emissions from the federal action without causing any delay in the schedule for attaining the relevant federal ambient air quality standard (40 CFR 93.158[a][5][i][B]; 40 CFR 51.858[a][5][i][B]).

All conformity determinations must also demonstrate that the total direct and indirect emissions are consistent with all relevant requirements and milestones in the applicable SIP including:

- Reasonable further progress schedules,
- Assumptions specified in the attainment or maintenance demonstration, and
- SIP prohibitions, numerical emission limits, and work practice requirements.

3.0 UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT CONFORMITY DETERMINATION

The Upper Newport Bay restoration project would take place within the South Coast Air Basin (SCAB or Basin). The SCAB does not attain NAAQS for four of the six criteria air pollutants. Ambient carbon monoxide, ozone, and particulate levels (PM10) may reach twice the standards. In addition, SCAB is currently the only area in the country that does not attain the federal nitrogen dioxide standard. The EPA considers the SCAB to be in extreme nonattainment for ozone, serious nonattainment for CO and PM10, and nonattainment for nitrogen dioxide. However, based on nitrogen dioxide levels meeting the federal standard within the past few years, the SCAQMD is in the process of requesting redesignation. The Basin is in compliance with federal sulfur dioxide and lead standards. Based on these designations, the annual de minimus thresholds for the SCAB that would trigger a conformity determination under Section 176(c) of the 1990 Clean Air Act are 10 tons of VOCs or NOx, 100 tons of CO, or 70 tons of PM10.

The proposed action would involve dredging and minor channel construction within the Upper Newport Bay area. The total volume to be removed is estimated at approximately 2,122,000 cu yd. Subsequent to the removal of this material, periodic maintenance dredging would be performed. Post-construction dredging would include occasional dredging for maintaining the appropriate channel depth and width.

Construction

Emissions for site construction were developed based on use factors included in the DEIS/R and the reader is referred to that document for more information. Table 1 presents the projected yearly emissions for nonattainment pollutants for each of the major operations involved in the dredging operations. Note that the table is based on the highest projected yearly equipment use.

Table 1
Total Yearly Dredging Emissions (Tons per Year)

Emission Source	CO	NOx	ROG[1]	PM10
Clamshell Dredge[2]	18.5	43.7	2.2	2.4
Tug Boats[3]	9.1	53.6	3.3	3.2
Crew Boats[4]	0.5	1.3	0.7	0.1
Generators[5]	3.8	8.9	0.4	0.5
Total Yearly Emissions[6]	31.9	107.5	6.6	6.2
De minimus Threshold Values	100	10	10	70

[1] ROG (reactive organic gases) and VOC (volatile organic compounds) are used synonymously.
[2] Based on a 1,000 hp diesel engine operating 24 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[3] See DEIS/R for hp and hours of operation. Emission factors for CO, NOx, and ROG are as per AP-42, 1985, Table II-3.3. Emission factors for PM10 are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
[4] See text for hp and hours of operation. Emission factors for CO, NOx, and ROG are as per AP-42, 1985, Table II-3.5. Emission factors for PM10 are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
[5] Based on a 250 hp diesel engine operating 19.5 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[6] Assumes 280 days of operation per year.

Based on the included analysis, one may conclude that the value presented for NOx would exceed de minimus levels thereby triggering the need for a conformity determination. However, the analysis is for the entirety of the project and includes both exempted operations as well as permitted equipment, both of which are exempt from conformity requirements.

As noted above, numerous actions are also excluded under 40 CFR 93.153[c][2]; 40 CFR 51.853[c][2]). Those relevant to the project at hand include;

- Actions where the total of direct and indirect emissions are below de minimus levels,
- Maintenance dredging and debris removal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site, and
- Routine operation of facilities, mobile assets and equipment.

Also as previously discussed, the portion of emissions that are exempt or presumed to conform under are not to be included in the total of direct and indirect emissions.

Thus, that portion of the project that represents maintenance dredging (i.e., 732,000 of the 2,122,000 cubic yards) would be exempt from conformity. Table 2 removes that portion of the projected emissions that are exempt from conformity due to maintenance (as opposed to "new") dredging. Note that this exemption would include all emission sources that are relevant to the dredging operations.

Table 2
Yearly Construction Emissions for "New Dredging (Tons per Year)

Emission Source	CO	NOx	ROG[1]	PM10
Clamshell Dredge[2]	12.1	28.6	1.4	1.6
Tug Boats[3]	6.0	35.1	2.2	2.1
Crew Boats[4]	0.3	0.9	0.5	0.1
Generators[5]	2.5	5.8	0.3	0.3
Total Yearly Emissions[6]	20.9	70.4	4.4	4.1
De minimus Threshold Values	100	10	10	70

[1] ROG (reactive organic gases) and VOC (volatile organic compounds are used synonymously.
[2] Based on a 1,000 hp diesel engine operating 24 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[3] See DEIS/R for hp and hours of operation. Emission factors for CO, NOx, and ROG are as per AP-42, 1985, Table II-3.3. Emission factors for PM10 are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
[4] See text for hp and hours of operation. Emission factors for CO, NOx, and ROG are as per AP-42, 1985, Table II-3.5. Emission factors for PM10 are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
[5] Based on a 250 hp diesel engine operating 19.5 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[6] Assumes 183 days operation per year.

Other emission sources associated with the action are also exempt from conformity review and their emissions must also be removed from the emissions inventory.

The function of a tug boat is to assist ships and barges in their daily operations. The project's use of the tug boat then fills this function. As such, tug boat operations would represent "routine operations of mobile assets and equipment" and would also be exempt from conformity analysis. These emissions are then removed from the inventory.

Finally, any equipment that has an existing permit issued though the SCAQMD would be included in the SCAQMD inventory of emissions and has therefore been accounted for in the emissions inventory within the air quality management plan and ultimately the SIP. This would include the dredge and any stationary source engines in excess of 50 horsepower. This then removes both the tug boats and dredge from conformity leaving only the crew boats and possibly the generators. (Actually, any generators over 50 horsepower may also be permitted further reducing the equipment inventory.) The resultant emissions are included in Table 3.

Table 3
Yearly Construction Emissions for "Non Exempt" Dredging Equipment (Tons per Year)

Emission Source	CO	NOx	ROG[1]	PM10
Crew Boats[2]	0.3	0.9	0.5	0.1
Generators[3]	2.5	5.8	0.3	0.3
Total Yearly Emissions[4]	2.8	6.7	0.8	0.4
De minimus Threshold Values	100	10	10	70

[1] ROG (reactive organic gases) and VOC (volatile organic compounds are used synonymously.
[2] See text for hp and hours of operation. Emission factors for CO, NOx, and ROG are as per AP-42, 1985, Table II-3.5. Emission factors for PM10 are as per AP-42, 1985, Table II-7.1 for a miscellaneous piece of diesel-powered, heavy-duty construction equipment.
[3] Based on a 250 hp diesel engine operating 19.5 hours per day. Emission factors are as per AP-42, 1995, Table 3.4-1.
[4] Assumes 183 days operation per year.

The included analysis is based on the use of a clamshell dredge as this is the most probable scenario. Alternatively, the action could use a hydraulic dredge. While total emissions would be greater, like the clamshell dredge scenario, when exempt operations and equipment is removed from the inventory, residual emissions would not be expected to exceed de minimus levels.

In addition to the listed emissions, extremely small quantities of indirect emissions would also be produced from worker travel. Additionally, some heavy construction equipment could be used in the habitat restoration alternatives. Use of this equipment, however, would not exceed 1 week per year and would only add minimal emissions. Therefore, even when these other emissions sources are considered, when exempt equipment is removed from the analysis, the project is "clearly de minimus" and not subject to conformity determination.

Post-Construction

The need for maintenance dredging is a function of time and weather conditions. Obviously, wet weather would require more frequent dredging as sediments are washed into the bay. Assuming a similar mix of equipment, daily dredging operations, when required, would produce a similar level of emissions as noted for the initial dredging. However, in the case of post-construction, all equipment use, and its related emissions, would fall under "maintenance dredging" and is exempt from conformity determination. Furthermore, the project is expected to reduce the need for channel dredging in lower Newport Harbor, and total maintenance dredging within the entirety of the harbor is expected to remain about the same as it is now. As such any emissions' increase would be de minimus.

4.0 CONCLUSIONS

Using the criteria included in 40 CFR 93.153[c][2]; 40 CFR 51.853[c][2], most elements of the Upper Newport Bay wetlands restoration project are exempt from conformity determination requirements. Those operations that are not exempt would not exceed the established de minimus levels and the project is exempt from a full conformity analysis. However, because the exempt operations and equipment are included in the existing emissions baseline, the action would not cause or contribute to new violations of federal air quality standards; increase the frequency or severity of existing violations of federal air quality standards; or delay the timely attainment of federal air quality standards.