UPPER NEWPORT BAY
ECOSYSTEM RESTORATION PROJECT
ORANGE COUNTY, CALIFORNIA

DESIGN DOCUMENTATION REPORT (DDR)

PREPARED BY
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
ENGINEERING DIVISION
COASTAL ENGINEERING SECTION

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In-Progress
Design Documentation Report
For
Upper Newport Bay
Ecosystem Restoration Project

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Department of the Army, Office of the Chief of Engineers CECW-PM Memorandum to the Secretary of the Army, subject: Upper Newport Bay, Orange County, CA, dated 29 December 2000.

Record of Decision, Upper Newport Bay Ecosystem Restoration, from U.S. Army Director of Civil Works, dated 24 September 2001.

State of California Standard Agreement with County of Orange dated 30 June 2004.

Executive Office of the President, Office of Management and Budget letter to the Honorable John P. Woodley, Jr, Assistant Secretary of the Army (Civil Works), dated December 26, 2004.

California Coastal Commission Staff Recommendation on Consistency Determination No. CD-039-04, dated 7/7/2004.

Department of the Army, Office of the Assistant Secretary of the Army, Civil Works, letter to the Senate, dated 24 January 2005.

Memorandum from Larry Smith to Record, subject Upper Newport Bay Ecosystem Restoration Project, dated April 21, 2005.

County of Orange Resource & Development Management Department letter to Colonel Thomas H. Magness, subject Upper Newport Bay Ecosystem Restoration Project, dated October 16, 2007.

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1. Syllabus

The Upper Newport Bay Ecosystem Restoration, Newport Beach, Orange County, CA project was a U.S. Army Corps of Engineers project, sponsored by County of Orange and California Department of Fish and Game. Congressionally authorized for construction in WRDA 2000, the funding stream for this project was spread out and consequently two solicitation packages were prepared to construct the entire project. Cost sharing is 65% Federal and 35% Sponsor. The Federal funding in the amount of $30,820,000 was provided as follows:

- FY2003 - $972,000
- FY2004 - $500,000
- FY2005 - $1.0 million
- FY2006 - $5.0 million
- FY2007 - $5.0 million
- FY2008 - $2.2 million
- FY2009 - $2.871 million
- FY2010 - $17.36 million (American Recovery and Reinvestment Act), gave back $4.083 million, using $13.277 million

The Sponsor has provided $16.6 million, including the value for lands, easements, rights-of-way, real estate and relocations and the value of the Sponsor's Project Coordination Team which is assumed to be valued at $1.304 million. The project is turned over to the Sponsor for operation and maintenance. The ecosystem is already owned and managed by the California Department of Fish and Game, as the Upper Newport Bay Ecological Reserve. The Sponsor will be responsible for maintenance dredging of the sediment control basins.

Construction duration was 5 years, 2005 to 2010, DD-M Crane and Rigging held the construction contract from 2005 to 2009, and RDA Contracting, Inc held the second construction contract from 2009 to 2010.

Approximately 1.8 million cubic meters (2.3 million cubic yards) were removed from the ecosystem for the purpose of sediment control and habitat restoration. The two (2) constructed sediment basins are projected to require maintenance dredging on a 21-year cycle. Five (5) Shallow channels around islands were deepened to enhance protection of nesting species. Three (3) areas were restored to mudflats: 23rd Street, Shellmaker Island, and Bullnose West.

The goal of no net loss of mudflat by more than 10% was closely met with 10.6%. Marsh plants were protected, but when they needed to be removed for the construction of an island channel, the marsh plants were transplanted. The sediment basin capacity for the next 21 years is 1.75 million cubic meters (2.3 million cubic yards).

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2. Introduction and Purpose

The purpose of a Design Documentation Report (DDR) is specified in the Engineering Regulation 1110-2-1150 titled Engineering and Design for Civil Works Projects, Appendix D titled Content and Format of Design Documentation Report. The purpose of this DDR is to provide a full record of design decisions, assumptions and methods, subsequent to the Upper Newport Bay Ecosystem Restoration Feasibility Study Report. The DDR is sufficiently clear so that individuals not familiar with the project can review the contents and understand how the project evolved into its final configurations, and why each key decision was made. This DDR is sufficiently detailed, for Civil/Coastal Engineering, Geotechnical Engineering, and Environmental Planning, so that the criteria which were used, the critical assumptions which were made, and the analytical methods which were used are evident for purposes of review and historical documentation. The report includes summaries of important calculation results and selected example calculations for all critical element of the design.

The purpose of the Upper Newport Bay Ecosystem Restoration Project is to implement a plan that would control the deposition of sediments in the ecological reserve and maintain a balance of open water, mudflats and marsh areas. Two types of features are sediment control features and habitat restoration features. Goals for the design of the project features as defined in the Feasibility Report are:

No loss or gain of any habitat type by greater than 10%
Marsh areas: No net loss.
Maintain sediment capacity for 21 years at 2.1 million cubic yards

According to the Project Management Plan, (USACE November 2001), the local sponsors of the project are the County of Orange and the California Department of Fish and Game. The County of Orange signed the Design Agreement and is the sponsor of Preconstruction, Engineering and Design (PED). Along with the USACE, both the County of Orange and the California Department of Fish and Game signed the Project Cooperation Agreement (PCA September 2005) and will be the Sponsors for the construction phase of the project. The California State Coastal Conservancy and the State of California Wildlife Conservation Board provided the local share of funding for the project by separate agreement with the County of Orange.

Due to funding constraints, the project has been constructed in two phases spanning from 2005 to 2010. The first project construction contract contains base construction features designed for the funds available (mostly habitat restoration features with partial sediment control features), and three options designed for anticipated funding (two sediment control features and one habitat restoration feature). The remaining recommended plan features (except for Northstar Beach Wetland Restoration) were accomplished by a new construction contract utilizing American Recovery and Reinvestment Act (ARRA) of 2009 funding.

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3. Project Description

3.1. Datum

This DDR uses Mean Lower Low Water (MLLW) meters as datum. The Feasibility Report used Mean Sea Level (MSL) feet as datum. A conversion table showing pertinent elevations in both MLLW and MSL is presented on Table 1. Numerical values throughout the text will be reported in MLLW meters (m MLLW), with MSL feet (ft MSL) in parentheses.

3.2. Types of Features

The objective to restore and maintain the ecosystem in Upper Newport Bay results in two types of project features: sediment control and habitat restoration. A sediment control feature is the part of the project that controls sediments by settling the bulk of the sediments within a basin or channel. Habitat restoration features were developed for protection of species and restoration of wetland areas. Important for use in the design of these features is the elevation range for mudflat and marsh, reference Table 2. Figure 1 shows an aerial view of the Upper Newport Bay overlain with the project features. Figure 2 and 3 show the phasing of the project. The following is a brief list of the project features by type. A more detailed description of each feature is provided in the Engineering Studies, Investigations and Design section.

3.2.1. Sediment Control Features

- Two Sediment Basins. Expanding and deepening the existing Unit II and Unit I/III in-bay sediment control basins to –5.26m MLLW (–20ft MSL). Previously maintained depth was –3.43m MLLW (–14ft MSL). For defining the expansion limits of the basins, approximately 30 meters (100 feet) of mudflats is retained around the shoreline perimeter of the deepened Unit II and Unit I/III basins and New Least Tern Island measured at a depth of –0.1m MLLW (–3 ft MSL). In constructing the expanded and deepened basins, the mudflats lying within the expansion area would be dredged on a 1V:3H slope to a depth of –5.26m MLLW (–20 ft MSL).
- Remove and relocate Skimmer Island. Removed the 1.3-hectare (3.35-acre) least tern island (measured at MHHW +1.64 m MLLW) (Skimmer Island, also called Kidney-shaped island) from the upper Unit I/III Basin to expand the sediment trapping capacity of the Unit I/III Basin. The New Least Tern Island was created in the Unit II basin, adjacent to the western segment of the main dike, as a replacement of Skimmer Island.
- Two Access Channels to Basins. A channel is necessary through the bay to allow dredging equipment access to the project feature areas, especially the two sediment control basins. The project maintained the existing access channel from the PCH bridge to the Unit II Basin, and the access channel between Unit II and Unit I/III basin, to a depth of –3.43m MLLW (–14 ft MSL).
- Santa Ana-Delhi Channel. The trapezoidal outlet Santa Ana-Delhi Channel was reconstructed as part of the sediment control features, with 15.24m (50 ft) bottom width, 1V:3H. Depth of the channel outlet is -0.68 m MLLW (-5 ft MSL).

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Table 1: Pertinent Elevations in MLLW and MSL
Upper Newport Bay Ecosystem Restoration Project

MLLW Meters	MLLW Feet (m x 3.28)	MSL Feet (ft mllw – 2.8)	Elevation Description
3.0	9.8	7.0	Top elevation of New Least Tern Island
2.4	7.9	5.0	Lower elevation of New Least Tern Island sand layer
2.4	7.9	5.0	Top elevation of Hot Dog Tern Island after sand layer
1.65	5.4	2.6	Upper elevation limit for defining upland material, Mean Higher High Water
1.3	4.3	1.5	Upper elevation limit of mudflat
1.2	3.9	1.1	
0.9	2.8	0.0	Datum in MSL
0.23	0.8	-2.0	Lower elevation for Northstar Beach, Shellmaker Island, and Bullnose West Wetland Restoration Areas
0.0	0.0	-2.8	Datum in MLLW
-0.1	-0.2	-3.0	Lower elevation limit of mudflat for basin design, open water begins transition to
-0.5	-1.5	-4.3	Lower elevation limit of mudflat for acreage calc
-0.7	-2.2	-5.0	Depth of restoration channel between island and shore
-1.0	-3.3	-6.1	
-1.3	-4.2	-7.0	Upper elevation to define sediment capacity
-3.4	-11.2	-14.0	Depth of access channels
-4.0	-13.3	-16.0	Depth of access channels including 0.61m (2ft) allowable overdepth
-5.0	-16.4	-19.2	Depth of New Least Tern Island Pit
-5.3	-17.2	-20.0	Depth of sediment control basins

Metric	English	English	Metric
1 hectare	= 2.47 acres	1 acre	= 0.404 hectares
1 cubic meter(cm)	= 1.308 cubic yard(cy)	1 cubic yard(cy)	=0.765 cubic meter(cm)

Table 2: Habitat Area by Type; Elevations and Elevation Range in MLLW and MSL

MLLW Meters	MLLW Feet (m x 3.28)	MSL Feet (ft mllw – 2.8)	Elevation Description	Existing Habitat Area (Hectares)	Existing Habitat Area (Acres)1	Note	Project Habitat Area (Hectares)	Project Habitat Area (Acres)	Gain(+) Loss (-) %
			Developed Areas	29.1	71.8	1	29.1	71.8	0.0%
>+2.4	>+7.8	>+5.0	Uplands	25.8	63.9	3	21.7	53.5	-16.2%
+2.4 to +2	+7.8 to +6.8	+5.0 to +4.0	Salt Panne	2.8	7.0	1	0.6	1.4	-79.4%
>+2.4	>+7.8	>+5.0	Freshwater Marsh	7.1	17.6	1	7.1	17.6	0.0%
+2.4 to +2.1	+7.8 to +6.8	+5.0 to +4.0	High Salt Marsh	4.0	9.9	1	4.0	9.8	-0.7%
+2.1 to +1.8	+6.8 to +5.8	+4.0 to +3.0	Middle Salt Marsh	62.1	153.5	1	62.1	153.4	-0.1%
+1.8 to +1.3	+5.8 to +4.3	+3.0 to +1.5	Low Salt Marsh	59.0	145.9	1	58.9	145.6	-0.2%
+1.3 to -0.5	+4.3 to -1.5	+1.5 to -4.3	Intertidal Mudflat	94.2	232.8	2	84.3	208.3	-10.5%
<-0.5	<-1.5	<-4.3	Open Water (Marine)	84.7	209.4	1	101.3	250.3	19.5%
Notes:				369.0	911.8		369.0	911.7	

1) Source is Final Report Upper Newport Bay Ecosystem Restoration Feasibility Study, September 2000, page 1-8, based upon a vegetation map to the +3.9m MLLW (+10 ft MSL) contour utilizing color infrared aerial photographs of April 1997 and field survey of October 1997.

2) Intertidal Mudflat area was recomputed during PED, using March 2002 Lidar, May 2002 Hydrographic survey, and 2001 City of Newport Aerial Photographs.

3) Upland area is updated from Feasibility by adding 0.8 Ha from Northstar and 1.72 from 23rd

Figure 1. Upper Newport Bay Ecosystem Restoration Project Project Features

Upper Newport Bay Ecosystem Restoration
Project Features

WILD 15/4 UAG-S
Nr. 13367 153.32
2832

3.2.2. Habitat Restoration Features

- Five Restoration Channels Around Existing Habitat Islands. In order to restore tidal action to the area around the existing habitat islands, –0.68m MLLW (-5ft MSL) deep trapezoidal channels were dredged between the island and the shore. The channel bottom width varies as indicated in the listing below. The side slope design for each channel varied in the Feasibility report, either 1V:3H or 1V:5H. The channel side slope design is altered to be a consistent 1V:5H, except for the New Least Tern Island channel, where we specified a box cut to minimize the impact to the marsh. However, this side slope is expected to slough to a 1V:5H over time, yet maintain a section in the middle of the channel deep enough to keep the island isolated.

  Shellmaker Island, east side: 1.52 m (5 ft) bottom width
  Middle Island, west side: 3.4 m (11 ft) bottom width
  New Island, east side: 8.8 m (29 ft) bottom width
  Hot Dog Tern Island, south side: 1.52 m (5 ft) bottom width
  New Least Tern Island: 8 m (26 feet) box cut, to -1 m (-3.28 ft) depth

- Segment Main Dike at Basin II. The Main Dike at Basin II was segmented into two parts, by removing one portion of the dike, to improve the protection of the species on the New Least Tern Island from land-based disturbances.

- Three Wetland Restoration Areas. The project restored about 5.28 hectares (13.04 acres) of wetlands (mudflats) located: Shellmaker Island; a section of the northwestern edge of the Basin I/III, west of Bullnose Point, referred to as Bullnose West; and a section west of Basin II, referred to as 23rd Street.

- New Least Tern Island. The New Least Tern Island was constructed in Basin II to replace Skimmer Island which was removed from Basin I/III.

3.3. Sediment Disposal Options

Dredged material from the Upper Bay, approximately 1.8 million cubic meters (2.35 million cubic yards) was disposed in three ways: in-bay, nearshore, and offshore.

In-bay. About 120,000 cm (158,000 cy) was disposed within the boundaries of the Upper Newport Bay Ecosystem to:

- Create New Least Tern Island
- Cap Hotdog Tern Island

Nearshore. About 16,000 cm (21,000 cy) was disposed:

- Nearshore Disposal at Newport Beach, west of the pier.

Offshore. About 1,660,000 cm (2,170,000 cy) were disposed:

- LA-3 Offshore Disposal Site located in the Pacific Ocean about 7.4 kilometers (4.6 miles) southwest of the Newport Harbor entrance. The EIS for the site designation for

LA3 was completed in 2005 prior to commencement of project construction. Therefore all materials taken to LA3 were disposed of at the newly designated location.

Upland. If sediment is not accommodated as island creation in-harbor fill, then there is the option of disposing materials upland. No dredge materials were taken for upland disposal. Clearing and grubbing materials, trash and debris was disposed at appropriate upland disposal sites.

4. Pertinent Data

Table 3 shows a Summary of Pertinent Data. Includes project cost, physical features, project purpose, and controlling elevation.

Table 4 summarizes the project construction: Total; Phase 1; and Phase 2.

The project underwent numerous changes, to accommodate the goals of the project. The sediment basin capacity was compromised to accommodate the mudflat loss goals, and Table 5 presents the sediment basin capacity of the project as constructed compared to the Feasibility Study goals.

5. Design Criteria

ER 414-1-1 Biddability, Constructability, Operability and Environmental Review

EM 1110-2-1003 Hydrographic Surveying
Established survey criteria and method of measurement of dredge quantities for payment.

ER 1110-2-1150 Engineering and Design for Civil Works Projects.
Guidance for preparing this DDR.

EM 1110-2-5025 Dredging and Dredge Material Disposal

a) Analyze dredging location and quantities to be dredged, considering future needs
b) Determine the physical and chemical characteristics of the sediments
c) Identify pertinent social, environmental and institutional factors
d) Evaluate dredge plant requirements

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Table 3. Summary of Pertinent Data

Project Cost	$47,415,216
Physical Features	o 2 Sediment Control Basins widened and deepened to -5.26 meters MLLW (-20 feet MSL) Unit II, 16.1 hectares (40 acres) Unit I/III, 18.2 hectares (45 acres) o 5 shallow island restoration channels deepened to -0.7 meters MLLW (-5 feet MSL) Shellmaker Island Middle Island New Island Hotdog Tern Island New Least Tern Island o 3 mudflats restored to elevation -1.5 ft to +4.3 ft MLLW Shellmaker 23rd Street Bullnose West o 1 tern nesting island relocated from Skimmer Island to New Least Tern Island o 2 maintenance access ramps provided for nesting islands New Least Tern Island Hotdog Tern Island o Provided 2 interpretive signs and 4 interpretive buoys
Project Purpose	To construct a long-term management facility to control sediment deposition in the Upper Bay to preserve the health of Upper Newport Bay's habitats. Basin capacity is designed to allow a maintenance dredging interval of 21 years, on average.
Controlling Elevations	Regional Water Quality Control Board set the standard for sediment capacity. Maintain both the Unit II and Unit I/III basins to a minimum - 7 feet MSL. The sediment control basins shall be maintained to have at least 50% design capacity available prior to November 15 of each year. Design capacity is defined from basin deepening depth to elevation -3 feet MSL. See Sediment Basin Capacity Table 5.

UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT
April 2006 to September 2010
Table 4a. Total Volume Summary

FEATURE	START	FINISH	Volume Removed CM	Placed LA-3 CM	Placed Nearshore CM	Placed NLTI/Pit CM	Placed Hotdog Tern	Scow Volume CM	e-trac report
Access Channel Between PCH and Unit II Basin	Apr-06	Sep-10	5,800	5,800				15,467	
Northstar Beach Wetland Restoration	Feature not built per County request		na						
Shellmaker Island Wetland Restoration	Feb-07	May-08	39,400	0		33,700	5,700		
Shellmaker Island Restoration Channel	May-06	Jun-06	9,700	9,700				8,318	
Middle Island Restoration Channel	May-06	May-06	9,600	9,600				11,148	
Access Channel to 23rd Street Wetland Restoration	Apr-07	Apr-07	4,600	4,600				4,752	
23rd Street Wetland Restoration	Aug-07	Mar-08	98,200	20,000		62,200		38,305	
Rev A Nearshore	Mar-08	Apr-08			15,000			20,479	
Rev B Nearshore	May-08	May-08			1,000			1,270	
New Island Restoration Channel	Jun-06	Jul-06	16,800	16,800				9,230	
Unit II Basin	Jun-06	Sep-10	803,860	803,860				796,778	
Access Channel to New Least Tern Island Pit	Jun-06	Jun-06	3,000	3,000					
New Least Tern Island Pit	Jun-06	Feb-07	74,600	74,600				69,113	
New Least Tern Island	Feb-07	Mar-08	na						
Segment Main Dike	Jun-07	Oct-07	900			900			
Cordgrass Transplant	Nov-09	Nov-09	na						
New Least Tern Island Channel	Jan-10	Jan-10	11,000	11,000					
New Least Tern Island Ramp	Jan-10	Jan-10	na						
Access Channel Between Unit II and Unit I/III	Feb-07	Apr-07	1,060	1,060				part of Unit I/III S	
Bullnose Access	Apr-07	Apr-07	1,800	1,800				2,485	
Bullnose West Wetland Restoration	Feb-07	Nov-07	18,100			18,100			
Hotdog Tern Island Restoration Channel	Feb-07	Apr-07	6,400	6,400				7,552	
Hotdog Tern Island Sand/Shell Layer	Mar-07	Apr-07	na						
Hotdog Tern Island Maintenance Access Ramp	Mar-10	Mar-10	na						
Unit I/III Basin	Feb-07	Sep-10	691,680	691,680				661,698	
Cubic Meters			1,796,500	1,659,900	16,000	120,600	<-------	1,624,846	1,946,239
		check	1,796,500					1,632,098	
Cubic Yards	0.764555		2,349,733	2,171,067	20,927	157,739		2,125,218	2,545,584
			Volume Removed	LA-3	Nearshore	In-Bay		Scow	e-Trac
Cubic Yards, Rounded			2,349,700	2,171,100	20,900	157,700		2,125,200	2,545,600
Disposal Percentage of Total Removed				92%	1%	7%			8%

Note: September 2000 Feasibility Study estimated the total volume of material to be dredged from the Upper Bay would be approximately 2.1 million cubic yards, and initial construction would take 2 years. The project was dredged in two phases, taking close to five years, and 2.35 million cubic yards were dredged and placed at LA3, Nearshore and In-Bay.
2,190,000 cubic yards were removed from the bay
158,000 cubic yards were placed in the bay

UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT
April 2006 to July 2009
Table 4b. PHASE 1 Volume Summary

FEATURE	START	FINISH	Bid Volume CM	Volume Removed CM	Placed LA-3 CM	Placed Nearshore CM	Placed NLTI/Pit CM	Hotdog Tern Island	Scow Volume CM	e-Trac START	e-Trac FINISH	e-Trac Approx. Volume
Access Channel Between PCH and Unit II Basin	Apr-06	May-06	Lump Sum	5,800	5,800				15,467	Apr-06	Jul-06	89,720
Northstar Beach Wetland Restoration	Feature not built per County request		NA	NA	NA					Sep-06	Jun-07	515,050
Shellmaker Island Wetland Restoration	Feb-07	May-08	Lump Sum	39,400	0		33,700	5,700		Jun-07	Apr-08	500,400
Shellmaker Island Restoration Channel	May-06	Jun-06	Lump Sum	9,700	9,700				8,318	May-08	Aug-08	127,000
Middle Island Restoration Channel	May-06	May-06	Lump Sum	9,600	9,600				11,148	Mar-09	Jul-09	149,850
Access Channel to 23rd Street Wetland Restoration	Apr-07	Apr-07	Lump Sum	4,600	4,600				4,752			
23rd Street Wetland Restoration	Aug-07	Mar-08	124,906	98,200	20,000		62,200		38,305			
Rev A Nearshore	Mar-08	Apr-08				15,000			20,479			
Rev B Nearshore	May-08	May-08				1,000			1,270			
New Island Restoration Channel	Jun-06	Jul-06	Lump Sum	16,800	16,800				9,230			
Unit II Basin Base + Option + Santa Ana Delhi Channel	Jun-06	Jan-08	678,811	661,800	661,800				656,832			
Base			144,543	114,500					122,587			
Option 1			172,299	181,800					534,245			
Option 2			361,969	363,900								
Santa Ana Delhi Channel			part of Options	1,600								
Access Channel to New Least Tern Island Pit	Jun-06	Jun-06	Lump Sum	3,000	3,000							
New Least Tern Island Pit	Jun-06	Feb-07	74,626	74,600	74,600				69,113			
New Least Tern Island	Feb-07	Mar-08	NA	NA								
Segment Main Dike	Jun-07	Oct-07	part of Bullnose	900			900					
Access Channel Between Unit II and Unit I/III	Feb-07	Apr-07	Lump Sum	0	0							
Bullnose Access	Apr-07	Apr-07	part of Bullnose	1,800	1,800				2,485			
Bullnose West Wetland Restoration	Feb-07	Nov-07	19,994	18,100			18,100					
Hotdog Tern Island Restoration Channel	Feb-07	Apr-07	Lump Sum	6,400	6,400				7,552			
Hotdog Tern Island Sand/Shell Layer	Mar-07	Apr-07	part of Bullnose		0		NA					
Unit I/III Basin + Modifications	Feb-07	Jul-09	379,149	377,300	377,300				354,438			
Base			111,149	140,500								
Mod Phase 1			150,000	153,600								
Mod Phase 2			40,000	40,000								
Mod CLIN 42 & 43			78,000	43,200								
Cubic Meters			1,277,486	1,328,000	1,191,400	16,000	120,600	<-------	1,177,640			1,382,020
		check		1,328,000					1,177,639			
Cubic Yards	0.764555		1,670,888	1,736,958	1,558,292	20,927	157,739		1,540,295			1,807,614
			Bid Volume	Volume Removed	LA-3	Nearshore	In-Bay		Scow			e-Trac
Cubic Yards, Rounded			1,670,900	1,737,000	1,558,300	20,900	157,700		1,540,300			1,807,600
Disposal Percentage of Total Removed				100%	90%	1%	9%					4%

UPPER NEWPORT BAY ECOSYSTEM RESTORATION PROJECT 10/13/2010
September 2009 thru September 2010
Table 4c. PHASE 2 Volume Summary

FEATURE	START	FINISH	Bid Volume CM	Approximate Volume Removed CM	Placed LA-3 CM	Scow Volume
Access Channel Between PCH and Unit II Basin	na	na	na	na	na	na
Cordgrass Transplant	Nov-10	Nov-10	na	na	na	na
New Least Tern Island Channel	Jan-10	Jan-10	Lump Sum	11,000	11,000	7,252
New Least Tern Island Ramp	Jan-10	Jan-10	na	na	na	na
Top of Skimmer Island	Dec-10	Mar-10	10,600	10,600	10,600	part of Unit I/III S
Southern Unit I/III Basin	Jan-10	Jun-10	225,000	235,836	235,836	256,788
Additional Southern Unit I/III Basin, Closeout Phase 1	Jan-10	Feb-10	Phase 1	17,944	17,944	part of Unit I/III S
Northern Unit I/III Basin	Jun-10	Jul-10	50,000	50,000	50,000	50,472
Access Channel Between Unit II and Unit I/III	Mar-10	Mar-10	Lump Sum	1,060	1,060	part of Unit I/III S
Unit II Basin	Jul-10	Aug-10	140,000	142,060	142,060	139,946
Hotdog Tern Island Ramp	Mar-10	Mar-10	na	na	na	na
Cubic Meters			425,600	468,500	468,500	454,458
		check		468,500		
Cubic Yards	0.764555		556,664	612,775	612,775	594,409
			Bid Volume	Volume Removed	LA-3	Scow
Cubic Yards, Rounded				613,000	613,000	594,000
Disposal Percentage of Total Removed					100%	

* Volume included in Phase 1

Table 5. Sediment Basin Capacity Table

Area	Date of Survey	Cubic Meters			Cubic Yards			Percent Difference in Capacity Goal
		-1.3m MLLW	-0.1 m MLLW	Feasibility	-7 ft MSL	-3 ft MSL	Feasibility*	
Conversion from meters to feet					0.764555			
Unit II Basin	Sep-10	615,375	806,601	869,299	804,880	1,054,994	1,137,000	
Unit I/III Basin	Jun & Sep 2010	650,254	855,239	999,273	850,500	1,118,610	1,307,000	
Access Channel	Jun-10	57,508	95,779	NA	75,218	125,274	NA	
Total		1,323,137	1,757,619	1,868,572	1,730,598	2,298,878	2,444,000	5.9%

* Reference Feasibility Report page 4-29 Table 4.11

5.1. Design of Features

Figure 1 shows the location of the project features. A listing of the features of the Upper Newport Bay project is presented below. All features are discussed, whether or not they were constructed. The features are generally listed in geographical order, four groupings are presented: Downstream from Unit II Basin; Unit II Basin; Unit I/III Basin; and Miscellaneous. The dredge volume for each feature constructed is listed on Table 4, Volume Summary.

Downstream Features

- Access Channel between PCH and Unit II Basin.

The purpose of the access channel is to maintain the dredge and barge equipment access from the Pacific Coast Highway (PCH) Bridge to the Unit II basin at depth of –3.4 m MLLW (–14 ft MSL). Plan view is shown on Figure 1. Contractually, this feature was left to the Construction Contractor to determine the need for dredging in any of the area. Many of the shoaled areas are very minor and in the corners of the channel. A few areas were dredged and dredge material was placed at LA-3.

- Plant eelgrass beds, not constructed

The original plan called for Eelgrass to be planted in a 0.24-hectare (0.6-acre) area south of and on the west side of Shellmaker Island, on the east side of the Access Channel. Recent efforts for planting eelgrass in the area have been unsuccessful; therefore, with concurrence with National Marine Fisheries Service, this feature was dropped from the project in 2005.

- Northstar Beach Wetland Restoration, not constructed

Northstar Beach Wetland Restoration was intended to restore and sand-filled area to mudflat. The area of mudflat restored would help offset the mudflat loss of the overall project. At the request of the County of Orange, this restoration feature was not constructed. County of Orange letter dated 16 October 2008 states "we received objections from a group of users that opposed using Northstar Beach as a wetland restoration site because it currently serves active recreation", and agreed to look at alternate sites. Alternate sites investigated were:

1) Expansion of 23rd Street Wetland Restoration Area. This would be costly and the filled area that would be excavated contains plants of special interest such as spiny rush, and the trap-door spider habitat.
2) Area south of Newport Aquatic Center. This area was eliminated due to the sighting of a least belle's vireo; existence of salt marsh bird's beak; numerous plants of special interest such as spiny rush and cactus; and the need for hydraulic modeling of the freshwater flow.

Alternate sites never became feasible, and the offset of mudflat loss came instead by reducing the size of Unit I/III Basin, hence reducing the take area of mudflat.

This habitat restoration feature would have restored the mudflats at Northstar Beach. A 0.8 hectares (2.0 acres) area would have been graded a distance of 4 meters (13 feet) from the edge of pavement and/or utilities along Northstar Lane and White Cliff Drive down to mudflat elevation and then sloped to drain. Side slopes of channel would have been 1V:5H. No

interior island would have been created as implied by the Feasibility Study, since the geometry of the area would not support such a design. The excavated materials would have been used to create the New Least Tern Island, and any extra material that was beach compatible would have been placed nearshore. The City of Newport Beach debris removal operation was temporarily relocated to Lower Castaways during construction, but will be restored to its original location and operation.

- Shellmaker Island Wetland Restoration

To restore wetland area on the west side of Shellmaker Island, prior dredge spoils were removed from the upland area at approximate elevation +2.5 m MLLW (+5 ft MSL) to elevation +0.3 m MLLW (-1.8 ft MSL). Approximately 1.57 hectares (3.88 acres) were originally created, then modified and increased to a total of 1.75 hectares (4.3 acres). The wetland area was graded with a 1V:5H slope from the top elevation to elevation +1.3 m MLLW, and sloped to drain from the eastern edge down to +0.3m MLLW (-1.8ft MSL) elevation. The western limit of wetland boundary daylights at +0.3m MLLW (-1.8ft MSL) elevation.

The sandy material removed from the island was used to resurface Hot Dog Tern Island, and then used in the construction of the top of the New Least Tern Island. All material was disposed in-bay, none was taken nearshore. Material was bulldozed to stationary 10-inch cutter-suction dredge "Pelican", waiting in an access channel dug through the mudflat. Material was then pumped to its destination, first to Hodog Tern Island, then to New Least Tern Island. Access channel was backfilled with existing adjacent material with the use of an amphibious excavator.

The boundaries of the wetland have been offset from the known presence of Salt Marsh Bird's Beak. The location of the Bird's Beak is documented in the MEC Analytical Systems, Inc. 2003 report, subsequently updated in 2006 and 2007. The P&S contracting language included language to protect the existing plants.

- Shellmaker Island, small dendritic channel, not constructed

The dendritic channel has been eliminated from the project because it cannot be constructed without disruption to an endangered species, the Salt Marsh Bird's Beak. A Focused Survey of Salt Marsh Bird's Beak was conducted at Upper Newport Bay in August 2003, reference MEC Analytical Systems, Inc. 2003, found Bird's Beak on Shellmaker Island in the area of the proposed dendritic channels.

- Shellmaker Island Restoration Channel

To restore tidal action around Shellmaker Island, the project provided a channel on the east side of the island. The channel starts at approximate station 0+700 instead of station 0+000 to avoid impacts to Salt Marsh Bird's Beak and other species. According to California Fish and Game personnel, the channel area from station 0+000 to 0+700 is performing satisfactorily, is close to habitat for the Salt Marsh Bird's Beak and a crab colony living in the area and therefore does not need to be dredged. The channel was deepened to -0.68 m MLLW (-5 feet MSL) with the 10-inch hydraulic cutter suction dredge "Pelican". The dredge material was pumped into scows and hauled to ocean disposal site LA-3. Some of the rocky material proved

difficult to dredge with the small hydraulic dredge and was unable to get the entire channel to grade. Subsequent cleanup of the channel was performed with an amphibious excavator and the material was side-cast onto the side slopes.

- Middle Island Restoration Channel.

To restore tidal action around Middle Island, the project provided a channel on the west side of the island. The channel was deepened to -0.68 m MLLW (-5 feet MSL) with the 10-inch hydraulic cutter suction dredge "Pelican". The dredge material was pumped into scows and hauled to ocean disposal site LA-3. Some of the rocky material proved difficult to dredge with the small hydraulic dredge and was unable to get the entire channel to grade. Subsequent cleanup of the channel was performed with an amphibious excavator and the material was side-cast onto the side slopes.

Unit II Basin

- New Island Restoration Channel.

To restore tidal action around New Island, the project provided a channel on the east side of the island. The channel was deepened to -0.68 m MLLW (-5 feet MSL) with the 10-inch hydraulic cutter suction dredge "Pelican". The dredge material was pumped into scows and hauled to ocean disposal site LA-3.

- 23rd Street Wetland Restoration

An area of mudflats near 23rd Street was a former dredge spoil area for the dredged Unit II Basin. These sediments were placed directly upon existing mudflats at the time. As part of this project, a portion of this area was excavated to become a mudflat again. From the existing ground on the western side, a 1V:3H slope will be cut down to elevation +1.3m MLLW (+1.5ft MSL). The area will then be sloped to elevation –0.47m MLLW (-4.3ft MSL). Then with a 1V:3H slope back up to daylight, which varies around +2 m MLLW (+3.8 ft MSL) on the eastern side.

The original design was to convert 2.03 hectares (5 acres) of upland area into mudflat. Review of the area under construction revealed that a portion of the upland to the north was freshwater marsh, so the boundary for construction was altered to take this area out of construction. Additionally, upland removal near the existing bluffs to the south was protested by a homeowner. Upon consultation with the County of Orange, the design was altered to offset 38 meters (125 feet) from the bluff, thereby reducing the size of the wetland restoration area. For these two reasons the total wetland restoration area was reduced. The wetland restoration area became 1.6 hectares (4 acres). Materials excavated from this site were used in the construction of the New Least Tern Island Pit, and disposed nearshore and at LA-3.

There is marsh land between the restoration area (mudflat) and the open water. Originally, two circulation channels were presumed to allow tidal influence into the mudflat, on the northern and southern ends. The existing channel to the north that would provide water circulation into and out of the mudflat was at an elevation higher than the lowest point of the mudflat. No

channel was dug to the north since construction of a deeper channel would have destroyed a portion of the marsh.

The circulation channel to the south was presumed to have been the scow channel remaining for mudflat construction. However, the scow channel was not constructed. The contractor attempted to construct the scow channel, but resistant material was encountered and the scow channel was abandoned. A field decision was made to allow the contractor to instead, construct a ramp across the mudflat, made of the excavated material, and with a bulldozer push material to the awaiting hydraulic dredge "Pelican". The "Pelican" was stationed in water deep enough to pump the excavated material to the New Least Tern Island or into a scow for hauling to LA-3 and nearshore.

Since there was no scow channel, a contract modification was issued for construction of a southern water channel to provide water circulation to the mudflat. The tide brought water into the newly constructed mudflat area, however without the southern water channel, not all of the water was able to drain off of the mudflat. The amphibious excavator excavated to -0.5 meters MLLW with a minimum 2 meter width and 1V:3H side slopes, for a length of approximately 70 meters. Approximately 1000 cubic meters of material was excavated from the channel and disposed by spreading out along the adjacent mudflat. There is a portion of the restored mudflat, on the eastern side, that continues to be covered with a few inches of water even at low tide. This was acceptable to California Department of Fish and Game. At the northern edge of the mudflat, fresh water enters the area. While the tide is going out, water exits the southern edge and water is entering on the northern edge.

The 23rd Street Wetland Restoration area is historically known for its springs. The springs were covered up with dredge spoils from the original dredging of Basin II. But the water from the springs emerged out the face of spoils. The landscape prior to this project included an erosion area of the dredge sediments. Upon removal of a portion of the historically placed dredge sediments and shaping of the 1V:3H cut slope, a section of the slope was weakened by the spring, and the slope was unstable. The Department of Fish and Game and the County of Orange were consulted and the decision was made to leave the area to nature. To stop the spring from eroding this area would require a major engineering effort. The water is not only surficial; it is seeping out of the cut slope. It cannot be addressed by reveting the surface only. To date, the area eroding is slightly north of the prior location along the slope. Many native plants have become established in the eroded section, due to the constant source of spring water.

- Unit II Sediment Control Basin.

The project provided for the deepening and expansion of the sediment basins. Unit II sediment control basin, sometimes referred to as the lower basin, was expanded to the west and deepened to a depth of –5.26 m MLLW (-20 ft MSL). Perimeter mudflats were maintained at 1V:33H side slopes from elevation +0.9 m to –0.1 m MLLW (0 ft to –3ft MSL). At the top of slope of the basin, a 1V:3H side slopes from elevation –0.1 m to –5.26 m MLLW (-3 ft to -20 ft MSL). The basin design has been modified from the Feasibility Study to include these 1V:3H side slopes. The Feasibility Study had proposed a 1V:5H slope. The governing criteria

in the decision to modify the side slopes was to reduce the impact to existing mudflat acreage and maintain a total (of the entire project area) sediment load capacity below elevation –0.1 m MLLW (-3 ft MSL) of approximately 1.6 million cm (2.1 million CY). The side slopes are considered stable at a 1V:3H as evidenced by the existing cross-sectional views of the basin and a geotechnical analysis performed for slope stability (see Geotechnical Appendix). The requirement for a 30 meter (100 feet) perimeter mudflat around the basin edge resulting in a 1V:33H side slopes from +0.9 m to –0.1 m MLLW (0 ft to –3 ft MSL) is an approximate guideline, and has been shortened in areas to avoid filling in shallow areas.

Unit II Basin was dredged under the first contract, utilizing an allowable overdepth of plus or minus 0.5 meters. After the first contract, the Unit II Basin had many areas above -5 meters MLLW. And significant shoaling had occurred from the construction of New Least Tern Island and from the natural shoaling occurring over time. The second contract included removal of material to grade using the standard 0.5 meter overdepth allowance. Except for the area closest to the New Least Tern Island, the Unit II Basin was dredged to grade.

A total of 803,860 CM (1,051,409 CY) were removed from Unit II Sediment Basin and disposed at LA-3. Based upon Corps of Engineers hydrographic survey dated September 2010, the capacity of the Unit II Sediment Basin is shown on Table 5.

- Santa Ana-Delhi Channel Sediment Control.

To increase the capacity of the Santa Ana-Delhi Channel inlet, the channel inlet was excavated to -0.68 m MLLW (-5 feet MSL) with the 10-inch hydraulic cutter suction dredge “Pelican” for a distance of 93 meters (305 feet). Dredge material was placed at LA-3.

- New Least Tern Island.

Construction of New Least Tern Island adjacent to Main Dike replaced the least tern island removed from Unit I/III Basin (Skimmer Island). The New Least Tern Island was constructed of sandy material, utilizing the existing Main Dike as the Northeast perimeter. The island was built out to the southwest from the dike.

A foundation was excavated to depth of –5 m MLLW (-19.2 MSL), 1V:3H side slope, called the New Least Tern Island Pit. Bay mud was removed and disposed at LA-3. 23rd Street Wetland Restoration material was put in its place. The top of the island was made by pumping material from Shellmaker Island Wetland Restoration. Top elevation of the island is approximately +3 meter MLLW (+7 feet MSL) and the area is 0.9 hectares (2.3 acres). Side slopes of the island are 1V:5H, making the island area 1.3 hectares (3.35 acres) at elevation +1.65 m MLLW (+2.6 ft MSL), which is the elevation of the mean higher high water elevation.

There were some difficulties during the construction of the island. Contractor was given the option to dredge an access channel into the pit from the Unit II Basin, which he choose to do. In fact, a larger access channel was dredged than originally designed because of the equipment needs of the contractor. It was intended that the contractor “plug” the access channel with a sand berm before filling the pit with material from 23rd Street Wetland Restoration site. However, it would appear that this step was not taken, and some of the material pumped into the pit flowed out through the access channel area into the Unit II Basin. This created two

problems, one was that more material was required to reach the top island elevation, and second, unanticipated material shoaled into a recently deepened Unit II Basin. Additional material was acquired from Shellmaker Island Wetland Restoration through its expansion; and cleanup of a portion of the shoaled material was accomplished under the second contract.

California Department of Fish and Game has the responsibility to clear the vegetation from the islands for the nesting California Least Terns. Originally, to make the island accessible by boat, a small boat ramp was designed with rock and geotextile fabric. However, the area where the ramp was to have been placed had been deepened as part of the access channel and no longer had the configuration needed to support the ramp design. In lieu of the geotextile fabric and rock design, California Department of Fish and Game proposed that the end of the existing dike be graded to a shallow ramp to allow easier equipment access. A ramp was graded by the amphibious excavator provided under the second contract. The DFG boat can be beached and equipment unloaded and rolled up the ramp.

- Segment Main Dike

The Main Dike has been used for human access as well as access for terrestrial predators such as racoons, cats, and coyotes. Removal of a segment of the main dike is intended to improve habitat quality by discouraging access. The existing main dike was segmented in one place to discourage access to the New Least Tern Island. The void length is about 3 meters (10 feet) at elevation –0.68m MLLW (-5ft MSL). The excavated slopes are 1V:5H. Approximately 900 cm (1,177 cy) of artificial fill material was removed from the Main Dike. This restoration feature would reduce disturbance to wetland birds from humans and terrestrial predators. However, since coyotes swim, it has not completely discouraged the coyotes from accessing the island.

- New Least Tern Island Channel

This is an added feature. After the Main Dike was segmented, California Department of Fish and Game personnel noticed that the island was not adequately isolated at low tide. Removal of a segment of the dike connected the Unit II Basin to a very shallow channel on the east side of the dike that did not have water at all times, thereby making it easier for predator access. CDFG requested an adequate channel be dug to properly isolate the channel. This channel had been discussed among the planners, designers and agencies, but it was not included in the design. One of the goals for the project was to take no marsh, but in order to provide an adequate channel, marsh land needed to be removed.

Creation of an adequate channel required cutting through approximately 500 square meters (5,382 square feet) of marshland. In order to compensate for the cutting of marsh plants, approximately 5,400 cordgrass plants were transplanted into three times this area, 1,514 square meters (16,300 square feet) , on the western edge of the New Least Tern Island, between elevations +1 and +2 meters MLLW (+0.5 and +4 feet MSL). This area for transplant was the only area in the entire bay that was suitable for transplantation. Areas of the bay which were the proper elevation already had the marsh plants growing on them. Since this area was newly constructed, the plants had not migrated to the area yet, and provided an opportunity for us to transplant.

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After the cordgrass was transplanted, the channel was dug with the 10-inch hydraulic cutter suction dredge "Pelican". A box channel was dug 8 meters (26 feet) wide to elevation -0.68 m MLLW (-5 feet MSL). The box cut minimized the taking of cordgrass. The width of the channel is wide enough to allow the side slopes, over time, to adjust to their natural repose. The channel courses from the Unit II Basin around the island along the back side of the Main Dike to the Access Channel, approximately 530 meters (1,740 feet). Approximately 7,250 cm (9,500 cy) of material was taken from the channel and disposed at LA-3.

Unit I/III Basin

- Access Channel between Unit I/III and Unit II Basins Sediment Control.

The purpose of the access channel is to maintain the dredge and barge equipment access between the Unit II and Unit I/III Basins. Maintenance of the Access Channel between Unit II Basin at Unit I/III was the responsibility of the Construction Contractor for the duration of the contract. The channel depth is –3.4 m MLLW (-14 ft MSL). The width of the channel is 30.5 meters (100 feet). Approximately 1060 cm (1,386 CY) were removed under the second contract, and disposed at LA-3.

- Bullnose West Wetland Restoration

A 1.93 hectare (4.77 acre) area, just downstream (west) of Bullnose Point, was restored to mudflat. The south boundary of the newly constructed wetland daylights at +0.23 m MLLW and slopes to drain toward Unit I/III sediment control basin.

Originally the Feasibility plan for mudflat creation at the bullnose section in the NW corner of Basin I/III was thought to create 1.5 hectares (3.7 acres) of intertidal mudflat, reducing the upland area from elevation +2.4 m (+5 ft MSL) down to elevation +0.2 m MLLW (–2 ft MSL), requiring 32,000 cm (42,000 cy) of material excavation. A topographic survey of the area reveals the existing topography to be higher than the +2.4 m MLLW (+5 ft MSL) elevation shown in the Feasibility Study. The design would yield very little mudflat for the amount of excavation required, and the costs would be exorbitant. The salt panne area west of Bullnose was pursued for mudflat creation in lieu of the plan proposed for the Bullnose Point in the Feasibility Study.

For construction, the area shape on the contract plans was based upon the vegetation at the time of design. When it came time for actual construction, the area shape was modified to avoid taking pickleweed. We were able to keep the total area measurement the same, expanding into areas of insignificance while pulling away from areas of significance.

The Construction Contractor needed an access channel through the mudflat area isolating the wetland restoration area, as well as an access channel through the restoration area in order to achieve floatation and adequate water flow to the pumps of the hydraulic dredge. This access channel needed to be a minimum of 12.5m (41 feet) wide and -1.25m MLLW (-7 ft MSL) deep. The 10-inch hydraulic cutter suction dredge "Pelican" cut this access channel through the Bullnose Wetland Restoration Area.

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A berm was created to keep out the tide while a bulldozer worked the area to grade. Material was pushed to the Pelican, which pumped the material to the New Least Tern Island Pit. After the creation of the mudflat, the access area was backfilled with material from the Unit I/III Basin, using the clamshell dredge on CB-3.

- Hotdog Tern Island Restoration Channel.

To restore tidal action around Hotdog Tern Island, the project provided a channel on the south side of the island. The channel was deepened to -0.68 m MLLW (-5 feet MSL) with the 10-inch hydraulic cutter suction dredge "Pelican". Approximately 6,400 cm (8,370 cy) of dredge material was placed at LA-3.

- Hotdog Tern Island sand/shell layer.

The surface of the existing Hotdog Tern Island was composed of the fine-grained material that has allowed vegetation to grow. To enhance the island for least tern habitat, the island surface was cleared of vegetation and courser-grained material replaced the fine grain material on the island surface. The materials above the elevation +2.4 m MLLW (+5.0 ft MSL) were intended to be removed from the island area and placed into the New Least Tern Island Pit. Instead of removing these materials, the Contractor saw an opportunity to grade the materials to below elevation +2.4 m MLLW (+5.0 ft MSL) on site. This slightly expanded the area of the island, and covered some existing perimeter vegetation. A 0.61 meter (2 feet) layer of sandy material was placed over the +2.4 meter MLLW elevation surface, with side slopes of 1V:3H. The purpose of the 0.61-meter (two foot) sand/shell layer is to increase the success of the Hotdog Tern Island for California least tern nesting habitat. Source of sand/shell material was Shellmaker Island Wetland Restoration areas.

- Hotdog Tern Island Maintenance Access Ramp.

A geotextile and rock ramp was constructed between the top of the tern island and the restoration channel, providing access across the mudflat and vegetation in the tidal zone. The original design called for a rock ramp across the restoration channel, below the low tide, such that an ATV could access to the island from land. The restoration channel was not supposed to be deepened in the area of the ramp; however, the contractor deepened the area. This made the ramp across the channel no longer practical. Coordination with California Department of Fish and Game resulted in the present design, a rock ramp to make crossing the mudflat easier on foot. The ramp is only on the island side of the restoration channel, therefore a shallow boat is needed to reach the edge of the ramp. The original width of the ramp was to accommodate an ATV; however, in March 2010 CDFG no longer saw the need for an ATV to access the island and reduced the width of the ramp to lessen the impact on the existing vegetation. The ramp was located in the southeast quadrant of the island. After clearing vegetation, geotexile, double layer was placed and abc placed on top. Due to difficulties in locating a source for the gradation specified for the abc, a coarser gradation was accepted and placed.

- Remove Skimmer Island ("Kidney" shaped).

Skimmer Island was removed and relocated as the New Least Tern Island. Removal of the island increases the sediment capacity of the Unit I/III Basin. After clearing and grubbing of the island, the removal of Skimmer Island involves the removal of the top of the island above elevation +1.65m MLLW (+2.6 ft MSL) for disposal at LA-3. Due to the spread of contract

funding and resultant construction timing, there was not the opportunity to place the upland materials into the New Least Tern Island Pit as originally planned. The top materials were geotechnically investigated for suitability for nearshore placement (SK-1, SK-2, and SK-3). The samples contained too high of a fine content for nearshore placement. The remainder of the island was dredged and disposed along with the entire Unit I/III Sediment Control Basin. However, due to lack of funding, a portion of the island did not become part of the Unit I/III Basin and was left as mudflat, a 0.5 hectare (1.2 acre) portion, measured from the original +1.3 m MLLW (+1.5 ft MSL) contour elevation line defining the island.

- Maintain northeast corner of Basin I/III intact.

The limits of the deepened Unit I/III Basin do not encroach into the mudflats in the northeast corner of Unit I/III Basin.

- Unit I/III Sediment Control Basin.

Approximately __% of the original design for Unit I/III Basin was deepened to depth of –5.26 m MLLW (-20 ft MSL); with perimeter mudflats at 1V:33H side slopes from +0.9 m to –0.1 m MLLW (0 ft to –3 ft MSL); and 1V:3H side slopes from –0.1 m to –5.2 m MLLW (-3 ft to -20 ft MSL). The basin design has been modified from the Feasibility Study to include a 1V:3H side slopes from the mudflat elevation of –0.1m MLLW (-3ft MSL) to the basin depth of –5.26m MLLW (–20 ft MSL). The Feasibility Study proposed a 1V:5H slope. The governing criteria in the decision to modify the side slopes is to reduce the impact to existing mudflat acreage and maintain a total (of the entire project area) sediment load capacity below elevation –0.1m MLLW (-3ft MSL) of approximately 1.6 million cm (2.1 million cy). The side slopes are considered stable at a 1V:3H as evidenced by the existing cross-sectional views of the basin and a geotechnical analysis performed for slope stability (see Geotechnical Appendix). The requirement for a 30 meter (100 feet) perimeter mudflat around the basin edge resulting in a 1V:33H side slope from +0.9m to –0.1m MLLW (0ft to –3ft MSL) is an approximate guideline, and has been shortened in areas to avoid filling in shallow areas.
Unit I/III Basin was partially dredged under the first contract. As funding allowed, additional areas were added to the contract. The first contract utilized the CB-3 barge mounted with a clamshell dredge. Under the first contract it became evident that the northern portion of the basin contained quaternary deposits that were occasionally resistant and increased dredging production time. The second contract subdivided the basin into North and South to allow for differences in production time. The second contract utilized the CB-3 mounted with a marine excavator instead of a clamshell dredge. This equipment setup made increased production.

A total of 691,680 CM (904,683 CY) were removed from Unit I/III Sediment Basin and disposed at LA-3. Based upon Corps of Engineers hydrographic survey dated June and September 2010, the capacity of the Unit I/III Sediment Basin is shown on Table 5.

- Scour Protection San Diego Creek.

To provide added protection to the Jamboree Road Bridge crossing San Diego Creek , the Feasibility Study assumed that the existing scour protection apron at the mouth of San Diego Creek had been placed on a slope to the bottom elevation of the Unit I/III Basin –3.4m MLLW (-14 ft MSL). The proposed project feature was to extend the scour protection apron downward to the excavated basin depth of –5.2m MLLW (-20 ft MSL). However, in 1998, a

scour protection apron was constructed immediately downstream of San Diego Creek. This rock apron consisting of 1 to 2 ton stone placed at approximate elevation 0 m MLLW (-2 to +3 feet MSL) provides adequate scour protection to the Jamboree Bridge. The Feasibility Study did not acknowledge the existence of this rock protective structure, and therefore the scour protection measure described for construction was no longer practical to construct. The solution was to offset the toe of the Unit I/III Basin 50 to 75 meters (164 to 246 feet) from the existing rock apron. This had minimal effect to the capacity of the Unit I/III Basin. Therefore there was no project feature constructed.

Miscellaneous

- Information Kiosks

Two land Information Kiosks pre-manufactured from the Great Lakes Specialty Products company were installed into concrete footings. One kiosk was installed near the Muth Interpretive Center, and the other kiosk was installed along the west side nature trail, alongside Irvine Blvd. Additionally, seven small buoys were provided with signs as notification to stay out of the island side channels. Also, 4 large marker sign buoys were provided, with the ability to mount interpretive signs. Newport Bay Naturalists and Friends, California Department of Fish and Game, and County of Orange designed the signs, and the signs were printed by the City of Newport Beach. Signs for each buoy would be unique to the area of buoy deployment.

The four Floating Interpretive Signs are placed in the bay as follows:

1. The Access Channel between Middle Island and Shellmaker Island.
    - Facts
    - Species that might be observed
    - Boundary map
    - Guidelines and rules
2. Big Canyon, located in the Access Channel
    - Facts
    - Species
3. Unit II Basin, located at the southern end
    - Facts
    - Species
    - Temp breeding Season Closure
4. New Least Tern Island, located at the island channel
    - Facts
    - Species
    - Closed Channel Information

5.2. Numerical Modeling

Throughout the Feasibility Report, reference is made to numerical modeling during the PED phase. There was no numerical modeling conducted during the PED phase. The numerical model would not have generated any additional information to base any technical decisions upon, and was therefore considered unnecessary.

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Page 5-5: "Detailed numerical modeling of the recommended plan will be used to determine whether future maintenance will be required for any of the restoration areas, but this modeling will not be initiated until the PED phase."

5.3. Civil

5.3.1. Survey and Mapping

Tidal Datum. The surveys conducted for the study of Upper Newport Bay used the tidal datum from the tidal epoch 1960-1978, metric. On April 21, 2003, U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) published new tidal datum for the Newport Beach, Newport Bay Entrance, Tidal Epoch is 1983-2001. However, to be consistent with the previous work, the previous published tidal datum (1960-1978) has been used in the design of this project.

LIDAR. Laser scan xyz data of land areas.
In March 2002, John Chance Land Surveys, Inc. (JCLS) was contracted to J.T. Blankinship & Associates through the St. Louis District Corps of Engineers for the Los Angeles District Corps of Engineers for support of the Upper Newport Bay Ecosystem Restoration Project. The purpose of the survey was to obtain a topographic survey and develop digital terrain model (DTM) of the project area to facilitate project layout and determining dredge and excavation volumes. The survey was accomplished utilizing aerial topographic laser surveying techniques (LIDAR).

In order to have coverage of the Upper Newport Bay area, JCLS flew three flights: on Sunday March 10, 2002, Tuesday March 12, 2002 and Wednesday March 13, 2002. Each flight had a different tidal influence.

The data collection process results in an ASCII data file that was imported into Terramodel where the data was linked and contoured. The data was cleaned, removing outliers. Upon importing the ASCII file into Terramodel, DTM candidates were linked and contoured at one-foot intervals. Once contoured, JCLS personnel removed most of the bluffs. JCLS personnel made an exception in areas where the beachfronts narrowed, and the bluffs remain to better define the surface.

Corps Survey. The LIDAR survey was supplemented by land and hydrographic surveys conducted by the U.S. Army Corps of Engineers, Los Angeles District. Hydrographic surveys were conducted 17 May 2002. Hydrographic soundings from single beam and multibeam surveys were performed. A land survey was conducted July 23-29, 2003 of the Salt Dike, Jamboree Weir, and 23rd Street Wetland Restoration Area; Oct 14, 2003 of Whitecliffs Dr. and Newport Aquatic Center areas. Data files were merged with the LIDAR data file, and the land topography survey governed over the LIDAR.

Aerial Photography. Aerial photographs were flown 25 February 2002 by I.K. Curtis, at 1 inch = 300 feet scale. The photographs were unable to be orthorectified, so they were not used for mapping. However, they were used as visual reference during design development. Eagle Aerial photos flown 29 April 2002 are orthorectified, and were used as a base map during

design development. The photographs do not meet the resolution needs of a base map for contract plans.

2002 Aerial Photography provided by the City of Newport Beach is orthorectified, and was used in the development of the contract plans and the delineation of the existing mudflat area.

Base map. A base map was developed for contract plans by using the hydrographic and topographic survey, and the property boundary map furnished by Orange County.

5.3.2. Channel Dimensions and Alignment

See Pertinent Data Table 6.

5.3.3. Stability of Shoreline and Harbor Structures

There are no harbor structures in the project area, except for the two bridges. The Jamboree Bridge has an existing rock apron to provide scour protection, and the Unit I/III Basin limits offset 50 to 75 meters from the rock apron. The Pacific Coast Highway Bridge is in the path from the dredge locations to the ocean and nearshore disposal locations. The construction contractor installed bumpers to the bridge piles as protection in case of collision. Approximately 5,000 tug and scow trips passed under PCH, and there were no incidents.

The stability of the shoreline was evaluated in several places. The primary location is the dredge cut slopes around the entire perimeter of the sediment control basins. The dredge cut slope was determined to be 1V:3H. The cut slopes within the tidal zone will stablilize to 1V:5H over time. The cut slope below the tidal zone should remain stable at 1V:3H. The shallow restoration channels and the wetland restoration areas were cut with side slopes of 1V:5H, because they are predominately in the tidal zone. The tidal action causes flatter slopes.

Features that are adjacent to shoreline structures are as follows:
Shellmaker Island Restoration Channel: adjacent to road, the design of the channel followed the path of the existing channel.
Middle Island Restoration Channel: adjacent bluff top homes, the design of the channel followed the path of the existing channel.
23rd Street Wetland Restoration: adjacent bluff top homes

Recommended boundary changes to the plans for 23rd Street Wetland Restoration have two offsets, resulting in a decrease in volume excavated/dredged. The intent of the design change to the slope below Galaxy Drive was to provide an offset from the toe of the existing slope below homes on Galaxy Drive. The offset is a 38-meter bench (125-feet bench). The excavated slope to mudflat is designed as 1V:3H resulting in approximately 60 meters in plan from the toe of the existing slope to toe of mudflat boundary. The intent of the design change to the West slope is to provide a 3-meter offset from the original boundary.

New Least Tern Island: The New Least Tern Island was constructed adjacent to the main dike utilizing the main dike as one edge of island creation. The slope stability of the island edges was constructed at 1V:5H, being subject to tidal influence.

Table 6. Feature Pertinent Data
Upper Newport Bay Ecosystem Restoration 2/2/2011

Sediment Control/Habitat Restoration Features	Channel or Other Feature						Wetland Restoration				
	Depth meters MLLW	Width meters	Length meters	Side Slopes	Surface Area (Hectares)	Surface Area (Square feet)	Height meters MLLW	Width meters	Length meters	Side Slopes	Area Mudflat gain hectares
Access Channel between PCH and Basin II	-3.43	30.48	4087	1V:3H	14.23	1,531,051					
Northstar Beach Wetland Restoration							not constructed				
ShellMaker Island Wetland Restoration					2.50	268,983	+1.3 to +0.3	30 to 90	250	1V:5H	1.75
ShellMaker Island Restoration Channel	-0.68	1.52	540	1V:5H	0.75	80,695					
Middle Island Restoration Channel	-0.68	3.4	836	1V:5H	1.38	148,479					
New Island Restoration Channel	-0.68	8.8	962	1V:5H	2.02	217,338					
23rd Street Wetland Restoration					2.97	319,552	+1.3 to -0.47	10 to 90	400	1V:3H	1.60
23rd Street Water Channel	0.00	2	30	1V:3H		0					
23rd Street scow channel excavation	not constructed										
Unit II Basin Sediment Control	-5.26	varies	varies	1V:3H	15.84	1,704,276					
Santa-Ana Delhi Channel Sediment Control	-0.68	15.24	93	1V:3H	0.20	21,519					
New Least Tern Island Pit excavation	-5.00	65	95 to 170	1V:3H	1.83	196,896					
New Least Tern Island (above existing mudline)					0.95	102,214	+3.0	5 to 70	220	1V:5H	
Segment Main Dike	-0.68	3	40	1V:5H	0.01	1,291					
Access Channel between Basin II and Basin I/III	-3.43	30.48	1446	1V:3H	3.38	363,665					
Bullnose West Wetland Restoration					2.27	244,237	+1.3 to +0.23	5 to 110	500	1V:5H	1.93
Unit I/III Basin Sediment Control	-5.26	30 to 150	870	1V:3H	23.25	2,501,542					
Hotdog Tern Island grade top material	2.40	22	192	na	0.43	46,265					
Hotdog Tern Island sand/shell layer	1.3 to 2.4	45	270	1V:3H	1.21	130,188					
Hotdog Tern Island Maintenance Access Ramp	-1.0 to 1.0	2.25	12	1V:1H	0.0027	291					
Hotdog Tern Island Restoration Channel	-0.68	1.52	368	1V:5H	0.81	87,150					

5.3.4. Dredge and Disposal Plan

In-Bay Disposal. Materials excavated or dredged below the Mean Higher High Water elevation (+1.65 m MLLW) are suitable for in-harbor fill and/or ocean disposal, and if the materials are compatible, they may be placed in the nearshore zone for beach nourishment purposes. Materials excavated above the Mean Higher High Water elevation are unsuitable for ocean disposal, but may be used for in-bay fills, and nearshore disposal if materials are compatible.

Ocean Disposal Regulation (based upon the London Convention (LC72) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter) prohibits the disposal of upland materials into the ocean. Upland materials are defined as materials lying above the MHHW elevation. The 404 Clean Water Act allows for the beneficial reuse of these upland excavated materials, and/or they may be disposed as fill in-bay. The in-bay areas are the New Least Tern Island Pit, New Least Tern Island, New Least Tern Island sand/shell layer and Hotdog Tern Island sand/shell layer.

One source of material, the top of Skimmer Island was originally to be disposed into the NLTI Pit. However, because of funding constraints, NLTI pit was filled before funding was available for the removal of Skimmer Island. The top of Skimmer Island materials failed the test for nearshore compatibility and could not be placed nearshore. Because of the relatively small volume, EPA made an exception and allowed disposal at LA-3.

LA-3. LA-3 is an ocean disposal site located 7.5 kilometers (4.6 miles) south of the entrance to Newport Harbor. The exact location of LA-3 changed prior to the commencement of any disposal operations, therefore 100% of the ocean disposal was taken to the new LA3 location.

Nearshore Disposal. A nearshore disposal site has been identified off Newport Beach. Nearshore compatible materials may be placed at this site in lieu of disposal at LA-3. Some materials from 23rd Street Wetland Restoration were placed nearshore.

5.3.5. Clearing and Grubbing

There was clearing and grubbing of the Skimmer Island, prior to its removal, and of Hotdog Tern Island, prior to removal of the top layer of materials and prior to receipt of sand/shell cover. Clearing and grubbing was also required on the wetland restoration sites: Shellmaker Island, 23rd Street, and Bullnose West. A significant amount of trash and debris has accumulated adjacent the Main Dike, and removal of trash and debris was required as part of the contract. Additionally, the proper disposal of trash and debris that accumulated in the sediment basins was ongoing during construction.

5.3.6. Utilities, Pipelines and Cables

The known utilities, pipelines and cables within the project area are identified on the plans. All utilities, pipelines and cables shall be protected in place.

5.4. Environmental

EA and Second CD. A supplemental Environmental Assessment (SEA) to the Final Environmental Impact Statement/Report for the Upper Newport Bay Ecosystem Restoration Project (EIS/EIR) September 2000 was prepared to address design changes since the Feasibility Study, and a second Coastal Consistency Determination (CD) was prepared for the California Coastal Commission (CCC) approval.
The following is a summary listing of design changes addressed in the SEA:

1. The Unit II and Unit I/III basin side slopes were steepened to reduce the loss of mudflat habitat.
2. The Unit II basin was reduced in size to reduce the loss of mudflat habitat.
3. A newly created mudflat was added at 23rd Street to offset loss of mudflat habitat in the two basins.
4. A second newly created mudflat was added to the Bullnose West area to offset loss of mudflat habitat in the two basins, replacing the prior Bullnose design.
5. Design for the removal of previously dredged materials from Shellmaker Island to restore wetlands functions was modified to avoid salt marsh bird's beak (*Cordylanthus maritimus maritimus*) a federal and state-listed endangered plant species.
6. Provisions were detailed to provide access to Hot Dog Island for California Department of Fish and Game maintenance activities including provisions for keeping the island isolated from people and their pets.
7. Provisions were detailed to provide access to the new California least tern nesting island for California Department of Fish and Game maintenance activities including provisions for keeping the island isolated from people and their pets.
8. The Shellmaker Island dendritic channel was deleted from the project to prevent potential impact to sensitive plant and animal species occurring in the nearby salt marsh.
9. New design for the California least tern nesting island with removal of all underlying material to project depth to provide disposal site for excavated material.
10. Scour protection feature were added to mouth of San Diego Creek. (subsequently deleted)
11. Restoration of side channel for Shellmaker will not include the southern portion of the channel that is already subtidal. This reduces the amount of dredging required and avoids impacts to salt marsh bird’s beak located adjacent to this section of the channel
12. Restoration of wetlands in the Northstar Beach area was redesigned to provide optimal area of intertidal mudflats, while avoiding existing structures. (not constructed)

California Coastal Commission. The California Coastal Commission hearing for this project was in 2000 and SEA on 12 August 2004. The Consistency Determination CD-72-00 and CD-039-04 were approved.

Sensitive Plant Survey. A survey for Bird’s Beak was completed August 2003, June 2006, and June 2007. Bird’s Beak was found on Shellmaker Island, and the design for the Shellmaker Island Wetland Restoration and Shellmaker Island Restoration Channel were modified to avoid any impact to the Bird’s Beak plant.

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Sediment Sampling. Sediment sampling of the project area was conducted in 2002, and is documented in "Final Dredged Material Sampling and Analysis Report Sampling and Tier III Analysis of Sediments Proposed for Dredging as Part of the Upper Newport Bay Ecosystem Restoration Project, Upper Newport Bay, Newport Beach, California", 4 Volumes, January 2003, prepared by MEC Analytical Systems, Inc. The results of the investigation were that the dredge material (materials lying below MHHW) were determined to be suitable for ocean disposal. Materials lying above MHHW are considered excavated materials, and excavated materials are not permitted to be ocean disposed. The excavated materials are considered clean and suitable for in-bay fill or other upland options.

Monitoring during construction. The project construction contractor was required to utilize a 3rd party monitor for the purpose of monitoring and protecting specific animals during construction operations. During both phases of the project construction, the services of Keane Biological were acquired.

Eelgrass Transplant. Recent efforts for planting eelgrass in the Upper Bay have been unsuccessful; therefore this feature has been dropped from the project.

5.5. Cost Estimate (Current Working Estimate)

The Cost Estimate for the project is shown on Table 7.

The Total Project Cost, for cost sharing purposes, includes: the construction contract cost; Planning, Engineering and Design (PED); Engineering During Construction (EDC); Supervision and Administration (S&A); Project Management; Environmental; and Real Estate.

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Upper Newport Bay Ecosystem Restoration

Table 7. Project Current Working Estimate

8/4/2010

Item No.	Codes of Accts.	Description	Quantity	Unit of Measure.	Unit Cost	Total w/o Conting.	Conting. %	Conting. Amounts	Total w/ Conting.
1	**01**	**REAL ESTATE**							
	01.02	Lands and Improvements (LERRD's)	1	LS	$820,000.00	$820,000.00	0%	$0.00	$820,000.00
		Sponsor Project Coordination Team				$484,648.90			**$484,648.90**
		Sub-total Sponsor Credit				**$1,304,648.90**			**$1,304,648.90**
2	**06**	**UPPER NEWPORT BAY (PHASE 1)**							
	06.03	Ecosystem Restoration							
	06.03.01	0001. Mobilization/Demobilization	1	EA	$2,100,000.00	$2,100,000.00	0%	$0.00	$2,100,000.00
	R00001	Lump Sum Unit Price Increase	1	LS	$261,587.54	$261,587.54	0%	$0.00	$261,587.54
	R00004	REA DSC Lower Castaways Staging Area & R00025	1	LS	$733,072.63	$733,072.63	0%	$0.00	$733,072.63
	R00026	Adjustment for R00026	1	LS	-$36,689.51	-$36,689.51	0%	$0.00	-$36,689.51
	R00025	Pavem't remain, credit CANCELED converted to cm under RDA	1	LS	$0.00	$0.00	0%	$0.00	$0.00
	06.03.73	Dredging							
		0002. Clearing and Grubbing	1	LS	$500,000.00	$500,000.00	0%	$0.00	$500,000.00
		0003. Dredge Contractor Access Channels to Sediment	1	LS	$430,000.00	$430,000.00	0%	$0.00	$430,000.00
		Control Basins; Place Materials at LA3							
		0004. Dredge Contractor Access Channels to 23rd Street	1	LS	$215,000.00	$215,000.00	0%	$0.00	$215,000.00
		and New Least Tern Island Pit; Place Materials at LA3							
		0005. Dredge/Excavate Shellmaker Island Restoration	540	LM	$476.00	$257,040.00	0%	$0.00	$257,040.00
		Channel; Place Material at LA3	9,660	cm					
		0006. Dredge/Excavate Middle Island Restoration Channel,	836	LM	$316.00	$264,176.00	0%	$0.00	$264,176.00
		Place Material at LA3	9,611	cm					
	R00007	006A. REA Rock Cleanout from Pump, Middle Island RC	1	LS	$411,313.00	$411,313.00	0%	$0.00	$411,313.00
		0007. Dredge/Excavate New Island Restoration Channel,	962	LM	$715.00	$687,830.00	0%	$0.00	$687,830.00
		Place Material at LA3	16,821	cm					
		0008. Dredge/Excavate Hotdog Tern Island Restoration	494	LM	$760.00	$375,440.00	0%	$0.00	$375,440.00
verage $/cm		Channel; Place Material at LA3	6,394	cm					
		0009. Dredge Unit II Basin & Unit I/II Basin, Place Mat'l at LA 3	273,692	CM	$12.00	$3,284,304.00	0%	$0.00	$3,284,304.00
	R00013	Variation in Basin I/III quantity (18,000cm)	0	CM	$12.00	$0.00	0%	$0.00	$0.00
	R00024	Reduction in Basin I/III quantity	-27,170	CM	$12.00	-$326,040.00	0%	$0.00	-$326,040.00
		0010. Dredge New Least Tern Island Pit; Place Mat'l at LA3	74,626	CM	$12.00	$895,512.00	0%	$0.00	$895,512.00
	R00024	Reduction in NLTI Pit quantitiy	-4,626	CM	$12.00	-$55,512.00	0%	$0.00	-$55,512.00
		0011. Excavate/Dredge 23rd Street Wetland Restoration;	70,826	CM	$12.00	$849,912.00	0%	$0.00	$849,912.00
		Place Materials in New Least Tern Island Pit							
	R00024	Reduction in 23rd Street quantity	-29,540	CM	$12.00	-$354,480.00	0%	$0.00	-$354,480.00
		0012. Excavate/Dredge 23rd Street Wetland Restoration;	54,080	CM	$12.00	$648,960.00	0%	$0.00	$648,960.00
	R00014	23rd Street Boundary Change	1	LS	$44,040.00	$44,040.00	0%	$0.00	$44,040.00
		0013. Excavate/Dredge Top Portion of Hotdog Tern Island	19,994	CM	$12.00	$239,928.00	0%	$0.00	$239,928.00
		and Bullnose West Wetland Restoration, and Segment Main							
		Dike; Place Materials in New Least Tern Island Pit							
	R00024	Reduction in quantity	-2,128	CM	$12.00	-$25,536.00	0%	$0.00	-$25,536.00
		0014. Excavate/Dredge Shellmaker Island Wetland Restoration;	27,248	CM	$13.00	$354,224.00	0%	$0.00	$354,224.00
		Construct New Least Tern Island and Hotdog Tern Island							
		Cover							
	R00011	Quantity overrun, boundary change	3,200	CM	$13.00	$41,600.00	0%	$0.00	$41,600.00
		0015. Excavate/Dredge Shellmaker Island Wetland Restoration;	9,495	CM	$20.00	$189,900.00	0%	$0.00	$189,900.00
		Place Materials at Nearshore							
	R00011	Quantity overrun, boundary change	1,300	CM	$20.00	$26,000.00	0%	$0.00	$26,000.00
	R00011	Add'l Clear & Grub on Shellmaker	1	LS	$18,436.00	$18,436.00	0%	$0.00	$18,436.00
	R00023	0016. Geotextile Filter - Deleted	253	SM	$0.00	$0.00	0%	$0.00	$0.00
	R00023	0017. Aggregate Base Course - Deleted	307	MT	$0.00	$0.00	0%	$0.00	$0.00
	R00005	0018. Option 1: Dredge Sediment Control Unit II Basin	172,229	CM	$9.00	$1,550,061.00	0%	$0.00	$1,550,061.00
		and Santa Ana Delhi Channel; Place Mat'ls at LA3							
	R00025	Reduction in quantity	-15,153.00	CM	$9.00	-$136,377.00	0%	$0.00	-$136,377.00
	R00002	0019. Option 2: Dredge Sediment Control Unit II Basin,	361,969	CM	$9.00	$3,257,721.00	0%	$0.00	$3,257,721.00
		Place Mat'ls at LA3							
	R00025	Reduction in quantity	-9,814	CM	$9.00	-$88,326.00	0%	$0.00	-$88,326.00
	R00003	0025. Environmental Survey Modification (Bat Monitoring)	1	LS	$18,513.77	$18,513.77	0%	$0.00	$18,513.77
	R00010	Unit I/III Dredging 150,000 cm Phase 1	150,000	LS	$24.26	$3,639,000.00	0%	$0.00	$3,639,000.00
	R00015	Unit I/III Dredging 40,000 cm Phase 2	40,000	LS	$24.26	$970,400.00	0%	$0.00	$970,400.00
	R00016	Interpretive Buoys (7 small, 4 Large)	1	LS	$42,728.00	$42,728.00	0%	$0.00	$42,728.00
	R00017	Education Kiosk (2)	1	LS	$5,910.00	$5,910.00	0%	$0.00	$5,910.00
	R00018	Settlement Monuments (3 on NLTI)	1	LS	$4,724.00	$4,724.00	0%	$0.00	$4,724.00
	R00020	23rd Street Water Channel	1	LS	$187,744.00	$187,744.00	0%	$0.00	$187,744.00
	R00021	Unit I/III Dredging 78,000 cm Phase 3	78,000	LS	$24.26	$1,892,280.00	0%	$0.00	$1,892,280.00
	CLIN42	Unit I/III Dredging Additional CM to Phase 3	51,942	CM	$19.00	$986,897.49	0%	$0.00	$986,897.49
	R00026	Unit Price increase	1	LS	$36,689.51	$36,689.51	0%	$0.00	$36,689.51
	R00025	Reduction in Volume, credit CANCELLED dredged under RDA	1	LS	$0.00	$0.00	0%	$0.00	$0.00
		Cubic Meter Roundoff error				$3.51			$3.51
		Sub-total construction of PHASE 1				**$24,397,986.94**		**$0.00**	**$24,397,986.94**
	30	Planning, Engineering and Design (PED)				$1,167,964.87	0%	$0.00	$1,167,964.87
		E&D&S&A&PM&Env	13.0%	13%	as of Jan 2010	$3,361,523.00	0%	$0.00	$3,361,523.00
		Total Phase I				**$30,232,123.71**			**$30,232,123.71**

Upper Newport Bay Ecosystem Restoration

Table 7. Project Current Working Estimate

8/4/2010

Item No.	Codes of Accts.	Description	Quantity	Unit of Measure.	Unit Cost	Total w/o Conting.	Conting. %	Conting. Amounts	Total w/ Conting.
									$30,232,123.71
	06	**RECOVERY - UPPER NEWPORT BAY ECOSYSTEM RESTORATION PHASE 2**							
	06.03.01	0001. Mobilization/Demobilization	1	EA	$3,550,000	$3,550,000.00	0%	$0.00	$3,550,000.00
		(clamshell and small hydraulic)							
	06.03.73	Dredging & Associated General Items							
		0002. Access Channels	1	LS	$200,000.00	$200,000.00	0%	$0.00	$200,000.00
		0003. NLTI Channel	1	LS	$650,000.00	$650,000.00	0%	$0.00	$650,000.00
		0004. Transplant Cordgrass	1	LS	$18,700.00	$18,700.00	0%	$0.00	$18,700.00
		0005. Clearing and Grubbing for Skimmer Island	1.00	LS	$65,000.00	$65,000.00	0%	$0.00	$65,000.00
		0006. NLTI Maintenance Access Ramp	1	LS	$90,408.00	$90,408.00	0%	$0.00	$90,408.00
		0007. Skimmer Island (upland part only)	10,600	m^3	$34.25	$363,050.00	0%	$0.00	$363,050.00
		0008. Southern Unit I/III	225,000	m^3	$20.95	$4,713,750.00	0%	$0.00	$4,713,750.00
		0008A. Southern Unit I/III, increase	9,847	m^3	$20.95	$206,296.00	0%	$0.00	$206,296.00
		0009. Northern Basin I/III	50,000	m^3	$26.50	$1,325,000.00	0%	$0.00	$1,325,000.00
		0010. Unit II Basin	140,000	m^3	$20.00	$2,800,000.00	0%	$0.00	$2,800,000.00
		0010A. Unit II Basin, reduction	-9,290	m^3	$20.00	-$185,800.00	0%	$0.00	-$185,800.00
		0011. Geotextile	110	SM	$196.00	$21,560.00	0%	$0.00	$21,560.00
		0012. ABC	122	MT	$336.00	$40,992.00	0%	$0.00	$40,992.00
		0012A. ABC, reduction	-61	MT	$336.00	-$20,496.00	0%	$0.00	-$20,496.00
		Sub-total Dredging & Associated General Items				**$10,288,460.00**		**$0.00**	**$10,288,460.00**
		Sub-Total Phase 2 Contract				**$13,838,460.00**		**$0.00**	**$13,838,460.00**
	31	**Silent Inspector**				**$85,000.00**		**$0.00**	**$85,000.00**
	30, 31	E&D&S&A&PM&Env	13.00%			$1,798,999.80		$0.00	$1,798,999.80
		Sub-Total Phase 2 Contract + EDSA				**$15,722,459.80**		$0.00	**$15,722,459.80**
		Closeout				**$100,000.00**			**$100,000.00**
									$46,054,583.51
									$313,822.55
		Adaptive Management Plan							
		A/E Preparation of Monitoring Plan	1	LS	$60,100.00	$60,100.00	0%	$0.00	$60,100.00
		Post Construction Monitoring	1	LS	$670,000.00	$670,000.00	10%	$67,000.00	$737,000.00
		Hydrographic Surveys	3	Survey	$75,000.00	$225,000.00	10%	$22,500.00	$247,500.00
		Topographic Survey by Aerial	1		$145,000.00	$145,000.00	10%	$14,500.00	$159,500.00
		Sub-total Adaptive Management Plan				$1,100,100.00		$104,000.00	$1,204,100.00
	30, 31	E&D&S&A&PM&Env	13.00%			$143,013.00		$13,520.00	$156,533.00
		Sub-total Adaptive Management Plan+EDSA				**$1,243,113.00**		**$117,520.00**	**$1,360,633.00**
		Subtotal Phase 1 & 2 and AMP& Closeout				**$47,297,696.51**		**$117,520.00**	**$47,415,216.51**
		Sponsor funds contributed to date			**$14,500,632.78**				
			35% - Sponsor Credit			$748,912.10			$790,044.10
			Federal Share 65%			$30,743,502.73			$30,819,890.73
			Non-Federal Share 35%			$16,554,193.78			$16,595,325.78

5.6. Adaptive Management Plan (Operation and Maintenance)

If the sediment accumulation within the Upper Newport Bay rises to above –1.3 meter MLLW (–7 feet MSL) at one-half of the locations investigated, this will trigger a requirement for sediment control maintenance. Capacity is listed on Table 5. Sediment control maintenance is a responsibility of the County of Orange and/or other agencies.

Pre-construction monitoring of vegetation types took place in 2001 (Tetra-Tech, Inc., 2001). Vegetation and bird monitoring took place during construction from 2006 to 2010, within the immediate construction area. This monitoring was conducted by experts in this field. A final bird monitoring report covering the entire construction period is listed in the references under Keane Biological Consulting 2010. Other reports are listed in the references addressing eelgrass, caulerpa taxifolia, salt marsh bird's beak and water quality.

Post-construction monitoring will be conducted by the Corps of Engineers, cost-shared with the County of Orange, for three years. After three years, for the total duration of 10 years, the monitoring will be assumed by the County of Orange and/or some other appropriate agency. A separate document, an Adaptive Management Plan, describes the 10-year monitoring plan.

6. Real Estate

All project properties were owned by the Sponsor: the County of Orange and/or City of Newport Beach or State of California. One parcel in the upper basin was owned by the Irvine Company. The Irvine Company donated (sold for $1??) the parcel to the State of California Department of Fish and Game for purposes of this project, prior to project construction. Even though the project property is already owned by the Sponsors, a one-time credit has been granted to the Sponsors for the value of the project acreage within each parcel.

The real estate parcel and property ownership is identified on Plate 1.

7. Changes in Design

In FY 2004, the Federal funding available toward construction was only $2 million in FY2005. The PCA allowed the Sponsor to advance funding so that the construction could commence. The County of Orange had acquired a grant from the California Coastal Conservancy for $12.5 million. Due to Federal funding constraints, a meeting was held early FY2005 with California Coastal Conservancy to discuss priorities of features for construction. Due to the nature of the grant, and for the available funding, we proceeded with construction of the restoration features, plus necessary access channel dredging and some sediment basin dredging. Therefore the plans and specifications were re-packaged to reflect this base construction with three options. The remaining features of work were constructed under a second contract issued in 2009. Project completed in 2010.

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PLATES

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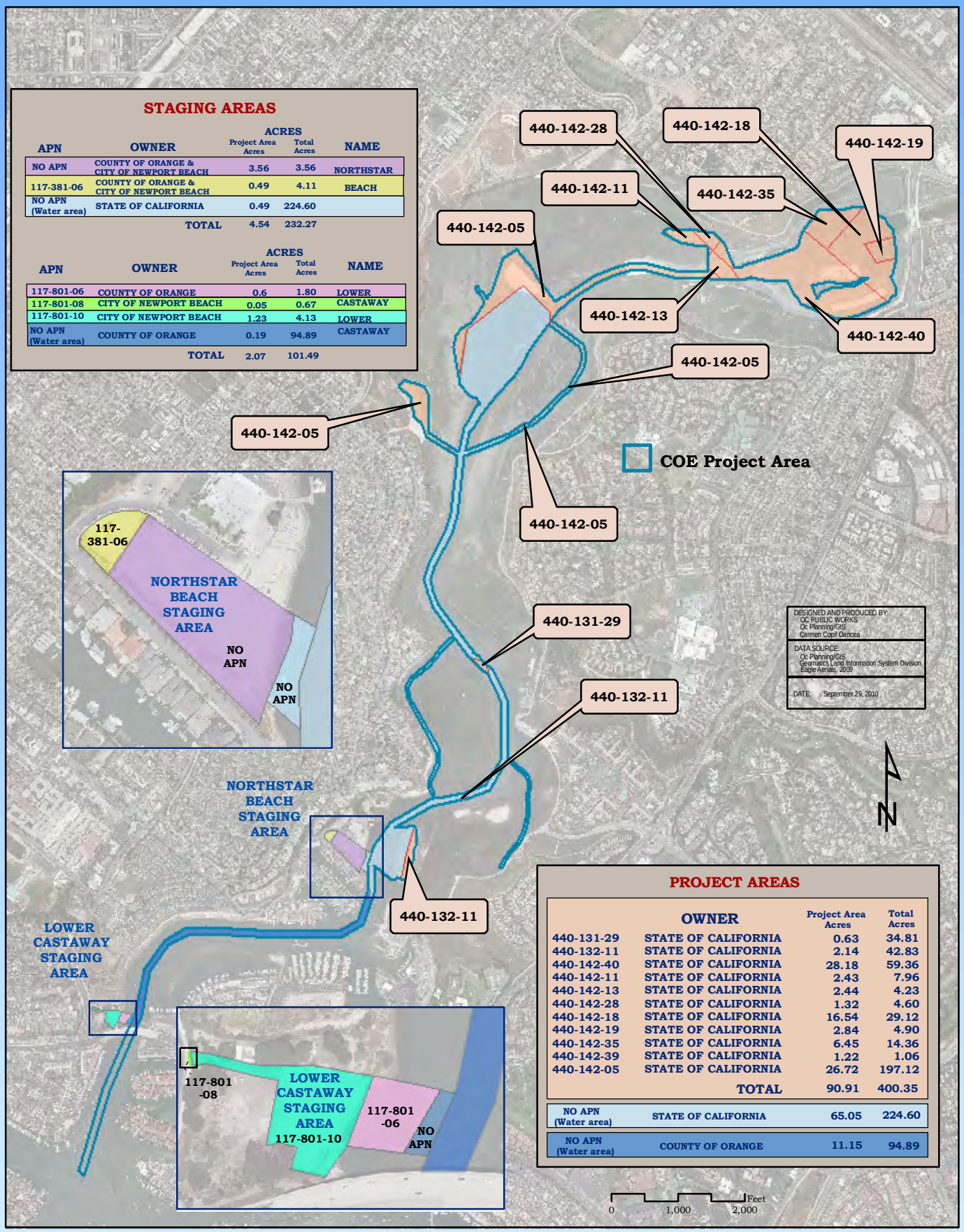

STAGING AREAS

APN	OWNER	ACRES Project Area Acres	ACRES Total Acres	NAME
NO APN	COUNTY OF ORANGE & CITY OF NEWPORT BEACH	3.56	3.56	NORTHSTAR
117-381-06	COUNTY OF ORANGE & CITY OF NEWPORT BEACH	0.49	4.11	BEACH
NO APN (Water area)	STATE OF CALIFORNIA	0.49	224.60	
	TOTAL	4.54	232.27	

APN	OWNER	ACRES Project Area Acres	ACRES Total Acres	NAME
117-801-06	COUNTY OF ORANGE	0.6	1.80	LOWER CASTAWAY
117-801-08	CITY OF NEWPORT BEACH	0.05	0.67	
117-801-10	CITY OF NEWPORT BEACH	1.23	4.13	LOWER CASTAWAY
NO APN (Water area)	COUNTY OF ORANGE	0.19	94.89	
	TOTAL	2.07	101.49	

PROJECT AREAS

	OWNER	Project Area Acres	Total Acres
440-131-29	STATE OF CALIFORNIA	0.63	34.81
440-132-11	STATE OF CALIFORNIA	2.14	42.83
440-142-40	STATE OF CALIFORNIA	28.18	59.36
440-142-11	STATE OF CALIFORNIA	2.43	7.96
440-142-13	STATE OF CALIFORNIA	2.44	4.23
440-142-28	STATE OF CALIFORNIA	1.32	4.60
440-142-18	STATE OF CALIFORNIA	16.54	29.12
440-142-19	STATE OF CALIFORNIA	2.84	4.90
440-142-35	STATE OF CALIFORNIA	6.45	14.36
440-142-39	STATE OF CALIFORNIA	1.22	1.06
440-142-05	STATE OF CALIFORNIA	26.72	197.12
	TOTAL	90.91	400.35
NO APN (Water area)	STATE OF CALIFORNIA	65.05	224.60
NO APN (Water area)	COUNTY OF ORANGE	11.15	94.89

UPPER NEWPORT BAY

County of Orange, California

COE PROJECT AREA WITH OWNERSHIP AND ASSESSOR PARCEL NUMBERS

GEOTECHNICAL APPENDIX

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UPPER NEWPORT BAY
ECOSYSTEM RESTORATION PROJECT
ORANGE COUNTY, CALIFORNIA

GEOTECHNICAL APPENDIX

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES
CORPS OF ENGINEERS
December 2004

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GEOTECHNICAL REPORT
UPPER NEWPORT BAY
ECOSYSTEM RESTORATION PROJECT
ORANGE COUNTY, CALIFORNIA

1. INTRODUCTION.

1.1 Authorization.

This geotechnical report was prepared in support of the engineering design tasks for Upper Newport Bay Ecosystem Restoration Project located in Newport Beach, California. It is meant to be an integral part of the ongoing Design Document Report (DDR) during the preparation of the Plans and Specifications.

1.2 Scope.

This report incorporates and organizes previous and current geotechnical explorations, investigation and laboratory testing results, and engineering analyses. This information will be used to create cost estimates, identify potential disposal sites, identify beach re-nourishment compatibility for dredged sediments, evaluate disposal options to include compatibility with offshore disposal site LA-3, determine side slopes of dredge areas within the project area, and design an island creating new least tern habitat.

1.3 Purpose.

The purpose of this project is to dredge large portions of Upper Newport Bay reducing the dredge frequency to twenty-one (21) years. In addition, the project will be creating and/or maintaining wildlife habitat with the objective of maintaining a balance of open water, mud flats, and marsh areas. Other benefits will include features that control the deposition of sediments in the ecological reserve and the potential beneficial use of dredged and excavated sediments.

2. TOPOGRAPHY

Newport Bay is located in Orange County on the Southern California coast, approximately 65 km south of Los Angeles and 120 km north of San Diego. The bay is located at the southeastern terminus of the Los Angeles coastal plain and adjacent to the southern edge of the Inglewood-Newport Uplift.

From the harbor entrance at the rocky headland at Corona del Mar, Newport Bay extends in a north-northeast direction about 8 km inland. The bay is a coastal estuary rimmed by steep bluffs up to 30 meters high and is divided into two portions. The Lower Bay parallels the coastline and is separated from the ocean by a sand spit called Balboa Peninsula. The Upper Bay lies north of the Highway 1 (Pacific Coast Highway) Bridge and extends 5.5 km inland. The Upper Bay is bordered to the west by Costa Mesa, a flat topped, uplifted landform underlain by bedrock. To the north lies the Tustin Plain, an alluvial floodplain composed of sediments derived from the surrounding San Joaquin and Santiago Hills, and to the east lie the San Joaquin Hills.

The perceptible bulge in the lower bay's sand spit named Balboa Beach is a natural irregularity due to the presence of a submarine canyon, which is the offshore extension of the ancestral Santa Ana River. The submarine canyon present offshore, called Newport Submarine Canyon, reduces the wave heights over the canyon and adjacent surf. This favors sand deposition being transported along the beach by southerly longshore currents.

Newport Bay receives terrigenous sediment primarily from two tributaries, San Diego Creek and the Santa Ana-Delhi Flood Control Channel. The Newport Bay watershed encompasses approximately 300 square km of land with uses including agricultural, residential, urban, and open space. San Diego Creek is by far the largest contributor, draining 270 square km of the surrounding foothills and much of the Tustin Plain, and delivering 94% of the sediment carried annually to the Upper Bay. The Santa Ana-Delhi Channel subwatershed drains approximately 30 square km. The total average annual volume of sediment being carried into the bay is estimated to be 125,000 m^3/year, based on the record spanning the 1972-1996 period.

3. GEOLOGY

3.1 Regional Geology

The project is located between the San Joaquin Hills and Newport Mesa within the southern central portion of the Los Angeles Basin. The region is tectonically active and complex. This part of the Los Angeles Basin is in the Peninsular Range Province near where it transitions into the Transverse Ranges to the north. The Tansverse Ranges consist of a series of east-west trending ridges and valleys that truncate the prevailing north-northwest trending Coastal and Peninsular Ranges. The Los Angeles Basin is underlain by Cretaceous to Quaternary sedimentary marine and alluvial sediments up to 15,000 feet thick. Below the thick accumulation of sediments is the Mesozoic Eastern (metamorphic) Los Angeles Basement Complex.

3.2 Site 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. The cliffs surrounding Upper Newport Bay are composed of Pliocene and Miocene sedimentary rocks. The southern part of the bay has outcrops of diatomaceous Miocene Monterey shale in the adjacent bluffs. The north, the bluff sediments transition in to the silty to sandy Capistrano Formation rocks and Unnamed Sandstone Unit. The Upper portion of the Newport Mesa and the San Joaquin Hills adjacent to the bay has various thicknesses of older alluvial deposits. The sediments in the Newport Back Bay consist generally of silts and clays with some sands.

3.3 Seismic Setting

The site is located within the seismically active area of southern California. The Intersection of the northwest trending San Andreas Fault System and east-west trending Transverse Ranges Fault system dominate the seismicity of southern California. The project site has the potential to experience strong ground shaking from local and regional faults. Active faults near Upper Newport Bay include Newport-Inglewood, San

Andreas, San Jacinto, and Whittier-Elsinore (Blake 2000). The closest active fault to the site is the Newport-Inglewood Fault (main branch) located about 4 km or greater offshore from the site. The epicenter of the Magnitude 6.3, 1933 Long Beach earthquake was centered on the offshore section of the Newport-Inglewood Fault near the City of Newport Beach. The maximum credible earthquake using deterministic calculations for the Newport-Inglewood Fault has a magnitude of 6.9.

Utilizing data from the U.S. Geological Survey at the National Seismic Hazard web site (http://eqint.cr.usgs.gov/eq/html/zipcode.html), the site probabilistic data is presented in a Table below.

Ground motion hazard values, expressed as a percent of the acceleration of gravity, (%g), are presented in the table. Peak Ground Acceleration, (PGA) is shown as 0.2 second period spectral acceleration, (SA), 0.3 second period (SA), and 1.0 second period (SA) for 10%, 5%, and 2% probability of exceedance, (PE), in 50 years. These ground motion values are calculated for 'firm rock' sites, which correspond to a shear-wave velocity of 760 m/sec. in the top 30m. Different soil sites may amplify or de-amplify these values

Ground Motion Hazard Values

	10%PE in 50 yr	5%PE in 50 yr	2%PE in 50 yr
PGA	39.16	57.63	84.75
0.2 sec SA	101.11	127.43	185.64
0.3 sec SA	93.75	123.80	178.74
1.0 sec SA	32.70	47.84	71.95

The San Andreas Fault is located about 80 km northeast at its nearest point to Upper Newport Bay. The maximum credible earthquake for the San Andreas Fault (Southern) is 7.4. The closest portion of the San Jacinto Fault is located about 70 km northeast of Upper Newport Bay. The maximum credible earthquake for the San Jacinto Fault is 6.7. The closest portion of Whittier-Elsinore Fault is located about 29 km north of

Upper Newport Bay. The maximum credible earthquake for the Whittier-Elsinore Fault is 6.8.

Other faults not considered active include the Pelican Hill Fault, which crosses the northern portion of the back bay of Newport Bay. The Shady Canyon Fault, which is also not considered active, is about a kilometer to the north of the Pelican Hill Fault.

3.4 Geologic Hazards

3.4.1 Ground Surface Rupture

The Newport-Inglewood Fault is interpreted as having the potential for generating the highest onsite ground accelerations at the project location. A portion of the Newport-Inglewood fault zone crosses the site or projects into Upper Newport Bay in the geologic literature reviewed. The Newport-Inglewood Fault Zone is primarily a strike strip fault and displacement has been mapped to the north, near the surface in the Newport Mesa area. In Upper Newport Bay, the potential of ground surface fault rupture is possible but unlikely at the site.

3.4.2 Secondary Seismic Effects

Secondary seismic effects for any site include liquefaction and associated ground settlement, slope instability, tsunami and seiches, and ground lurching.

Liquefaction involves a sudden loss in strength of a saturated, cohesionless soil (predominantly sand) caused by cyclic loading such as an earthquake. This phenomenon results in elevated pore-water pressures that temporarily transform the soil into a fluid mass resulting in vertical settlement and could include lateral spreading. Typically, liquefaction occurs in areas where groundwater is less than 50 feet from the surface and where the soils are comprised of predominantly poorly-consolidated sands. Since material within the areas to be dredged consists of saturated, unconsolidated

silts, sands, and silty sands, there is a potential for liquefaction of this material within Upper Newport Bay.

The topography within the project site is essentially flat. The surrounding bluffs may have some slope failures during a large earthquake in the area of the Newport Bay. Lurching may also develop along the edges of bluffs due to focusing of seismic energy at the bluff edge.

All low-lying areas along California's coast are subject to potentially dangerous tsunamis. Tsunamis are long-period waves generated primarily from distant and local submarine earthquakes, landslides, or volcanic eruptions. Heights of the 100- and 500-yr tsunami have been predicted at Newport Harbor entrance to be on the order of 1.2 meters and 1.8 meters, respectively (Ziony, 1985). Despite being at sea level and connected to the open sea, the tsunami hazard for Upper Newport Bay is relatively low due to the distance from the open sea through Newport Harbor Channel and Lower Newport Bay.

Due to the relatively small surface area of Upper Newport Bay, the potential hazard from seiches is not considered likely (City of Newport Beach, 1975).

Ground lurching usually forms during seismic events along cliffs, ridges, stream banks and/or along the ridge of artificial embankments. The general topography and soil conditions in the area indicate a low risk from ground lurching.

4. SAMPLING METHODS

All sediment collection, handling, and preservation techniques with the exception of the 1995 sampling event followed the procedures outlined in the Ocean Testing Manual (USEP/USACE 1991). The sediments were logged according to the Unified Soil Classification System (USCS) and in adherence with ASTM D-2487, Unified Soil Classification System (USCS) and in adherence to ASTM D-2487, "Standard Practice for Description and Identification of Soils (Visual Manual Procedure)".

4.1.1 Vibratory Core Collection Procedures.

A vibratory corer sampler consists of a core barrel and a vibratory driving mechanism mounted on a four-legged tour guide and platform. The vibratory core assembly is lowered to the mud line below the water by a small deck-mounted crane system. After being positioned on the bottom, flexible hoses supply compressed air from the barge to the vibratory unit. An oscillating hammer (vibrator) drives the core barrel into the materials below the mud line. After the core barrel has been driven to the required penetration depth, the sample is retracted from the bottom and returned to the deck of the barge. The core barrel has a catcher at the bottom to prevent sediment loss during removal. A removable plastic corebarrel containing the sediment is removed from the sampling device after extracting from the water. The vibratory core tube is laid on the barge deck for observation and the ends are capped for sample preservation until the sample is extruded.

4.1.2 Vibratory Core Logging Procedures.

Once collected, all sediment samples were brought aboard the barge and logged as time permitted. The vibratory cores were measured, photographed, and logged before being packaged for shipment to a laboratory for physical analysis. Once logged, the sediment was placed into plastic bags and sent to the Los Angeles District soils lab in El Monte for physical testing.

4.1.3 Diver Core Collection Procedures.

The diver core exploration was conducted utilizing Navy (SCUBA) contract divers. Sediment samples were collected using a 10-foot (3 meter) long, 1-1/4 inch (3.2 cm) diameter, and clear lexan sampling tube. The tubes were driven by hand or with the aid of a 10-pound slide hammer attached to the top of the tube. The divers also twisted and turned the tube in conjunction with hammering. In addition to the tube sampling, the divers made visual observation of the seafloor in the vicinity of the sampling location.

The standard operating procedure for diver core collection is as follows: Divers were transported by boat (a 25 foot/7.6 m Boston Whaler) to the pre-mapped sediment sampling locations within the proposed project area. The locations were located with an onboard DGPS (differential global

positioning system) and a buoy was dropped to mark the final borehole location. The DGPS aboard the boat was calibrated twice each day to the vessel tie-up locations. The vessel tie-up location was a slip at the Newport Dunes Marina.

The dive sampling was initiated once the dive boat moved to a buoy location. Upon arriving at the buoy location, divers would submerge into the water and follow the buoy line down to the sampling point at the bottom of the bay floor (the mud line).

Once the divers reached the mud line, they would immediately begin to drive and/or twist a lexan sampling tube into the bottom while the sediment sample was simultaneously suctioned up into the tube via a piston and valve rod attached inside the tube. Once the required depth or refusal was reached, the tube was then pulled from the hole and immediately capped and brought to the surface. After reaching the surface, the tube was placed in the vessel, where it was stored in a vertical position throughout transport.

Refusal occurred when the tube could no longer be advanced to its fill length of 3 meters. Refusal most often is due to a dense sediment interval such as stiff clay, compacted sand, or gravel layer.

4.1.4 Diver Core Logging Procedures.

Once collected, all sediment samples are taken back to the dock for logging. The diver cores are then measured, photographed, and logged. Once logged, the sediment is placed into plastic bags to be sent to the Los Angeles District soils lab for physical testing.

4.1.5 Beach Profile Collection Procedures.

Beach profile collection procedures are involve the collection of sediment by grab samples. The samples are then placed in a plastic bag for storage, and if sampling occurred under water, the samples are then brought to the surface. The beach profile samples are collected along transects perpendicular to the beach. Samples are collected at depths of +4, +2, 0, -2, -4, -6, -8, and –10 m MLLW.

4.1.6 Hollow Stem Auger

Hollow stem augers are used by a power drill rig to advance a borehole and take undisturbed samples through the center of the auger column, which acts as casing during drilling. A center plug used during the drilling process is removed and conventional drill samplers are run to the bottom of the hole when a sample is desired. Hollow stem sampling was utilized at only the 23rd Street location.

4.1.7 Hand Auger Procedures

A hand held auger consists of an auger blade that is threaded to a pipe with a cross-arm attached to the other end. The diameter of the hand auger blade used on this project was 102 mm. The hand auger method was generally used in land areas inaccessible to a truck or track mounted drill rig. Hand auger samples were obtained at 23rd Street, Bullnose West, Shellmaker Island, Main Dike, and Least Tern Island.

5. GEOTECHNICAL EXPLORATIONS.

Geotechnical explorations in support of dredging and habitat enhancement/restoration were conducted in the Upper Bay during 1995 (TOXSCAN, 1995), November 2000 and March 2001, February and March 2002, and October and November 2003. These investigations compared existing sediments within Upper Newport Bay to sediments located at the LA-3 offshore disposal area as well as the proposed nearshore/beach disposal location at Newport Beach.

5.1 1995 Upper Newport Bay Investigations.

In 1995 UNB was sampled utilizing a vibratory corer and grab sampling. Twelve separate locations were sampled. Six samples from six locations representing the access channel were taken from the Pacific Coast Highway Bridge to the Unit II Basin. These six samples were composited into one sample and sent to a lab for physical, chemical, and bioassay analysis.

The remaining 12 samples were collected from 6 different locations (2 from each location) within the Unit I/III Basin and the channel between Unit I/III and Unit II Basins. Vibratory corer obtained samples were divided into a top portion and a bottom portion for testing and analysis.

The top portion is from –0.8m MLLW to –3.0 meter MLLW and the bottom portion from –3.0 m MLLW to –5.1 m MLLW. All samples from the top portion were composited together and all samples from the bottom portion were composited together for a separate sample. Once collected, the samples were sent to a lab for physical, chemical, and bioassay analysis. Grain size analysis results are shown in Table 1.

5.2 1995 LA-3 Disposal Site Sampling.

Representative samples were taken from the LA-3 Disposal site as reported in TOXSCAN 1995. Table 2 shows the physical analysis results for LA-3 sediments taken in May 1995. Bioassay tests were also performed on samples taken from LA-3.

5.3 February 2002 Investigations

The February explorations consisted of 49 diver cores taken at 48 separate locations. The diver core-sampling objective was to obtain continuous samples throughout the bay. Diver core depth recoveries ranged from 0.4 to 2.6 meters. The purpose of this investigation was to study geologic conditions, obtain subsurface information, and determine the physical characteristics of the sediments. Physical results can be seen in table 3.

Physical analysis was performed on all samples to gather grain size distribution, density information, and other physical characteristics. For more information see "Geotechnical Site Characterization Study Upper Newport Bay, Newport Beach, California," prepared by Group Delta Consultants, Inc.

5.4 March 2002 Investigations

A total of 27 locations were sampled. The 27 locations were then separated into areas. The areas and hole locations in each area are designated Unit II Basin (A-1, A-2, A-3, A-5, and A-6) Unit I/III Basin (B-1, B-3, B-5, B-7, and B-8), channel between Unit I/III and Unit II Basins (D-48, D-52, and D-56), channel between Unit II Basin and Lower Bay (PCH Bridge) (D-6, D-16, D-24, D-32, and D-38), Tern Island channel (HD-2 and HD-3), New Island east channel (N-1and N-3), Middle Island West channel (M-1 and M-3), Shellmaker Island east channel (S-2 and S-4), Shellmaker Island “dendritic” channel (S-6 and S-7), Santa Ana-Delhi channel (SA-1 and SA-3),

and LA-3 Reference site. Samples from each boring location were composited into one sample for testing. Two areas were split into an upper and lower set of samples and each set of samples were analyzed. Vibratory cores were collected utilizing a 102 mm outside diameter core barrel at depths ranging from 1.5 to 7.8 m. Vibratory core analysis consisted of physical, chemical, and bioassay analysis. Physical analysis results can be seen in Table 4.

Physical analysis was performed on all samples to gather grain size distribution, density information, and other physical characteristics. Density analyses included pocket penetrometer readings performed in the field and penetration rates using the vibratory corer system. Results can be seen in Table 5.

5.5 Postulated Salt Layer Exploration

On 21 November exploration was undertaken on Skimmer Island for any evidence of a possible salt layer as postulated by the USF&W at a TRC meeting (March 2002) at the Visitors Center. Exploration participants were R. Walker, A. Shak, S. Murphy, and J. Jackson representing USACE and T. Rossmiller representing county of Orange. Sampling took place between 0900 and 1130 hours during a tidal phase of +5.8 to +4.0 feet (+1.77 to+1.22 m) MSL.

Two hand auger holes (H-1 and H-2) at estimated elevation +/- 6.0 ft (1.83 m) MSL were bored to a depth of 7.0 feet (2.13 m) below the dry surface of the island. Hole H-1 was at the extreme east end of the island and H-2 was 180 meters to the west. Both holes encountered fine sand and silt with clay to 3.0 feet (0.91m). Below 3.0 feet, plastic clay with silt (with organics and shells) was encountered; water level in each hole was 5.5 feet (+0.5 ft. MSL). Based on the 1961 RBF engineering study map of the salt works obtained by T. Rosmiller, a salt layer, if one were present, should occur at elevation +5.0 (+1.52 m) MSL (Personal communication, 9/24/02).

No evidence of a concentrated salt layer was encountered in either hole. No visible evidence of salt crystals was seen in any sample. Based on the results of the two test holes, it is the conclusion of the team members that any in-place salt layer at the old mining operations was likely washed away by the floods of December 1969, when the main dike was breached and the evaporative basins flooded. Additionally, any residual salt has been subject to dissolution over

the past thirty years by the daily tides rising and falling between the mean range of 3.7 feet (1.13 m).

Organic plastic clays encountered in both auger holes below three feet suggest that materials to be excavated from Skimmer Island might not be suitable for use in the top several feet of the new tern island.

5.6 October and November 2003 Investigations

The October and November 2003 sampling event consisted of 13 samples taken in 4 different areas using hand augers and vehicle mounted hollow stem augers. The samples were taken at Northstar Beach, Bullnose West, Shellmaker Island, Main Dike, and 23rd Street. The samples were collected and analyzed to obtain additional subsurface information, determine physical characteristics, and to run chemical analysis on 23rd Street, Northstar Beach, and Shellmaker Island.

6. LABORATORY TESTING

6.1 Chemical Testing

Bulk sediment chemistry analyses performed in 1995 (TOXSCAN 1995) on 4 composite samples (Unit I/III Basin bottom sediments, Unit I/III Basin top sediments, Access Channel, and LA-3 reference site sediments). Chemical contaminant levels have been determined to be within acceptable levels as determined by the Environmental Branch, SPL, and USEPA. For additional information see ‘Chemical and Toxicity Evaluation of Sediments Proposed for Dredging and Ocean Disposal'. Prepared by TOXSCAN, INC.’

The Navy Regional Environmental Laboratory (NREL), San Diego, California, coordinated chemical testing for the March 2002 sampling event. For more information see ‘Sampling and Tier III Analysis of Sediments Proposed for Dredging as Part of the Upper Newport Bay Ecosystem Restoration Project’ prepared by MEC for the U.S. Army Corps of Engineers.

Chemical testing for the November and December 2003 sampling event was coordinated by the NREL. The samples were collected in the 23rd Street, Shellmaker Island, and Northstar Beach locations. Results of the chemical analysis for these areas indicate the materials are compatible with Newport Beach.

6.2 Bioassay Testing

Bioassay tests were performed in 1995 (TOXSCAN 1995) on three composite samples from UNB and one reference sample from LA-3. Results of the bioassay tests indicate disposal of the sediments from Upper Newport Bay in LA-3 disposal site is allowable. This is reflected in the Record Of Decision, Upper Newport Bay Ecosystem Restoration Project, California signed 24 September 2001.

Bioassay tests were also performed on sediment samples from the February and March 2002 sampling event. Tests were performed on sediment from 11 separate areas including a representative sample from LA-3. Based on results of the testing and analysis, all materials evaluated are suitable for disposal at LA-3.

6.3 Physical Testing

The tests run on the sediment samples typically consisted of sieve analysis (in accordance with ASTM D-422) and Atterberg Limits determination (liquid limit and plastic limit, in accordance with ASTM D-4318). All sediments were classified according to ASTM D-2487, except for density samples with greater than five-percent fines, which were classified according to field logs and ASTM D-2488.

6.3.1 1995 Testing

Results of the 1995 TOXSCAN testing for samples taken within UNB are summarized in Table 1. These results indicate sediments in Unit I/III and II Basins as well as the Access Channel have a large range of sand-silt-clay mix. The sediment samples range from 16% to 60% by weight sand, 18% to 26% by weight silt, and from 21% to 57% by weight clay. These samples were not tested in accordance with ASTM requirements.

Samples were also obtained from the representative sediments from LA-3. Grain size analyses performed. The sediments are predominantly silt with some clay, and a small percentage of sand. Table 2 presents the results from this analysis. These samples were not tested in accordance with ASTM requirements.

6.3.2 February and March 2002 Testing.

Sampling in February and March 2002 included testing for grain size analyses, Atterberg Limits Tests, and in-situ density. Sampling undertaken throughout Upper Newport Bay showed the sediments are predominantly poorly graded sand, silt, and clay with minor gravel in some areas. Results indicate a high variability of fines (from 1% to 98%) and sandy material throughout the bay. The results also indicate the fine sediment percentages are randomly spread throughout the bay. Laboratory testing of the Navy Dive Core samples taken in February 2002 are presented in Table 3 and the vibratory corer samples taken in March 2002 are presented in Table 4. Also included is the average grain size distribution of all samples providing a good indication of the overall sediment size distribution.

For additional information see Appendices B and C of "Geotechnical Site Characterization Study Upper Newport Bay, Newport Beach, California," dated October 2002 prepared for the Los Angeles District by Group Delta Consultants, Inc.

6.3.3 October 2002 Beach Profile Testing.

In October 2002, Navy Divers obtained 24 grab samples. Eight sampling were collected along 3 separate transects (STA 668+53, STA 689+00, and STA 713+28). Transects locations coincide with 29th Street, 50th Street, and 60th Street on Newport Beach Peninsula. Samples were collected at approximate elevations +4, +2, 0, -2, -4, -6, -8, and –10 m, MLLW. The results are presented in Table 6.

6.3.4 November and December 2003 Testing.

Samples were collected using hand held and track mounted augers at Northstar Beach, Bullnose west, Shellmaker Island, Main Salt Dike, and 23rd Street. Testing of these sediments included grain size analyses for each location. The laboratory test results are presented in Table 7 along with the fine limit, coarse limit, and average grain sizes for each location.

Chemical and bioassay analysis was performed on selected vibracore samples throughout the bay. The samples were selected from eleven representative areas. Samples from each area were then composited and analysis performed on each of the 11 composite samples. One reference sample was obtained from LA-3 and analyzed.

For more information see "Geotechnical Site Characterization Study Upper Newport Bay, Newport Beach, California," prepared by Group Delta Consultants, Inc.

7. ANALYSES AND RESULTS.

7.1 Slope Stability Analysis.

Stability analysis was performed on side slopes throughout Upper Newport Bay. Analyses were performed for varying conditions and various locations. Slope stability analyses for slopes located along the edges of the main channels, basins, Least Tern Island, and small channels were performed using Utexas4 computer program. In addition to the Utexas4 program, the "Geotechnical Engineering in the Coastal Zone" (USACE), the “Engineering and Design-Slope Stability EM 110-2-1902” manual, and observations of existing conditions were utilized in the decision making process. Pressure exerted by water due to depth and soil type mainly determines slope stability within Upper Newport Bay. Since the soil type throughout Upper Newport is similar, the analyses are centered mainly on tidal effects. Slope stability analyses using Utexas4 program was performed using the most conservative scenario, rapid drawdown. A factor of safety of 1.3 was used.

Side slopes that are continually inundated having a stable or semi stable external water pressure applied to the side slopes are much more stable at steeper gradients than slopes experiencing a larger change in external water pressure in relation to slope height. Tidal influences range from 0 m MLLW to 1.65 m MLLW in the vicinity of Upper Newport Bay. The side channels are 1.5 m deep and tidal effects will nearly drain the channels daily. During high tide, the side slopes will experience an increase in external water pressure being exerted as well as an increase in pore pressures when the channel is full. At low tide, the side slopes will experience an elimination of water pressure being exerted on all or a portion of the side slope depending upon the magnitude of the tide as well as a reduction in pore pressure and a draining of water from the side slopes. All of these factors contribute to reducing the stability of the side slopes. Side slopes in the side channels having 1.5 m depths are not able to maintain 1V:3H slopes.

The following are the results of the analysis: side slopes of 1V:5H or flatter are stable in all areas; slopes of 1V:3H are stable in the deeper channels (e.g., 4.3 m deep and 30 m wide channels); slopes of 1V:3H are not stable in some areas in the more shallow channels (e.g., 2 m deep, 15 m wide channels) due to tidal effects. It should be noted that it is not possible to determine which areas will remain stable and those that will not remain stable without extensive investigative data. Therefore, due to the non-critical nature of these side slopes, it is recommended that these channels be dredged at a 1V:3H side slope and allowed to adjust naturally where necessary in an effort to preserve as much mud flat habitat as possible. However, slopes around islands should be 1V:5H in order to maintain stability of the islands and slopes of 1V:8H are necessary near structures, roadways, and other areas requiring structural stability.

Experience indicates that not all of the steeper side slopes of 1V:3H will be stable in areas that experience wave, propeller wash, and currents. These areas are expected to experience localized adjusting in some areas to a more stable slope of approximately 1V:5H.

7.2 Riprap Protection.

The riprap shall be quarried, angular stone, and reasonably well distributed.

7.2.1 San Diego Creek Scour Protection.

Riprap shall be placed and grouted at the confluence of San Diego Creek and Unit I/III Basin. The grouted riprap, designated A-1000 stone will serve as scour protection.. Ninety-five to one hundred percent (95-100%) of the stone shall be greater than 1000kg. Fifty to 100 percent shall be greater than 400 kg. Fifteen to forty nine percent (15-49%) shall be greater than 100kg. Not more than zero to three percent (0-3%) shall be smaller than 30kg.

The total volume grouted riprap is approximately 1,745 cubic meters. With a void ratio of 0.35, the mass of riprap is approximately 4,000 metric tons and the volume of grout is approximately 500 cubic meters. These estimates are based on a specific gravity of 2.65.

7.2.2 Northstar Beach Erosion Protection.

Riprap shall be placed at Northstar Beach to protect the beach from erosion due to tidal currents. The riprap gradation shall be as follows: The maximum diameter shall be not more than twenty three centimeters (23cm); ninety to one hundred percent (95% to 100%) shall be 23cm; Fifty to one hundred percent (50% to 100%) shall be larger than 15cm ; not less than fifteen percent (15%) and not more than 49 percent (49%) shall be 12cm; zero to three percent (0-3%) may be less than 7cm.

7.3 Grout.

Grout shall be used for the grouted riprap. The grout shall be composed of cement, sand, gravel, and water and meet specifications of ASTM C 33, C150, and C309.

7.4 Beach Compatibility Analysis and Results.

7.4.1 Physical Analysis and Results

Los Angeles District Corps of Engineers Beach Compatibility guidelines states that proposed dredge material grain size shall be similar to the receiving beach. The proposed material may be coarser than the receiving beach unless esthetic or other conditions restrict beach disposal. The proposed dredge material may be finer, but shall not exceed the percent fines in the finest beach sample by more than 10 percent.

The grain size analysis of the 3 transects taken at Newport Beach in October 2002 are shown in Table 6 and in graph form in Figure 1. The results of the Beach samples show 2 samples with high percentages of fines material (39 and 27%). The test results for these 2 samples were not considered representative since they are significantly higher than the remaining samples. Using the 39 and 27 percent fines would result in placing sediments in the near shore having a much higher fines content. Therefore 21 percent was used to determine near shore placement of sediments. Samples taken from Newport Beach with the smallest percent of fine sand (0.075 mm) is 1 percent. Criteria allow proposed sediments to be finer, but shall not exceed the percent fines in the finest beach sample by more than 10 percent. Therefore 11 percent maximum fines are allowable for placement onto the beach. Compatibility requirements for sediments proposed for near shore placement shall not exceed the beach sample with the greatest percentage of fines by more than 10 percent. Beach samples containing the largest percent fines are 21 percent. Therefore 31 percent fines are allowable for near-shore placement.

The grain size analyses for samples obtained in November and December 2003 (Northstar Beach, Bullnose West, Shellmaker Island, Main Salt Dike, and 23rd Street) are shown in Table 7. The data from these samples are compared to the results of the Newport Beach sample gradations. Table 8 shows a comparison of Newport Beach results (fine limit, coarse limit, and composite) vs. composite samples from each of the 5 sites sampled in November and December 2003. According to Los Angeles District Corps of Engineers Beach Compatibility guidelines, sediments from 23rd Street, Shellmaker Island, and Northstar Beach meet the requirements for near shore placement at Newport Beach. Figure 2, 3 and 4 presents the information in graph form as a comparison of each area (23rd Street, Bullnose, Shellmaker Island, and Northstar Beach) to that of Newport Beach grain size.

The sediments currently located within the Upper Newport Bay proposed dredge area contain a relatively high concentration of fines (a composite average of 26% silt and 34% clay totaling 60% fine material less than 0.074 mm). Approximately 26 out of 98 samples contain less than 21% fines (e.g., 21% of the material is less than 0.074 mm). Although this appears to be a significant amount of samples with less than 20% fines, most of these sample locations are

spread throughout Upper Newport Bay making separation and/or sorting too costly. Therefore beach nourishment or near shore disposal using this material is not an option.

Material to be used for the upper 0.61 m of the New Least Tern Island and Hot Dog Tern Island shall be sand with a small amount of shell fragments. The sand should come from Shellmaker Island and/or Northstar Beach. The site with the largest percentage of shell is recommended.

7.4.2 Chemical Compatibility.

Three onshore locations have been analyzed for chemical compatibility with Newport Beach and LA-3. The three sites are 23rd Street, Northstar Beach, and Shellmaker Island. All three areas have been determined to be compatible with Newport Beach and/or the offshore LA-3 site.

7.5 Pumpability Analysis.

The pumpability for Upper Newport Bay is based on the sediment gradation, median and maximum grain sizes, and grain shape. The maximum grain size indicates the maximum pump clearance needed to pump the sediment (i.e., large size coarse sediments, such as gravels, large cobbles, and boulders may not pass through dredge pumps and therefore reduce production rates of the hydraulic or pneumatic dredge methods). Smaller size coarse sediments, such as sands can pass through dredge pumps. The median grain size is an indicator of the energy required to pump the sediments as a slurry (i.e., a larger median grain size requires more pump energy).

The presence of seashells within the sediment should not cause excess pump wear since the shells are widely scattered throughout the borrow area sediments and uncemented.

The most recent exploration data indicates that sediment within Upper Newport Bay typically consists of sandy silt (MH) and silty sand (SM). According to logs and sieve analysis, sediments encountered range from fine silt and clay to coarse grained, subrounded to rounded gravel with a very minor amount of coarse gravel.

7.6 Dredgeability Analysis.

All project alternatives providing improvement in the Upper Newport Bay environment include the need for dredging to remove accumulated sediment. Although many parameters must be evaluated to consider the acceptability of dredging operations, the analysis presented here is limited to consideration on the physical dredgeability (ability to dredge the material with standard clamshell, backhoe, or hydraulic dredging equipment) and any limitations to dredging given current guidelines for sediment chemical contaminants.

7.6.1 Previous Experience.

Based on extensive previous experience within Upper Newport Bay during the past 20 years, it is clear that dredging is possible within Upper Newport Bay by standard regional dredging methods. Bedrock is located below any of the proposed dredge depths within the proposed project limits. Also, the dredge material is unconsolidated alluvium, ranging from clay to gravel. Both hydraulic and clamshell dredging have been utilized in the Upper Bay with success in the past. In 1987, a clamshell dredge and barges (3,000 cubic yard capacity) were used to remove over one million cubic yards of sediment from the Upper Bay, at a rate of approximately 5,000-10,000 cubic yards per day. During 1998-99, clamshell-dredging operations removed 784,000 cubic yards of sediment from the Unit I/III Basin and access channels. During this program, hydraulic dredging removed 75,000 cubic yards from the Dover Shores area. The rate of dredge production varied significantly but averaged about 3,000 cubic yards/day.

The second consideration in determining the acceptability of dredging sediment from the Upper Bay is the need to meet the criteria established by the EPA and USACE for the evaluation of dredge material. The recent 1998-1999-dredge program in the Upper Bay allowed offshore disposal of the material at the LA-3 disposal site. All Federal and State requirements for dredged sediment quality were achieved in order for this offshore dumping to occur.

Recent comprehensive testing for chemical contaminants of the sediments within Upper Newport Bay has been conducted. Results indicate that the sediments from Upper Newport Bay are suitable for disposal in LA-3.

7.6.2 In-Situ Density Analysis.

Insitu and relative density are indicators of how easily the materials can be dredged. Extremely soft or loose sediment can be suctioned, while dense to very dense sediment may have to be scoured by cutting or hydraulic disturbance in order to excavate and remove.

The depth of sample penetration achieved by a hand held penetrometer as well as the Navy diver core itself provides a qualitative in-situ density analysis for most areas. For example, loose to dense sands and very soft-to-soft silts and clays are fully penetrated by the vibratory corer (usually to 3 meters). Table 10 shows depths and times achieved using the vibratory corer equipment. Table 11 shows total penetration of the Navy Divers push cores at each location. Dense to very dense sands, medium stiff to very stiff clays and silts, and medium grained gravels are penetrated only a few inches (7 to 15 cm) by the diver core.

The qualitative in-situ density for Upper Newport Bay is a soft to increasingly dense sediment. Upper Newport Bay sediments mainly consist of Bay Deposits of very soft silts, clay, loose sand, silty sand, and clayey sand. Sediment density located in the vicinity from the Pacific Coast Highway Bridge up to Station 3+500 can be anticipated as loose sand. Sediments from Station 3+500 up to and including the Unit II Basin can be considered soft and classified as a mixture of silt, sandy silt, silty clay, and sandy clay. Sediments in the Middle Island Channel are considered loose with a mixture of sand and silt with a medium dense under layer of gravel and sand. Sediments in the Santa Ana-Delhi channel can be classified as soft clay. Sediments located in the channel connecting the Unit II and Unit I/III Basins and including the Unit I/III Basin have a mixture of soft sediments classified as sandy silt, elastic silt, sandy clay, clay, with an under layer of dense sand and gravel with sandy clay in some areas. Sediments located in the New Island Channel are considered soft and classified as sandy clay, silty clay, and clay.

7.7 Sediment Chemistry Analysis and Results.

7.7.1 1995 Analysis and Results

Three composite samples (Unit I/III Top, Unit I/III Bottom, and Access Channel) were tested in 1995. The sediment samples are uncontaminated with metals. All metal values were below their recent ERL values published by Long, et al (1995) and concentrations of most metals in the test sample (Unit I/III Top, Unit I/III Bottom and Access Composite) were lower than those in the LA-3 reference sediment.

The sediments were evaluated for ocean disposal in accordance with the draft Regional Implementation Agreement (RIA, 1992). With the presence of existing data, an established process for determining whether additional testing is necessary is explained in the following text. The Corps and Region IX EPA representative(s) reviewed existing data. Once the review was complete, the Corps provided EPA with a recommendation regarding the need for any further testing under the US Army Corps of Engineers/US Environmental Protection Agency's tiered approach for dredged sediments as shown in EPA-503/8-91/00 "Evaluation of Dredged Material Proposed for Ocean Disposal," also known as the "Green Book." Under the tiered approach, a recommendation can be no further environmental testing is required, or a higher tier level evaluation is necessary to make final determination on ocean disposal suitability. In the case of Upper Newport Bay, the Corps determined to go directly to Tier III testing based on past sampling chemistry results and potential sources of contamination from runoff into Upper Newport Bay. Tier III analyses includes toxicity and bioaccumulation testing. Based on these tests results, the Corps determined that the material to be dredged from Upper Newport Bay is suitable for ocean disposal at LA-3. EPA concurrence is required for all suitability determinations, including testing protocols. EPA has concurred with this determination.

7.7.2 2002 Analysis and Results

Chemical analysis was performed on 11 separate areas. Analyses results indicate sediments dredged from Upper Newport Bay are suitable for disposal at LA-3.

7.7.3 2003 Analysis and Results

Chemical analysis was performed on samples taken in 2003. Three sites were analyzed (23rd Street, Northstar Beach, and Shellmaker Island). Results indicate sediments from all three areas are suitable for nearshore placement along Newport Beach between 39th Street and 60th Street.

7.7.4 Chemical Acceptability.

Generally, all contaminants detected are within ER-L (effects range low as determined by NOAA's National Status and Trends (NS&T) Program). For the few contaminants exceeding the ER-L, none of the samples exceeded the ER-M (effects range medium).

7.8 SKIMMER ISLAND, HOT DOG TERN ISLAND, AND NEW LEAST TERN ISLAND.

7.8.1 Removal of Skimmer Island.

Removal of Skimmer Island may be performed using dredge equipment.

7.8.2 Hot Dog Tern Island.

Hot Dog Tern Island will remain in place. The top material will be removed and replaced with 0.61 m sand-shell mixture from Shellmaker Island. Minimum side slopes of 1V:5H are necessary to maintain the integrity of the sand-shell layer.

7.8.3 New Least Tern Island.

Creation of the New Least Tern Island may be constructed using excavated material from upland sources. Dredge material from within UNB may also be used if needed for the island foundation. A 0.61 m sand-shell mixture shall be placed on the top of the island to maintain a dry and stable surface. Side slopes of 1V:5H are necessary to maintain the integrity of the sand-shell layer.

8. CONCLUSIONS.

- Physical characteristics from prior sampling events are consistent with the most current sampling events.
- The proposed receiving beach (Newport Beach between the Santa Ana River and the Newport Pier) has fines contents ranging from 1 to 39% with an average 6%. For compatibility calculation, the maximum fines content for beach placement is limited to 11 percent. The maximum fines content for near shore placement is 31 percent.
- Twenty-third Street, Shellmaker Island, and Northstar Beach sediments are nearshore compatible with Newport Beach in respect to both grain size and chemistry.
- Sediment from Bullnose West in not onshore compatible but is nearshore compatible. The average fines content is 60%.
- The sediment in the lower portions of the Upper Newport Bay (from the Pacific Coast Highway Bridge to the confluence of Upper Middle Island Channel to the main channel) consists mainly of poorly-graded sand and silt. The sediment contained within the upper portions of Upper Newport Bay (from upper Middle Island Channel and the effluent of San Diego Creek) consists mainly of sandy silt and clay mixed throughout. The relative density of the sediment within Upper Newport Bay as observed by field personnel indicates the following: a high percentage (65 to 75%) of borings show a soft to very soft overlying material; less than 15% of the borings show a soft to very soft overlying material of medium dense underlying material and only two borings show a stiff underlying material; approximately 25% of the total borings indicate a medium to stiff material based on penetration rates of either the vibratory core or diver cores. All methods of dredging may be used for the entire area.
- Sediment samples were collected at Newport Beach and compared with samples collected from Upper Newport Bay to determine compatibility for near shore placement. The sediments from Upper Newport Bay contain a much higher percentage of fine material (material passing the #200 mesh) than the sediments from Newport Beach. Therefore, sediments from Upper Newport Bay are not compatible with Newport Beach profiles. Placing Upper Newport sediments on Newport Beach or near shore will create undesirable conditions and therefore is not an option.

- Tidal effects play an important role in slope stability throughout Upper Newport Bay. Side slopes are stable at 1V:3H in areas that do not experience significant tidal effects in relation to slope height. Areas with the larger tidal effects in relation to slope height, the slopes are not able to maintain as steep a gradient as other areas. Therefore -0.61 m (MLLW) deep restoration channels are not stable at 1V:3H.

9. RECOMMENDATIONS

- 1V:5H side slopes in all restoration channels (e.g., -0.61 m deep channels).
- 1V:3H side slopes throughout the access channel and basin areas except as stated below.
- 1V:5H side slopes around all islands.
- 1V:8H side slopes along sensitive areas (e.g. roadways and buildings) where the top of slope is within 1 meter of the sensitive area.
- All sediments dredged from below MHHW within the bay shall be disposed in LA-3 disposal site. These sediments may be used to construct the New Least Tern Island if the volume of upland materials is not adequate to complete construction of the island.
- Sediment from 23rd Street, Shellmaker Island, and Northstar Beach is suitable for near shore placement. This material shall be placed near shore at Newport Beach.
- Sediments from Bullnose West, Main Dike, the top portion of Skimmer Island, and Hotdog Tern Island should be used as the foundation for the New Tern Island.
- A sand-shell mixture of 0.61 m thick should be placed on top of the New Least Tern Island and Hotdog Tern Island. The sand-shell mixture will come from Shellmaker Island and/or the upper 0.61 meters of the existing Least Tern Island.

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Table 1: 1995 Composite Physical Sample Results.

Location	% Silt	% Clay	% Sand
Access Channel	18.5	21	60.5
Unit II Basin	36.5	26.4	37.1
Unit I/III Basin Top Portion -1.64 to -3.84 m MLLW	26.5	34.1	39.4
Unit I/III Basin Bottom Portion -3.84 m to –5.94 m MSL)	26.9	57.3	15.8
Average of all Samples	26.4	34.2	39.4

Source: Orange County, 1997

Table 2: 1995 LA-3 Reference Site Composite Sample Results.

Location	% Silt	% Clay	% Sand
33°31.70'N, 117°51.30'W	70.9	22.6	6.5

Source: City of Newport Beach, California

Table 3

2002 Navy Diver Cores Physical Analysis

(ASTM - D 2487) Beach Classification

Seive size (mm)			19	9.5	4.75	2.8	2	1.4	1	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063			
HOLE	DEPTH METERS		Standard Sieve Number Designation																Atterberg Limits		
No.	TOP	BOT	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230	LL	PI	CLASSIFICATION
B-1	0	0.6	100	100	100	100	99	99	99	99	98	98	98	97	97	96	96	95	71	38	MH; elastic silt, soft, occassional shells
B-3	0	0.5	100	100	100	100	100	98	95	88	77	66	57	52	48	45	44	42			SM; silty sand, grey-green, w/rare gravel
B-5	0	1.5	100	100	100	100	100	99	99	99	99	99	98	98	97	96	95	95	58	31	CH; soft grey-green with shells
B-8	0	1.4	100	100	100	100	100	99	99	99	98	98	98	98	97	97	97	96	60	35	MH; elastic silt, soft, occassional shells
B-9	0	0.9	100	100	100	99	99	98	97	97	97	96	96	95	95	95	94	94	67	34	MH; elastic silt, black mud
D4-A	0.8	1.2	100	100	100	100	99	99	98	97	96	92	86	40	13	9	9	9	NP	NP	SP-SM; sand w/silt, light grey w/shells
D4-A	1.2	2	100	100	84	81	78	75	72	64	53	41	27	11	4	3	2	2	NP	NP	SP; poorly graded sand w/shells
D4-B	0	1.2	100	100	93	91	90	89	87	82	69	51	26	11	7	5	5	4	NP	NP	SP-SM; gravel at surface, sand w/silt, shell
D-6	0	1.4	100	100	87	85	83	81	80	78	73	64	35	8	2	1	1	1	NP	NP	SP; medium to coarse grained sand, w/shell
D-8	0	1.5	100	100	100	98	97	95	93	90	85	74	60	51	44	38	34	32	NP	NP	SM; silty sand, dark grey, organic odor
D-10	0	0.9	100	100	100	100	100	99	99	98	97	94	85	73	64	56	54	53			Surface mud, ML; sandy silt, orgainic silty clay
D-12	0	1.1	100	100	100	100	100	100	100	100	99	99	98	97	96	95	94	93			ML;silt, but sandy at mudline, soft, tan
D-12	1.1	1.4	100	100	100	98	97	96	95	93	86	69	40	20	10	6	5	5	NP	NP	SP-SM; sand w/silt, grey, occassional shells
D-14	0	1.4	100	100	100	100	100	99	99	99	98	97	94	89	79	67	60	54			ML; sandy silt, dark, occassional shells
D-14	1.4	1.9	100	100	94	90	89	87	86	84	79	67	45	27	17	12	11	10	NP	NP	SP-SM; sand w/silt, shell hash at bottom
D-16	0	1.2	100	100	98	98	97	96	96	95	90	82	9	45	21	8	5	4	NP	NP	SP-SM, sand w/silt, occassional shells
D-16	1.2	1.5	100	100	100	100	100	99	99	99	98	95	92	90	73	52	46	43	NP	NP	SM; silty sand, tan
D-16	1.5	1.7	100	100	100	99	98	98	97	99	98	98	96	90	73	52	46	43			SM; Silty Sand
D-18	0	0.2	100	100	98	96	95	94	93	91	88	83	69	48	34	23	19	17	NP	NP	SM; silty sand, soft
D-18	0.2	1.1	100	100	86	85	84	82	82	79	71	56	27	9	4	2	2	2	NP	NP	SP; medium grained sand with shells
D-20	0	1.4	100	100	84	79	76	74	72	71	69	64	43	15	6	3	3	3	NP	NP	SP; shells w/med grained sand.
D-22	0	2.4	100	100	100	100	100	100	100	99	99	98	85	47	23	7	5	4	NP	NP	SP-SM; sand w/silt, dark, med. Grained
D- 24	0	1.1	100	100	100	100	100	100	100	100	100	100	100	99	99	98	98	97			ML; silt, dark grey, slightly silty
D-24	1.1	2.6	100	100	97	94	93	92	91	90	88	82	67	39	14	2	1	1	NP	NP	SP; sand, dark grey with shells
D-26	0	3.1	100	100	100	100	99	98	98	97	95	92	83	48	16	5	3	3	NP	NP	SP; sand, dark grey with shells
D-28	0	2.6	100	100	100	100	100	100	100	99	99	98	92	52	19	9	8	7			SP-SM; sand w/silt
D-30	0	2.4	100	100	97	94	92	90	88	87	84	82	76	60	33	11	7	5	NP	NP	SP-SM; sand w/silt, minor clay, w/shell hash
D-32	0	2.4	100	100	100	99	98	97	96	94	90	78	54	30	20	1	1	1	NP	NP	SP; sand, dark grey, medium SP; dark grey
D-34	0	1.3	100	100	100	100	99	99	99	99	99	99	99	98	98	98	98	98	76	43	MH; black organic to 1.5m, elastic silt

Table 3

2002 Navy Diver Cores Physical Analysis

(ASTM - D 2487) Beach Classification

Seive size (mm)			19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063			
HOLE No.	DEPTH METERS		Standard Sieve Number Designation																Atterberg Limits		
	TOP	BOT	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230	LL	PI	CLASSIFICATION
D-36	0	0.9	100	100	98	92	88	84	81	78	74	69	62	55	47	36	32	28	47	27	SC; mucky clay to .15m, shells
D-38	0	8.5	100	100	100	98	97	96	95	95	94	92	90	86	74	52	44	40			SM; silty sand, minor clay, occassional shells
D-40	0	0.8	100	100	100	100	100	100	99	99	99	98	97	93	57	19	13	10			SM; silty sand, rare shell, well sorted
D-48	0	1.7	100	100	100	99	97	97	96	95	95	94	92	84	68	56	52	49	40	23	CL; dark, no shells, occ. thin black layers
D-50	0	2	100	100	100	99	99	98	98	98	97	97	94	87	75	64	59	56	33	12	CL; sandy clay, black, soft, organic
D-52	0	1.3	100	100	100	99	98	98	97	97	96	96	95	93	92	90	89	87	110	80	MH; elastic silt, black, organic
D-54	0	1.3	100	100	100	100	99	99	99	99	99	99	98	98	97	97	96	96	77	42	MH; elastic silt, soft, rare shells, greenish tan
D-56	0	1.4	100	100	100	99	98	97	96	95	92	89	81	70	63	59	58	56	30	14	Sandy Lean Clay
D-58	0	1.7	100	100	100	100	100	100	99	99	99	98	98	98	97	96	96	95	61	30	MH; elastic silt, soft occassional shell
HD-1	0	1.1	100	100	100	100	100	100	100	100	99	99	99	99	97	95	95	93	53	24	CH; fat clay, orgainic, soft, some silt & shells
HD-2	0	1.1	100	100	93	93	92	92	92	91	91	90	89	87	86	83	80	76	51	27	CH; clay w/sand, orgainic, soft, rare shells
HD-3	0	1.4	100	100	100	100	99	98	97	96	95	93	92	89	85	82	79	76	46	19	CL; organic muck to .2m, clay w/sand & shells
M-1	0	0.6	100	100	97	92	90	87	86	84	83	81	77	72	62	48	43	39	27	7	SC-SM, sility clayey, soft, with silt and shells
M-2	0	0.7	100	100	100	99	99	98	98	96	94	92	90	88	84	79	77	75	47	21	CL; clay w/sand, occassional shells
M-3	0	0.7	100	100	100	96	94	92	90	87	83	76	63	55	47	40	38	36	26	8	SC; clayey sand, occasoinal shells
M-4	0	0.8	100	100	100	100	99	99	98	98	96	93	82	68	56	42	38	36	28	11	SC; clayey sand, occasoinal shells
N-1	0	1.6	100	100	100	100	100	99	99	98	98	97	97	96	94	89	82	76	42	16	CL; clay w/sand, organic w/plant material
N-2	1.7	100	100	100	100	100	100	100	100	100	100	100	99	99	99	98	95	93			CL; clay, organic w/plant material & shells
S-1	0	0.6	100	100	97	96	96	95	95	95	95	94	93	89	72	42	35	31	NP	NP	SM; silty sand, high percentage of shells
S-2	0	0.7	100	100	100	99	99	98	97	97	96	95	94	91	88	81	79	77	36	9	CL; clay w/sand, soft w/ shells toward base
S-3	0	0.4	100	100	100	98	96	94	93	92	91	90	89	87	84	79	77	75			ML; silt w/sand, w/shells toward base
S-4	0	0.8	100	100	100	100	100	100	99	99	98	97	96	95	90	78	71	67	26	6	CL; silty clay, w/sand
S-5	0	0.4	100	100	96	95	95	95	94	94	93	91	85	74	52	28	23	20	NP	NP	SM; silty sand, very fine to fine, 40% shells
SA-1	0	0.8	100	100	96	94	92	90	87	81	75	71	68	65	62	55	50	46	46	19	SL; sandy clay, 20% shells
SA-2	0.3	0.9	96	94	88	83	79	75	70	65	58	50	41	35	31	27	25	23			CL; clay,
SA-2	0.9	1.5	100	100	100	100	99	98	97	95	93	91	88	86	83	81	80	78	47	26	SM; sility sand, w/coarse gravel, 50% shells
SA-3	0	1.2	100	100	100	100	99	99	98	97	96	95	93	91	88	85	83	80	52	29	CH; fat clay w/sand
Average			98	98	94	92	92	91	90	89	87	83	74	65	56	50	48	47			

Table 4

2002 Vibracore Physical Analysis

(ASTM - D 2487) Beach Classification

Seive size (mm)			19	9.5	4.75	2.8	2	1.4	1	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063			
	Depth m		Standard Sieve Number Designation																ATTERBERG LIMITS		
HOLE N0.	TOP	BOT	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230	LL	PI	CLASSIFICATION
A-1 RUN1	0	2.4	100	100	100	100	100	100	100	99	99	98	97	96	94	86	73	59	NP	NP	ML; very soft, dark olive w/ shells, PP <25 Kpa
A-1 RUN1	2.4	5.2	100	100	100	100	100	100	99	99	99	99	98	98	98	97	96	93	24	7	CL-ML; very soft, dark olive with shells
A-1 RUN1	5.2	7.6	84	84	83	81	79	77	74	70	65	60	52	41	32	25	22	20	NP	NP	SW; silty sand with gravel, dark olive with shells
A-2 RUN2	0	2.4	100	100	100	99	98	98	97	96	96	95	94	92	91	89	83	76	41	18	CL; very soft, dark olive, fine grain sand with shells
A-2 RUN2	2.4	4.6	100	100	100	100	99	99	99	99	98	98	98	98	97	97	97	96	61	27	CH; fat clay, very soft, dark olive, w/shells
A-2 RUN2	4.6	5.2	100	100	100	99	99	98	97	93	87	80	71	61	53	49	46	45	28	11	SC; clayey sand, very loose, olive, fine grained w/shells
A-2 RUN2	5.2	7.6	100	100	100	98	97	95	91	83	72	61	49	37	28	23	21	20	NP	NP	SM; silty sand, fine grained sand with shells,
A-3 RUN2	0	7.3	100	100	100	97	96	95	94	93	92	91	90	90	89	87	85	81	45	20	CL; very soft with shells and orgaincs. PP<25 Kpa
A-4	0	6.1	100	100	100	100	99	99	99	98	98	98	97	96	95	92	87	82	50	28	CH; fat clay, very soft, dark olive, w/shells
A-5	0	6.1	100	100	100	100	100	99	99	99	98	98	98	98	97	97	96	95	39	16	CL' veryh soft, dark olive, with organics. PP<25KPa
A-6 RUN1	0	6.1	100	100	100	100	100	100	99	99	99	99	98	96	91	77	62	52	NP	NP	ML; Sandy silt, very soft,dark olive. PP<25KPa
A-6 RUN3	0	2.4	100	100	100	100	100	100	99	99	99	98	92	67	38	22	14	11	NP	NP	SM-ML; dark olive fine grained sand, some organics
A-6 RUN3	2.4	6.1	100	100	100	99	98	98	97	97	96	96	95	94	94	93	92	90	27	9	CL; very soft, olive with occassional shells
B-2	0	1.1	100	100	100	100	100	100	99	99	96	89	72	53	34	19	14	11	NP	NP	SM; silty sand, dark grey
B-2	1.1	2.1	100	100	100	100	100	100	100	100	100	99	97	95	93	92	91	91			ML; silt, dark grey. PP< 25KPa
B-2	2.1	2.7	100	100	100	100	99	99	97	94	88	82	73	65	56	52	5	47	NP	NP	ML; sandy silt, very stiff brown and olive. PP=300KPa
B-2	2.7	3.5	100	100	100	100	99	98	95	90	83	74	62	50	40	33	30	27			SM; silty sand, light olive
B-4	0	1.1	100	100	100	100	100	100	100	100	100	99	99	98	97	95	93	91	79	44	CH; fat clay, very soft with organics. PP< 25KPa
B-4	1.1	2.1	100	100	100	100	99	97	95	89	80	69	58	50	45	42	39	37	22	8	SC; clayey sand, loose to medium dense. PP=100KPa
B-4	2.1	2.7	100	100	100	100	99	99	98	98	97	95	93	89	82	72	66	61	54	38	MH; elastic silt, very stiff, dark grey. PP=325KPa
B-4	2.7	2.8	100	100	100	100	99	98	96	91	81	70	59	52	46	43	41	38			SM; silty sand, medium dense, light olive
B-5 RUN1	0	0.9	100	100	100	100	99	99	98	97	95	92	87	80	72	67	62	59	56	33	MH, silt, very soft, dark. PP<25KPa
B-5 RUN1	0.9	2.6	100	98	96	94	92	89	85	80	72	65	56	48	44	40	36	34	26	13	SC; clayey sand, medium dense, dark olive with shells
B-6	0	7.6	100	100	100	99	99	97	96	93	91	88	84	80	75	67	62	58	25	10	CL; sandy clay, very soft, olive with occassional shells
B-7 RUN1	0	2.4	100	100	100	98	96	95	94	93	93	92	91	89	88	87	86	82	25	6	CL-ML; silty clay, very soft, olive. PP<25KPa
B-7 RUN1	2.4	7.6	100	100	100	100	99	99	99	99	98	98	98	97	96	95	94	91	28	13	CL; clay, very soft, olive, fine grained sand with organics
B-8	0	6.1	100	100	100	100	99	98	97	96	96	95	94	94	93	92	91	90	31	23	CL; very soft, olive with shells. PP<25KPa
B-8	6.1	7.8	100	100	100	100	100	100	99	99	99	99	98	94	82	65	54	48	23	10	CL; very soft, olive
B-10 Run1	0	4.9	100	100	100	100	100	100	100	99	99	98	94	92	90	90	89	88	24	12	CL; very soft , olive with occassional shells
B-10 Run1	4.9	5.2	100	100	100	100	99	98	96	92	87	81	73	64	54	45	41	37	NP	NP	SM; silty sand, olive.
B-10 Run1	5.2	6.1	100	97	95	92	90	88	87	85	83	79	73	65	55	48	42	38	NP	NP	SM; silty sand, olive.

Table 4

2002 Vibracore Physical Analysis

(ASTM - D 2487) Beach Classification

Seive size (mm)			19	9.5	4.75	2.8	2	1.4	1	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063			
	Depth m		Standard Sieve Number Designation																ATTERBERG LIMITS		
HOLE N0.	TOP	BOT	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230	LL	PI	CLASSIFICATION
D-6	0	2.1	100	100	100	100	99	98	97	93	86	72	39	9	2	1	1	1	NP	NP	SP; sand, light grey fine to meduim sand with shells
D-16	0	2.1	100	100	100	99	98	97	96	94	85	69	51	31	13	5	3	2	NP	NP	SP; sand, dark grey, fine grained, shells, high organics
D-24	0	1.5	100	100	100	100	99	98	97	96	91	79	46	18	7	5	4	4	NP	NP	SP; sand, olive, fine grained sand with shells
D-32	0	0.3	100	100	100	100	100	100	100	100	99	99	99	99	99	99	98	98	30	24	CL; very soft, olive with shells
D-32	1.5	2.1	100	100	100	96	94	91	91	90	89	89	88	88	87	86	85	83	25	17	CL; very soft, olive with shells
D-38	0	3.1	100	100	100	100	100	99	99	98	97	94	85	93	34	17	8	6	NP	NP	SP-SM; sand w/silt, light grey
D-48	0	3.1	100	100	100	99	98	97	97	96	96	95	94	93	93	92	92	92	61	49	CH; fat clay, very soft, olive, no odor
D-52	0	1.1	100	100	100	99	98	97	96	95	94	93	91	89	87	85	84	82	56	32	CH; fat clay w/sand, dark grey, fine grained sand w/shell
D-52	1.1	1.5	100	100	100	99	99	98	97	95	91	85	72	52	36	28	25	22	NP	NP	SM; sility sand, very loose, dark olive
D-56	0	1.7	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	79	37	MH, elastic silt, very soft, dark grey
HD-3	0	1.4	100	100	100	100	100	99	99	99	99	99	99	99	98	98	97	96	31		CL; clay, very soft, organics w/tree roots. PP<25KPa
M-1	0	0.6	100	100	100	100	99	99	97	96	94	92	89	87	84	80	70	66	32	6	ML; silit w/sand, olive, ocassional gravel w/lots of shells
M-1	0.6	3.1	100	100	100	100	99	99	97	96	94	92	89	87	84	80	70	66	NP	NP	GP; poorly graded gravel w/sand, medium dense, brown
M-3		NA	100	100	100	96	94	92	90	87	83	76	63	55	47	40	38	36	NP	NP	SP-SM; sand w/silt, olive with lots of shells
N-1	0	2.9	100	100	100	98	98	97	96	96	95	95	94	94	93	89	83	76	25	9	CL; clay w/sand, very soft, dark olive, shells, no odor.
N-3	0	2.9	100	100	100	100	100	99	99	99	99	99	99	98	98	96	95	93	23	15	CL; clay, very soft, occassional shells. PP<25KPa
S-2	0	0.3	100	100	100	99	99	99	98	98	97	96	95	92	84	75	67	64	49	29	CL; sandy clay, very soft, dark olive
S-2	0.3	2.9	100	100	100	99	97	96	95	94	93	92	87	77	50	21	13	10	NP	NP	SM; silty sand, loose olive, with shells
S-4	0	1.1	100	100	100	100	99	99	99	98	97	96	95	94	93	90	89	87	71	37	MH; very soft, dark olive, PP<25KPa
S-4	1.1	2.7	100	100	100	96	93	89	87	84	78	64	40	20	8	4	3	2	NP	NP	SP; sand, light olive, fine grained sand w/shells
SA-1 RUN1	0	0.3	82	68	63	57	50	43	33	20	10	65	4	4	4	4	3	3	NP	NP	SP; poorly graded sand/gravel, greyish brown.
SA-1 RUN1	0.3	4.3	100	100	100	97	95	92	91	88	84	81	79	77	76	75	72	69	19	3	ML; silt w/sand; very soft, shells, odor. PP<25KPa
SA-3 RUN3	0	0.6	93	82	71	61	55	45	36	25	16	11	6	2	1	1	1	1	NP	NP	SP; poorly graded sand w/gravel, brown and grey
SA-3 RUN3	0.6	2.3	100	100	100	100	99	99	99	99	98	98	98	97	96	96	96	95	NP	NP	ML; very soft, olive.

TABLE 5

2002 Vibracore Insitu Density Testing

Boring Number	Location	Type	Total Depth(m)	Time (seconds)
A-1 Run1	Unit II Basin	Vibracore	7.6m	90sec
A-2 Run1	Unit II Basin	Vibracore	6.1m	26sec
A-2 Run2	Unit II Basin	Vibracore	7.6m	81sec
A-3 Run1	Unit II Basin	Vibracore	6.1m	58sec
A-3 Run2	Unit II Basin	Vibracore	7.3m	60sec
A-4	Unit II Basin	Vibracore	6.1m	67sec
A-5	Unit II Basin	Vibracore	6.1m	88sec
A-6 Run1	Unit II Basin	Vibracore	6.1m	78sec
A-6 Run2	Unit II Basin	Vibracore	6.1m	60sec
A-6 Run3	Unit II Basin	Vibracore	6.1m	113sec
B-1	Unit I/III Basin	Vibracore	3.0m	606sec
B-1Run2	Unit I/III Basin	Vibracore	3.2m	960sec
B-2	Unit I/III Basin	Vibracore	3.5m	540sec
B-3 Run1	Unit I/III Basin	Vibracore	3.8m	979sec
B-3 Run2	Unit I/III Basin	Vibracore	3.3m	1200sec
B-4	Unit I/III Basin	Vibracore	2.8m	748sec
B-5 Run1	Unit I/III Basin	Vibracore	2.6m	801sec
B-5 Run2	Unit I/III Basin	Vibracore	2.6m	960sec
B-6	Unit I/III Basin	Vibracore	7.6m	120sec
B-7 Run1	Unit I/III Basin	Vibracore	7.6m	60sec
B-8	Unit I/III Basin	Vibracore	7.8m	100sec
B-10 Run1	Unit I/III Basin	Vibracore	6.1m	300sec
D-6	Main Channel	Vibracore	2.1m	150sec
D-16	Main Channel	Vibracore	2.1m	102sec
D-24	Main Channel	Vibracore	1.5m	60sec
D-32	Main Channel	Vibracore	2.1m	86sec
D-38	Main Channel	Vibracore	3.0m	330sec
D-48	Main Channel	Vibracore	2.4m	62sec
D-52 Run1	Main Channel	Vibracore	1.5m	31sec
D-56	Main Channel	Vibracore	1.7m	110sec
HD-3	Tern Island Channel	Vibracore	3.0m	480sec
M-1	Middle Island Channel	Vibracore	3.0m	131sec
M-3	Middle Island Channel	Vibracore	3.7m	39sec
N-1	New Island	Vibracore	2.9m	42sec
N-3	New Island	Vibracore	2.9m	34sec
S-2	Shellmaker Island	Vibracore	2.9m	28sec
S-4	Shellmaker Island	Vibracore	2.7m	28sec
SA-1 Run1	Shellmaker Island	Vibracore	4.3m	31sec
SA-3 Run3	Shellmaker Island	Vibracore	2.3m	24sec

Table 6

2002 Navy Diver Cores Beach Transects Physical Analysis

24 October 2002 Beach Transects (39th Street, 50th Street, and 60th Street) on Newport Beach Peninsula

BEACH GRADATIONS TRANSECT A, STA 668+53 (39th Street)

Data #	Sample Location No.	Standard Sieve Number Designation																	
		3	1.5	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230
1	Sta A+4	100	100	100	100	100	100	100	100	100	99	94	77	29	6	1	1	1	1
2	Sta A+2	100	100	100	100	100	100	100	100	100	100	94	66	13	2	1	1	1	1
3	Sta A+0	100	100	100	100	100	100	100	99	99	98	95	90	79	51	20	4	1	1
4	Sta A-2	100	100	100	99	99	98	97	94	89	82	74	68	59	44	24	11	2	1
5	Sta A-4	100	100	100	100	99	98	98	97	97	97	97	96	93	82	43	7	2	1
6	Sta A-6	100	100	98	94	91	89	88	88	88	87	87	86	83	72	44	14	4	1
7	Sta A-8	100	100	100	100	100	100	100	100	100	100	100	99	97	93	86	52	21	9
8	Sta A-10	100	100	100	100	100	100	100	100	100	100	99	95	86	71	57	57	39	24
Average		100	100	100	99	99	98	98	97	97	95	93	85	67	53	35	18	9	5

BEACH GRADATIONS TRANSECT B, STA 689+00 (50th Street)

Data #	Sample Location No.	Standard Sieve Number Designation																	
		3	1.5	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230
1	Sta B+4	100	100	100	100	100	100	100	100	100	98	90	65	24	5	1	1	1	1
2	Sta B+2	100	100	100	100	100	100	100	100	100	100	96	73	22	4	1	1	1	1
3	Sta B+0	100	100	100	100	100	100	100	99	99	99	96	85	55	25	9	3	1	1
4	Sta B-2	100	100	100	100	100	100	100	99	99	97	93	89	80	55	25	24	1	1
5	Sta B-4	100	100	100	100	100	100	100	99	99	99	98	95	82	47	16	2	1	1
6	Sta B-6	100	100	100	99	98	97	96	96	95	93	91	86	73	45	18	13	1	1
7	Sta B-8	100	100	100	100	100	100	99	99	99	98	97	96	92	82	57	20	7	2
8	Sta B-10	100	100	100	100	100	100	100	100	100	99	99	97	93	85	75	60	27	14
Average		100	100	100	100	100	100	99	99	99	98	95	86	65	44	25	16	5	3

BEACH GRADATIONS TRANSECT C, STA 713+28 (60th Street)

Data #	Sample Location No.	Standard Sieve Number Designation																	
		3	1.5	3/4	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230
1	Sta C+4	100	100	100	100	100	100	100	100	99	98	94	79	39	10	2	1	1	1
2	Sta C+2	100	100	100	100	100	100	100	100	100	100	99	90	42	8	2	2	1	1
3	Sta C+0	100	100	100	100	100	100	100	100	100	100	100	97	86	34	8	2	1	1
4	Sta C-2	100	100	100	100	100	100	100	99	99	97	93	86	77	53	22	22	1	1
5	Sta C-4	100	100	100	100	100	99	97	94	87	74	53	36	22	12	4	1	1	1
6	Sta C-6	100	100	100	100	99	99	99	99	99	99	99	98	96	85	51	34	3	1
7	Sta C-8	100	100	100	100	100	100	100	100	100	100	99	97	93	78	44	22	5	2
8	Sta C-10	100	100	100	100	100	100	100	100	100	99	98	95	90	81	62	29	15	6
Average		100	100	100	100	100	100	100	99	98	96	92	85	68	45	24	14	4	2

NOTE: The fines limit of 39% and 27% were not considered representative

Table 7

Physical Analysis of 2003 Sampling
Shellmaker Island

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
SM-01-03	0.0	2.7	3.0	0.3	100	100	100	100	99	97	96	93	87	75	49	23	9	9	2	2
	2.7	3.5	0.3	0.2	100	100	99	99	98	98	97	96	93	85	57	24	9	3	2	2
SM-02-03	0.0	1.2	2.0	0.8	100	100	100	99	97	96	94	92	86	76	67	42	28	21	20	19
SM-03-03	0.0	1.2	1.5	0.3	100	100	100	100	100	100	100	100	100	99	97	94	86	86	77	77
	1.2	3.7	0.3	0.2	98	95	90	87	85	84	83	82	80	75	58	40	28	20	19	19
			Fine Limit		100	100	100	100	100	100	100	100	100	99	97	94	86	86	77	77
			Coarse Limit		98	95	90	87	85	84	83	82	80	75	49	23	9	3	2	2
			Average		100	100	100	100	99	97	96	94	90	81	64	44	31	30	24	23

NOTE: Bottom elevations for SM-01-03 and SM-03-03 were adjusted to stop at the project elevation of +0.23 m MLLW.

Main Dike (Salt Dike)

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
SD-01-03	0.0	1.5	2.8	1.3	100	100	99	99	99	98	96	88	74	61	49	42	37	35	32	22
	1.5	3.7	1.3	-0.7	100	100	100	100	100	99	96	86	69	53	42	37	34	34	29	27
SD-02-03	0.0	1.8	3.0	1.2	100	100	100	100	100	99	96	86	70	56	44	37	32	30	28	25
			Fine Limit		100	100	100	100	100	99	96	88	74	61	49	42	37	35	32	27
			Coarse Limit		100	100	99	99	99	98	96	86	69	53	42	37	32	30	28	22
			Average		100	100	100	100	100	99	96	87	71	57	45	39	34	33	30	25

NOTE: Bottom elevations for SD-01-03 was adjusted to stop at the project elevation of -0.68 m MLLW.

Table 7

Physical Analysis of 2003 Sampling

Northstar Beach

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.08	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
NS-01-03	0.0	1.8	5.1	3.3	98	95	92	91	90	89	88	87	83	74	52	25	10	10	3	2
	1.8	3.1	3.3	2.1	98	97	94	93	92	91	90	88	84	76	51	26	12	5	4	3
	3.1	3.7	2.1	1.4	100	100	100	99	99	98	98	97	97	96	93	92	91	90	90	90
NS-02-03	0.0	2.1	3.0	0.9	97	95	91	89	88	87	85	82	74	57	31	14	6	6	2	2
	2.1	2.4	0.9	0.6	100	99	99	98	98	97	97	96	94	88	74	54	31	17	14	12
				Fine Limit	100	100	100	99	99	98	98	97	97	96	93	92	91	90	90	90
				Coarse Limit	97	95	91	89	88	87	85	82	74	57	31	14	6	5	2	2
				Average	99	97	95	94	93	92	92	90	86	78	60	42	30	26	23	22

Bullnose West

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.08	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
BN-01-03	0.0	0.8	1.9	1.1	100	100	100	100	100	100	100	99	98	97	94	89	79	77	52	46
	0.8	1.8	1.1	0.2	100	100	100	100	100	100	100	99	99	97	93	86	81	81	75	74
BN-02-03	0.0	0.3	2.0	1.7	100	100	100	100	100	100	100	100	99	99	98	96	90	79	72	66
	0.3	0.9	1.7	1.1	100	100	100	99	99	96	91	80	60	40	27	22	20	20	18	17
	0.9	1.7	1.1	0.3	100	100	100	100	100	99	97	93	87	82	79	78	78	78	78	78
				Fine Limit	100	100	100	100	100	100	100	100	99	99	98	96	90	81	78	78
				Coarse Limit	100	100	100	99	99	96	91	80	60	40	27	22	20	20	18	17
				Average	100	100	100	100	100	99	98	94	89	83	78	74	70	68	59	57

NOTE: Bottom elevations for BN-01-03 was adjusted to stop at the project elevation of +0.23 m MLLW.

Table 7

Physical Analysis of 2003 Sampling
23rd Street Sampling Areas

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
B-1	0.0	0.2	8.0	7.8	100	97	91												22	
	0.2	0.3	7.8	7.7	100	97	95												77	
	0.3	0.5	7.7	7.5	99	94	83												19	
	0.5	0.6	7.5	7.4	100	99	97												4	
	4.6	5.0	3.4	3.0	100	100	100	100	100	100	100	100	100	100	99	98	91	59	47	40
	6.1	6.6	1.9	1.5	100	100	100	94	90	86	82	77	71	64	56	48	38	29	25	23
	7.6	7.8	0.4	0.2	100	100	100	99	98	96	93	84	66	44	24	15	10	6	4	4
	9.1	9.4	-1.1	-1.4	100	100	100	100	99	99	97	92	82	70	54	46	40	34	31	29
	10.7	11.0	-2.7	-3.0	100	100	100	100	100	99	98	96	93	88	83	77	71	66	59	55
				fine limit	100	100	100	100	100	100	100	100	100	100	99	98	91	66	77	55
				coarse limit	99	94	83	94	90	86	82	77	66	44	24	15	10	6	4	4
				average	100	99	96	99	97	96	94	90	82	73	63	57	50	39	32	30
US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
B-2	0.0	0.3	7.2	6.9	100	100	100												25.1	
	0.3	0.6	6.9	6.6	100	99	99												8.5	
	0.6	0.9	6.6	6.3	100	100	100												21.6	
	0.9	1.2	6.3	6.0	100	99	96												62.1	
	1.2	1.5	6.0	5.7	100	99	98												62.4	
	1.5	1.8	5.7	5.4	100	99	99												78.3	
	1.8	4.0	5.4	3.2	100	100	99												21.1	
	4.0	4.6	3.2	2.6	100	100	100												5.9	
	4.6	4.7	2.6	2.5	100	100	100	100	100	100	100	100	99	99	98	96	65	28	19	15
	6.1	6.6	1.1	0.6	100	100	100	99	98	96	95	94	92	88	80	59	30	11	7	6
	7.6	8.1	0.2	0.2	100	100	100	100	100	100	100	99	99	99	98	94	80	61	54	50
	9.1	9.6	0.2	0.2	100	100	100	97	95	93	91	90	89	88	86	85	83	76	66	60
				fine limit	100	100	100	100	100	100	100	100	99	99	98	96	83	76	78	60
				coarse limit	100	99	96	97	95	93	91	90	89	88	80	59	30	11	6	6
				average	100	100	99	99	98	97	97	96	95	94	91	84	65	44	26	33

NOTE: Bottom elevation for B-2 were adjusted to stop at the project elevation at this location which is +0.2 m MLLW.

Table 7

Physical Analysis of 2003 Sampling
23rd Street Sampling Areas

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
B-3	0.0	0.6	6.6	6.0	100	99	98												19.8	
	0.6	1.5	6.0	5.1	99	97	95												13.7	
	1.5	1.8	5.1	4.8	100	99	98												19.3	
	1.8	2.4	4.8	4.2	100	100	99												15.5	
	2.4	3.0	4.2	3.6	100	100	100												18.8	
	3.0	3.7	3.6	2.9	100	100	100												20.4	
	3.7	4.3	2.9	2.3	100	99	99												18.9	
	4.3	4.6	2.3	2.0	100	100	100												19	
	4.6	5.2	2.0	1.4	100	100	100	100	99	99	99	99	99	98	98	96	81	44	30	25
	6.1	6.4	0.5	0.2	100	100	100	98	97	96	96	95	93	91	86	75	47	22	15	12
	7.6	8.1	0.2	0.2	100	100	100	100	100	99	99	99	99	98	97	95	91	86	83	80
	9.1	9.4	0.2	0.2	100	100	100	97	94	92	90	88	84	82	79	77	75	74	71	70
				fine limit	100	100	100	100	100	99	99	99	99	98	98	96	91	86	83	80
				coarse limit	99	97	95	97	94	92	90	88	84	82	79	75	47	22	14	12
				average	100	100	99	99	98	97	96	95	94	92	90	86	74	57	20	47

NOTE: Bottom elevation for B-3 were adjusted to stop at the project elevation at this location which is +0.2 m MLLW.

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
B-4	0.0	0.3	7.7	7.4	100	96	85												7.5	
	0.3	0.6	7.4	7.1	100	100	98												3.1	
	0.6	0.9	7.1	6.8	100	95	91												58.9	
	0.9	1.2	6.8	6.5	100	93	85												45	
	1.2	1.5	6.5	6.2	100	100	100												53.2	
	1.5	1.8	6.2	5.9	100	100	100												51.5	
	1.8	2.1	5.9	5.6	100	100	100												40.8	
	2.1	2.4	5.6	5.3	100	99	99												44.4	
				fine limit	100	100	100	-	-	-	-	-	-	-	-	-	-	-	59	
				coarse limit	100	93	85	-	-	-	-	-	-	-	-	-	-	-	3	
				average	100	98	95	-	-	-	-	-	-	-	-	-	-	-	38	

Table 7

Physical Analysis of 2003 Sampling
23rd Street Sampling Areas

US Standard Sieve Sizes					19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
			Elevation		Standard Sieve Number Designation															
	Depth		m MLLW		3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
Location	Top	Bot	Top	Bot	fine gravel		coarse sand		medium sand					fine sand					fines	
B-5	0.0	0.3	7.0	6.7	100	100	100												26.7	
	0.3	1.2	6.7	5.8	100	100	100												12.1	
	1.2	1.4	5.8	5.6	100	100	100												47.3	
	1.4	1.8	5.6	5.2	100	100	100												81	
	1.8	2.3	5.2	4.7	100	100	100												85	
	2.3	2.7	4.7	4.3	100	100	100												42.6	
	2.7	3.4	4.3	3.6	100	100	100												12.3	
				fine limit	100	100	100	-	-	-	-	-	-	-	-	-	-	-	85	-
				coarse limit	100	100	100	-	-	-	-	-	-	-	-	-	-	-	12	-
				average	100	100	100	-	-	-	-	-	-	-	-	-	-	-	39	-

TABLE 8

Grain Size Comparison (Bullnose, Main Dike, 23rd Street, Northstar Beach, Shellmaker Island, and Newport Beach)

Comparison of Newport Beach fines limit, coarse limit, and composite average to the composite averages of Bullnose, Main Salt Dike, Northstar Beach, Shelmaker Island, and 23rd Street sample composites (composite areas for 23rd Street, B-1, B-2, B-3, B-4, and B-5).

US Standard Sieve Sizes (mm)	19	9.5	4.75	2.8	2	1.4	1	0.71	0.5	0.355	0.25	0.18	0.125	0.09	0.075	0.063
	Standard Sieve Size Designation															
Location	3/4"	3/8"	No. 4	No. 7	No. 10	No. 14	No. 18	No. 25	No. 35	No. 45	No. 60	No. 80	No. 120	No. 170	No. 200	No. 230
Newport Beach fine limit	100	100	100	100	100	100	100	100	100	99	97	93	86	60	11	6
Newport Beach coarse limit	98	98	94	91	89	88	87	74	53	36	13	2	1	1	1	1
Newport Beach composite average	100	100	100	99	99	98	98	96	93	85	67	47	28	16	6	3
Bullnose composite average	100	100	100	100	100	99	98	94	89	84	79	75	70	69	59	58
Main Dike composite average	100	100	100	100	100	99	96	87	71	56	45	38	34	33	30	25
23rd Street B-1 composite average	100	100	99	12	12	11	11	11	11	11	10	8	5	2	34	1
23rd Street B-2 composite average	100	100	99	12	12	11	11	11	11	11	10	8	5	2	26	1
23rd Street B-3 composite average	100	99	99	17	17	17	17	17	17	17	17	16	12	7	20	4
23rd Street B-4 composite average	100	93	85	0	0	0	0	0	0	0	0	0	0	0	38	0
23rd Street B-5 composite average	100	100	100	0	0	0	0	0	0	0	0	0	0	0	39	0
Shellmaker Island composite average	99	99	97	96	95	94	93	91	87	80	62	41	28	25	24	20
Northstar Beach composite average	98	96	93	92	91	90	89	87	82	71	50	30	18	16	23	12

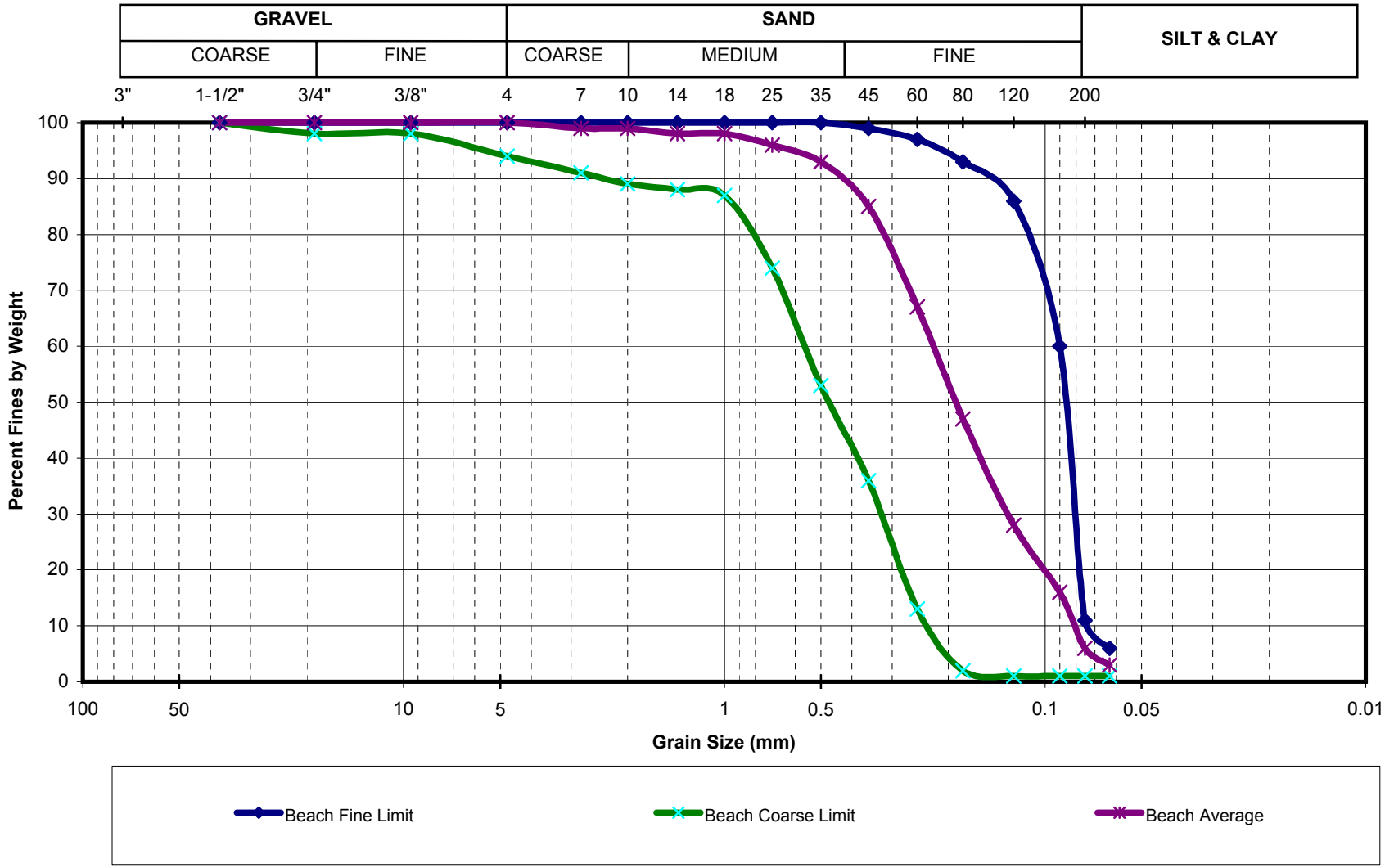

Figure 1
Beach Gradation Envelope (coarse limit, fine limit, and average)

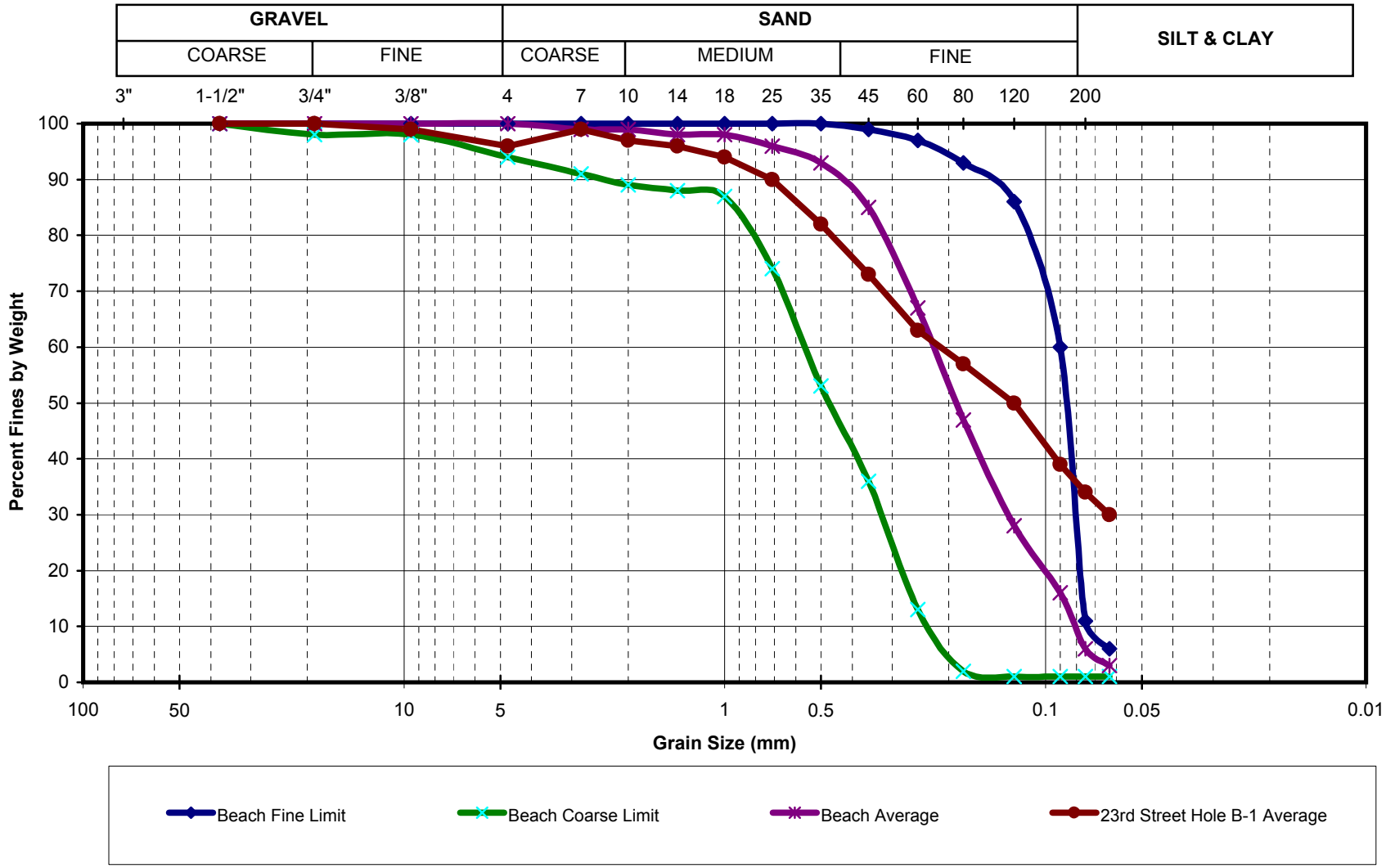

Figure 2
Beach Gradation Envelope vs. 23rd Street Average Grain Size Hole B-1

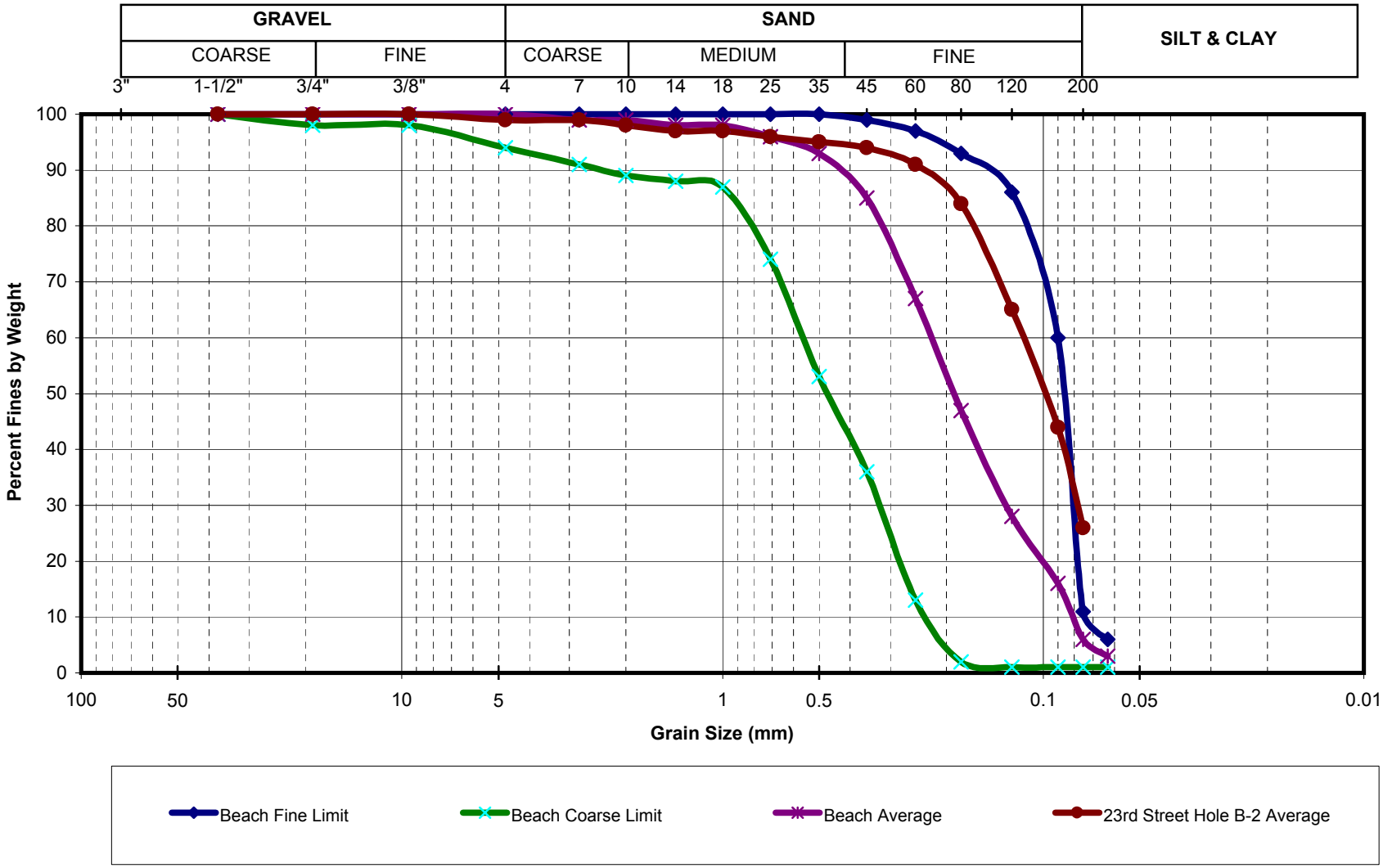

Figure 2
Beach Gradation Envelope vs. 23rd Street Average Grain Size Hole B-2

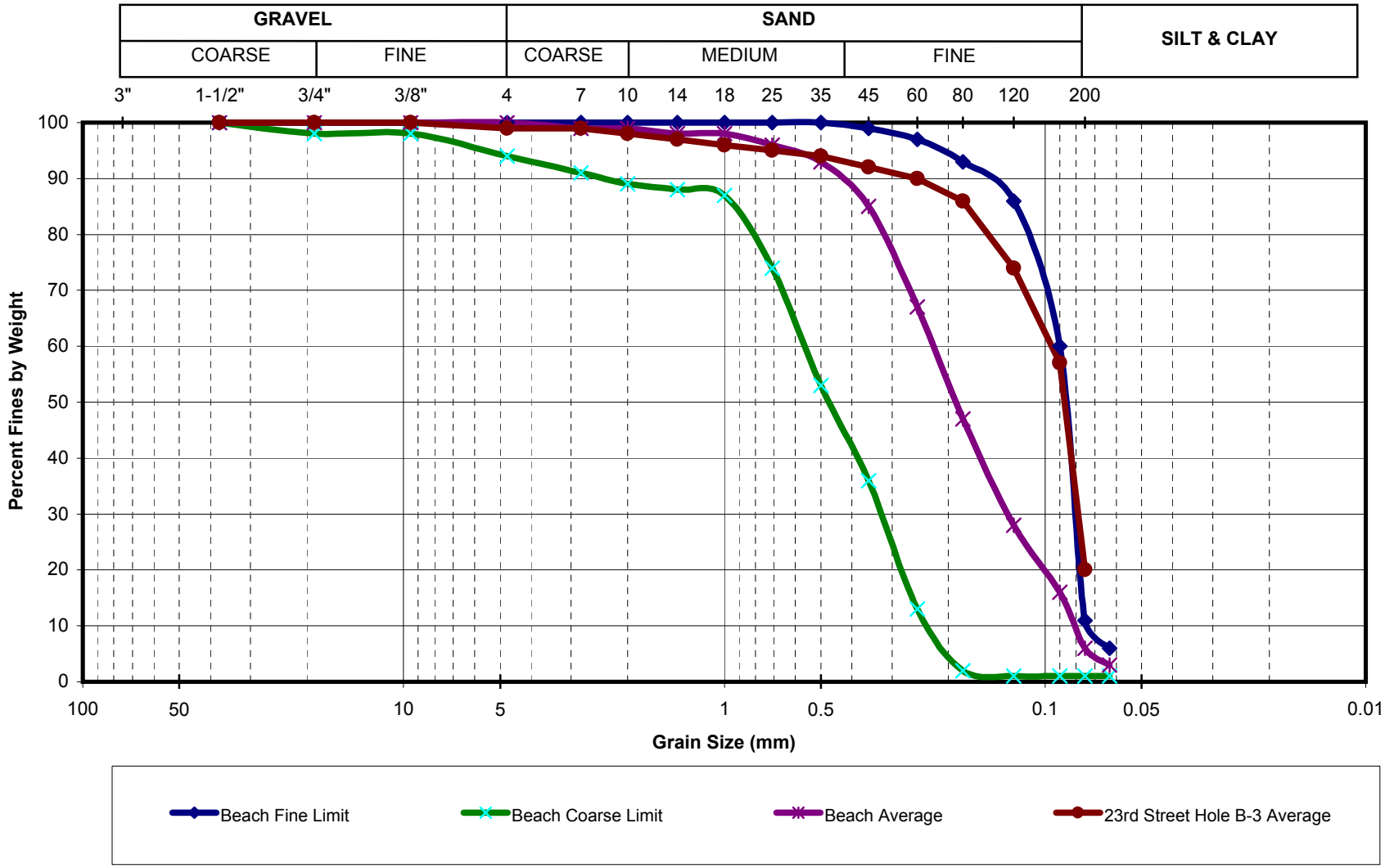

Figure 2
Beach Gradation Envelope vs. 23rd Street Average Grain Size Hole B-3

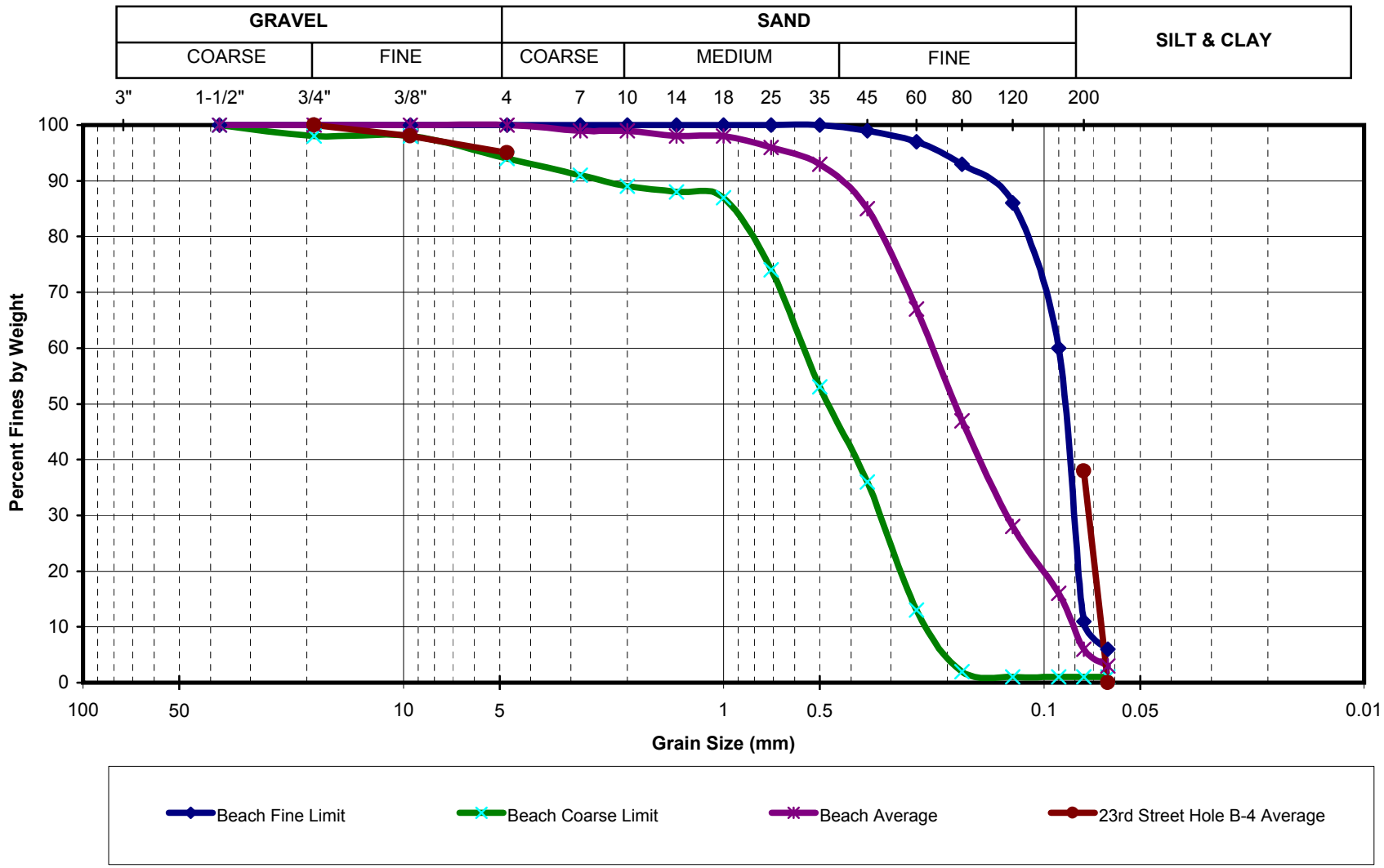

Figure 2
Beach Gradation Envelope vs. 23rd Street Average Grain Size Hole B-4

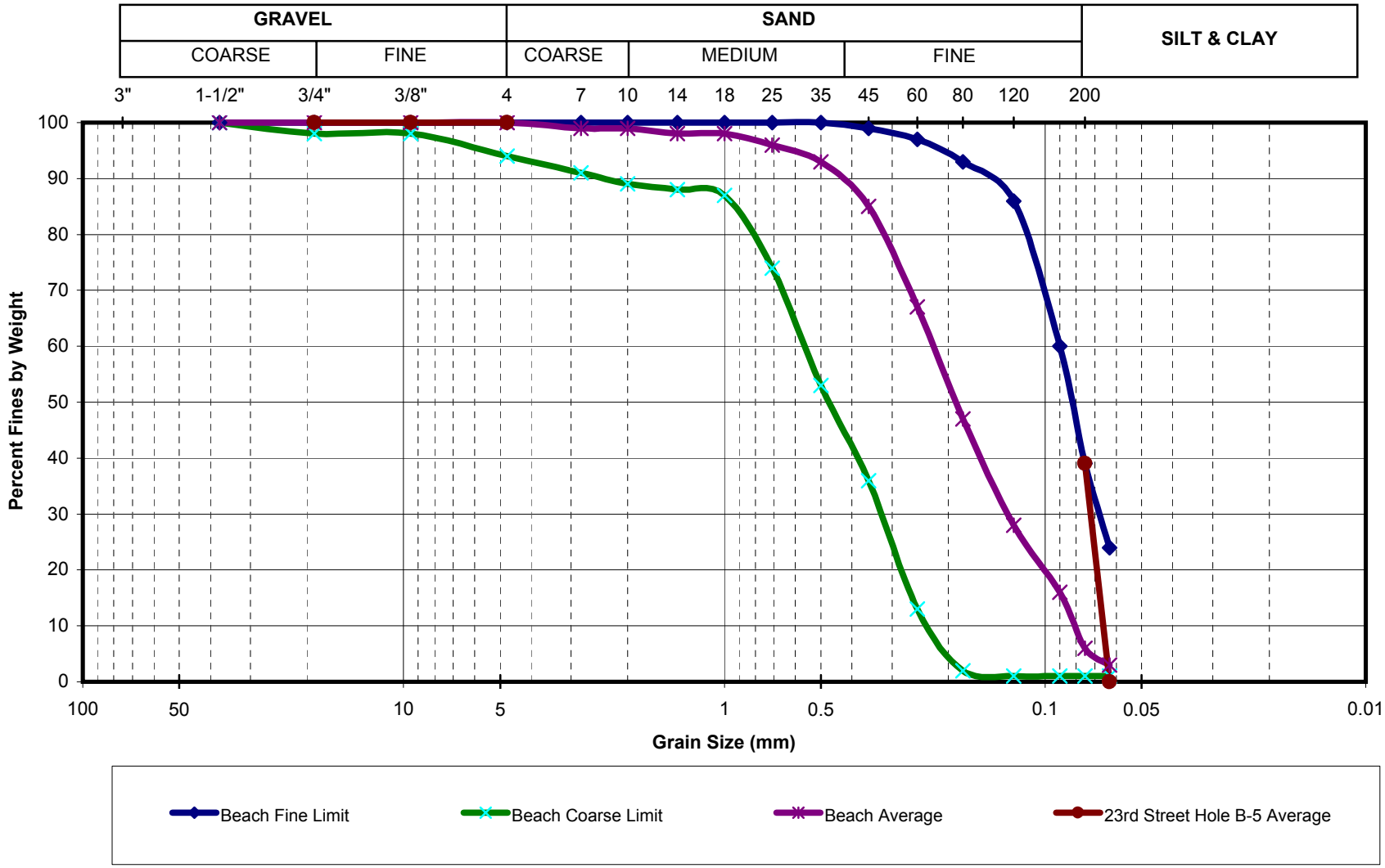

Figure 2
Beach Gradation Envelope vs. 23rd Street Average Grain Size Hole B-5

Figure 3
Beach Gradation Envelope vs. Shellmaker Island

Figure 4
Beach Gradation Envelope vs. Northstar Beach