Appendix K
Water Quality

Appendix K
Summary of DREDGE Simulations

The United States Army Corps of Engineers (USACE) DREDGE model was used to estimate total suspended solids (TSS) concentrations in a turbidity plume associated with dredging operations for construction of Berths 97-109 in the West Basin section of the Port of Los Angeles. Model results demonstrate that for a set of reasonable assumptions describing dredging operations and ambient conditions, sediments resuspended by dredging activities are quickly dispersed to levels approaching background concentrations a short distance from the dredging operations.

The numerical model is a planning tool for estimating sediment resuspension and transport during dredging operations. The program was developed at the University of Utah by Dr. Donald Hayes and Chung-Hwan Je and is contained in the USACE Automated Dredging and Disposal Alternatives Management System (ADDAMS). The model calculates TSS concentrations in a turbidity plume extending away from a dredging site. Submodules allow for specification of dredge-specific parameters, ambient conditions, and site-specific sediment properties.

Model simulations were conducted assuming use of an environmental bucket dredge with a bucket volume of 10 cubic meters (m^3) and a cycle time of 90 seconds. Model simulations assumed that dredging operations take place in 10 meters (m) of water, and that ambient currents average 0.1 meter per second (m/s). Sediment was assumed to be primarily fine grained silt with an average diameter of 10 microns, an in situ dry density of 700 kilograms per cubic meter (kg/m^3), and a settling velocity of 0.7e-4 m/s. Sediment resuspension rates were assumed to be on the order of 1 kilogram per second (kg/sec), which corresponds to a resuspension rate of approximately 1 percent. This is a reasonably conservative assumption considering use of a closed bucket dredge. Dispersion coefficients were set at 1000 cubic centimeters per second (cm^2/sec) in the lateral direction and at 10 cm^2/sec in the vertical direction.

Figure 1 presents the decrease in TSS concentration with position downstream of the dredging operations. Results are presented for two ambient current velocities to demonstrate the sensitivity of results to this parameter. Figure 2 demonstrates how the turbidity plume spreads in the lateral direction as it is carried away from the dredging site by the ambient currents. Results are presented at 100-m increments away from the dredge. For reference, water quality monitoring activities (post Phase 1) indicate that ambient TSS concentrations range from 10 to 20 milligrams per liter (mg/l)[1].

[1] Berth 100 Wharf Construction Project Receiving Water Monitoring. Los Angeles Harbor, MBC Applied Environmental Sciences, August 12, 2002, August 23, 2002.

Sensitivity simulations were also conducted to ensure that assumptions were conservative in nature. Figure 3 presents results of two DREDGE simulations that demonstrate the conservative nature of the assumptions made above and presented in Figures 1 and 2. The conservative simulation presented in Figure 3 has dispersion coefficients of 1,000 cm^2/sec and 10 cm^2/sec for the horizontal and vertical directions, respectively. It also assumes fine silt sediments with a mean diameter of 10 microns. The nonconservative simulation presented in Figure 3 used diffusion coefficients one order of magnitude larger than those used previously and also increases the sediment size slightly to 40 microns (coarse silt). While these values are still reasonable, they demonstrate the sensitivity of the model to slightly less conservative estimates of key parameters.

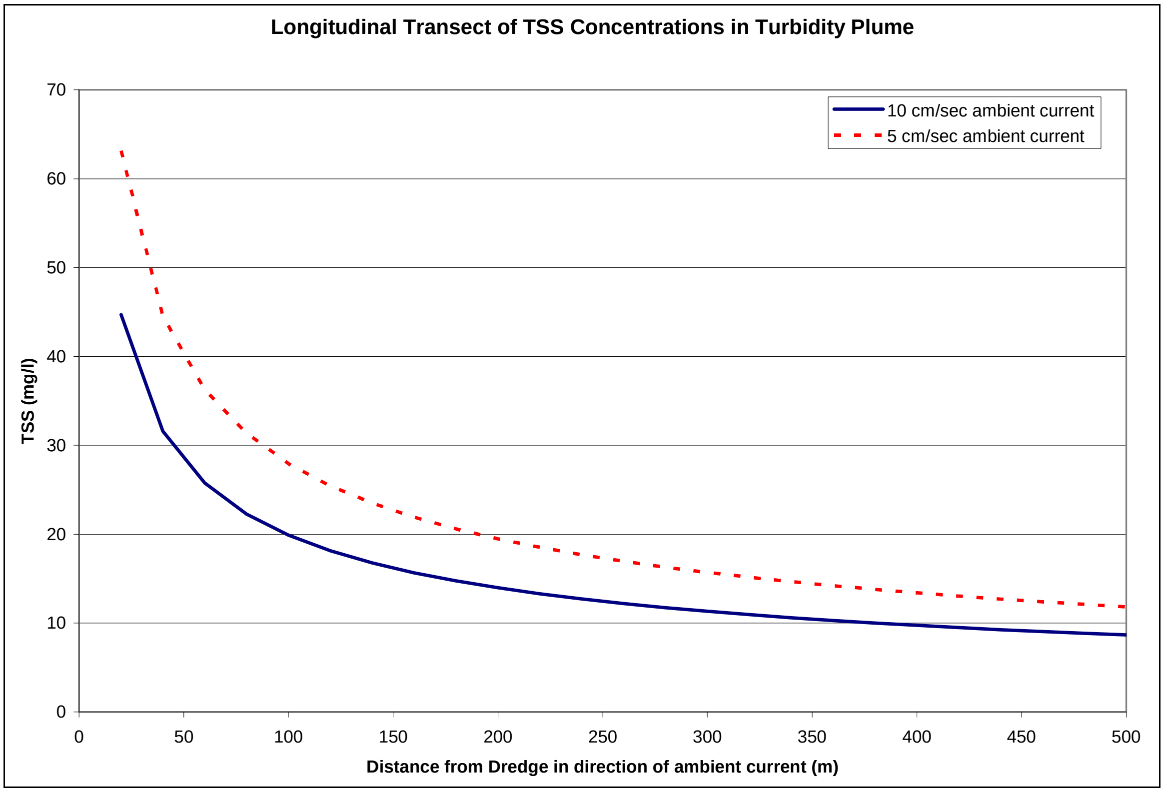

Figure 1. Longitudinal Transect of TSS Concentrations in Turbidity Plume

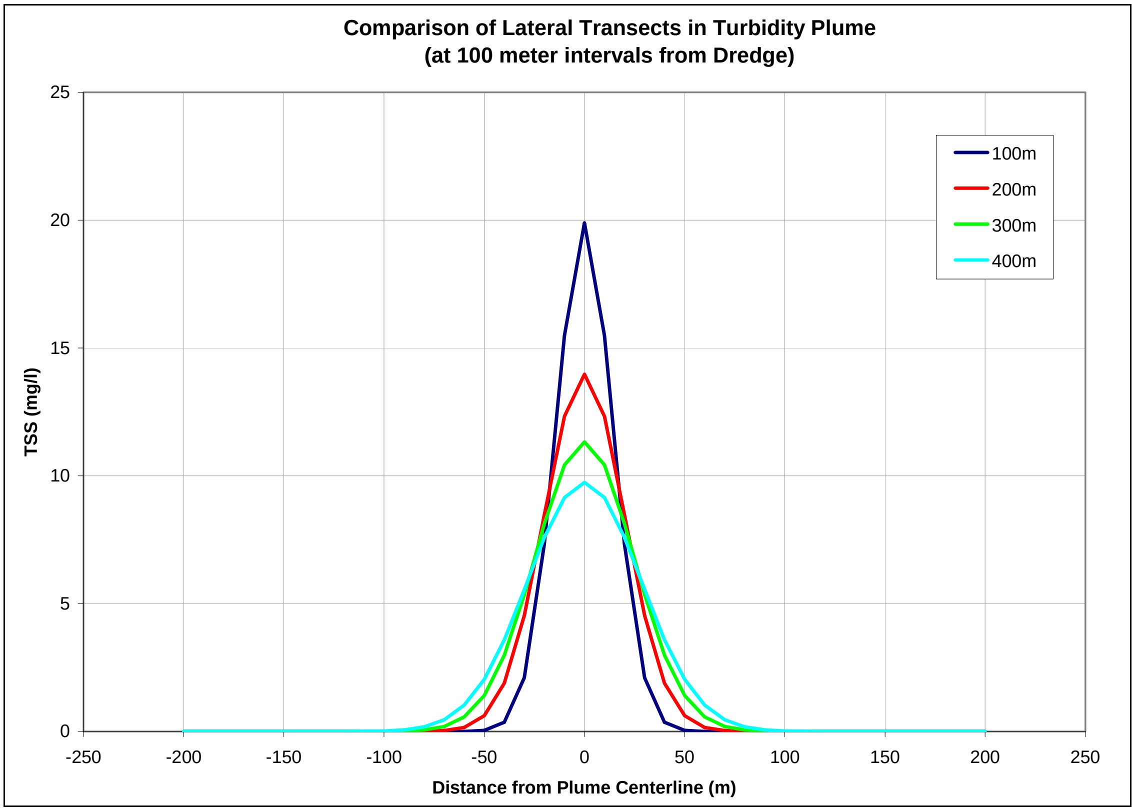

Figure 2. Lateral Transects of TSS Concentration in Turbidity Plume

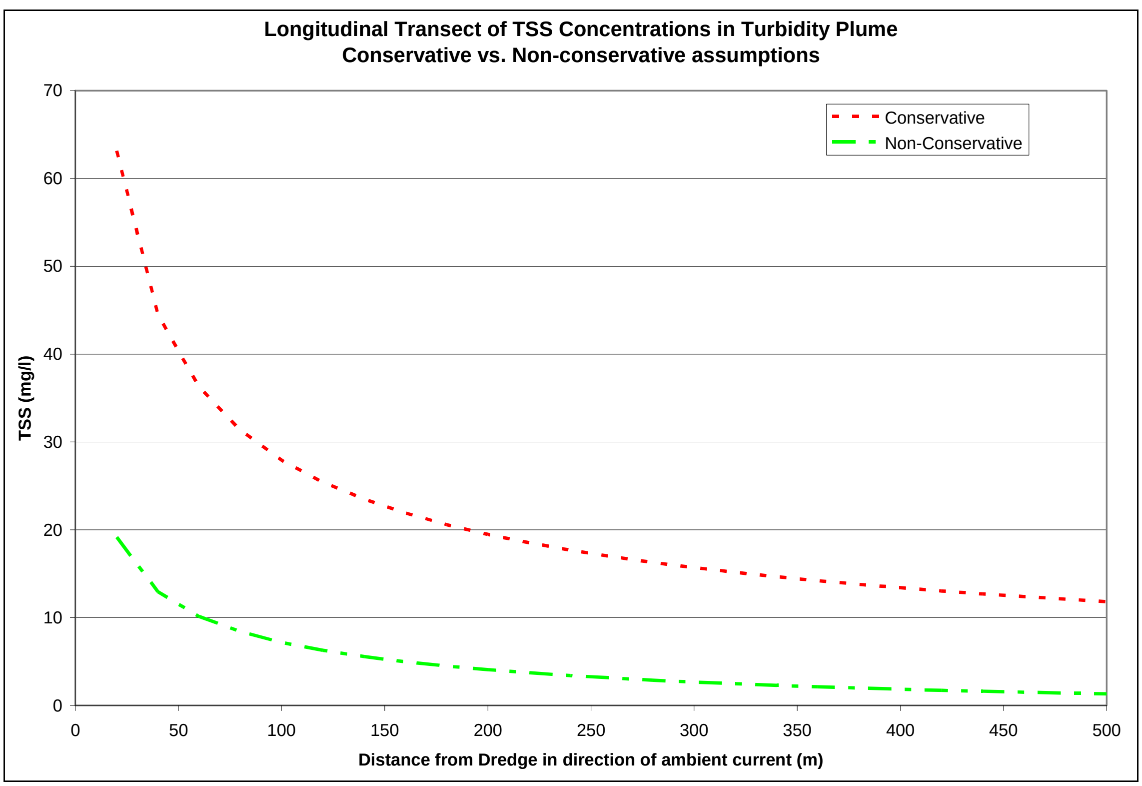

Figure 3. Comparison of DREDGE Results for conservative and nonconservative assumptions

NPDES Discharge Permit Records

Tabel X.X. California Regional Water Quality Control Board – Los Angeles District, NPDES Discharge Permit Records for Dischargers into the Dominguez Channel / LA – LB Harbor Watershed Management Area.

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
			ACTIVE PERMITS			
8052	99-060	Long Beach, City of	Long Beach City	Citywide, Long Beach, CA 90802	G	6/30/1999
5985	R4-2002-0079	VOPAK Terminal Los Angeles Inc	Petroleum & Chemical Terminal	401 Canal Ave, Wilmington, CA 90744	I	3/28/2002
8100	00-097	Churchill Downs California Co.	Hollywood Park	1050 S Prairie Ave, Inglewood, CA 90301	I	7/27/2000
5742	01-129	Mobil Oil Corp.	Torrance Refinery	3700 W 190th St, Torrance, CA 90509	I	9/19/2001
6108	01-181	Shell Oil Products US	Carson Terminal	20945 S Wilmington Ave, Carson, CA 90749	I	12/13/2001
6211	R4-2003-0052	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N. Alameda St, Wilmington, CA 90744	I	4/3/2003
8014	R4-2003-0108	Southern California Water Co.	Dalton Well	17308 Dalton Ave, Gardena, CA 90247	G	11/20/2003
8095	R4-2004-0109	Pacific Terminals LLC	Systems Wide Pipelines	LA River/LB Harbor Watershed	G	4/21/2005
7873	R4-2005-0007	VOPAK Terminal Long Beach Inc	Vopak Terminal Long Beach Inc.	3601 Dock St, San Pedro, CA 90731-7540	I	1/27/2005
7873	R4-2005-0007	VOPAK Terminal Long Beach Inc	Vopak Terminal Long Beach Inc.	3601 Dock St, San Pedro, CA 907317540	I	1/27/2005
			HISTORICAL PERMITS			
6520	01-041	Hitco Carbon Composites, Inc.	Hitco/Defense Prod Div,	1600 W 135th St, Gardena, CA 90249	I	3/29/2001
5935	75-082	Kinder Morgan (Former GATX)	Los Angeles Harbor Terminal	1900 Wilmington-San Pedro Road, San Pedro, CA 90731	I	7/21/1975
1558	78-090	ExxonMobil Oil Corporation	Southwestern Terminal-Area I	799 S Seaside Ave, Terminal Island, CA 90731	I	7/24/1978
6431	79-148	AMC Long Beach Shipyard	Long Beach Naval Shipyard	S.Of Seaside Blvd., Terminal Island, CA 90744	I	9/24/1979
5999	81-050	Douglas Aircraft Co	Torrance Facility	190th St & Normandie Ave, Torrance, CA 90502	I	10/26/1981
6080	83-001	Tidelands Oil Production Co.	Wilmington and Terminal Island	420 Henry Ford Ave, Wilmington, CA 90744	I	1/25/1983
4581	83-057	Radisson Los Angeles Airport	Radisson Los Angeles Airport	6225 W Century Blvd, Los Angeles, CA 90045	I	10/24/1983
5427	84-053	Shell Oil Products US	L.A. Refining Co. (Wilmington)	2101 E Pacific Coast Hwy, Wilmington, CA 90744	I	5/21/1984
2020	84-110	Los Angeles City of DWP	Harbor Generating Station	161 North Island Ave, Wilmington, CA 90744	I	11/19/1984
2061	86-036	Southwest Marine, Inc.	Southwest Marine, Inc.	985 S Seaside Ave, Terminal Island, CA 90731-7331	I	6/23/1986
6802	88-003	BP West Coast Products LLC	Long Beach Marine Terminal 2	1300 W Pier B St, Long Beach, CA 90813	I	1/25/1988
6379	88-063	Rhodia Inc.	Rhodia Inc.	20720 S Wilmington Ave, Long Beach, CA 90810	I	6/27/1988
6797	89-078	Harbor Cogeneration Company	Harbor Cogeneration Company	420 Henry Ford Ave, Wilmington, CA 90744	I	7/24/1989
6211	90-040	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N Alameda St, Wilmington, CA 90744	I	3/26/1990
6707	91-047	Long Beach, City of	Southeast Resource Recovery	120 Henry Ford Ave, Long Beach, CA 90802	I	4/22/1991
6922	91-104	Morton Salt/Rohm and Haas	Bee Chemical Co.	1500 W 178th St, Gardena, CA 90248	I	10/28/1991
7158	92-024	Port of Long Beach	L.B.Harbor 5 Yr Maint	Port Of Long Beach, Long Beach, CA 90801	I	4/20/1992
6103	93-019	ConocoPhillips Company	LA Refinery, Wilmington Plant	1660 W Anaheim St, Wilmington, CA 90744	I	4/5/1993
6417	94-014	Honeywell Inc.	Torrance Facility	2525 W 190th St, Torrance, CA 90509-2960	I	2/28/1994
5244	94-062	Kinder Morgan (Former GATX)	Carson Terminal	2000 E Sepulveda Blvd, Carson, CA 90810	I	7/18/1994
6877	94-125	US Navy Defense Logistics Agen	Defense Fuel Supply Pier 12 Lb	Naval Station, Pier 12, L.B., Long Beach, CA 90731	I	12/5/1994

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6007	95-070	Greene's Ready Mixed Concrete	Greene's Ready Mixed Concrete	19030 S Normandie Ave, Torrance, CA 90502	I	6/12/1995
6023	95-141	BP West Coast Products LLC	Long Beach Marine Terminal 3	1400 W Pier C St, Long Beach, CA 90813	I	10/30/1995
7700	96-063	Port of Los Angeles	West Basin Entrance	Berths 97 To 102, San Pedro, CA 90533	I	8/19/1996
6546	97-021	California Sulphur Co.	Sulfur Pelletizing, Wilmington	2509 E Grant St, Wilmington, CA 90744	I	3/3/1997
8399	97-043	LA Co Dept of Public Works	Dominguez Gap Proj. Part 2B	Intermodal Way & Spring, Carson, CA 90810	G	4/26/2002
8451	97-043	LA Co Dept of Public Works	Pump Station CDS Unit	Ocean/E. Eliot St, Long Beach, CA 90815	G	8/8/2002
7775	97-044	Northrop Grumman Corp. Masd	Former AG-1 Facility	3201 W 131st St, Hawthorne, CA 90250	G	6/4/1997
7706	97-045	Port of Los Angeles	Terminal Island Container	130 Mormon St, Los Angeles, CA 90731	G	5/12/1997
7959	97-045	Southern California Water Co.	Ocean Gate Well	5016 W 133 rd. St, Hawthorne, CA 90250	G	10/16/1998
8026	97-045	Southern California Water Co.	Yukon Wells 1 & 2	3541 W 111th St, Inglewood, CA 90303	G	5/17/1999
8423	97-045	Lomita, City of	City Water System Well No. 5	26112 Cypress St, Rolling Hills Estates, CA 90274	G	7/18/2002
7426	97-046	Mobil Oil Corp.	Mobil SS#11-Ed5	1403 Redondo Beach Blvd, Gardena, CA 90247	G	5/12/1997
7923	97-047	Arco Petroleum Products Co.	Los Angeles Refinery	1801 E Sepulveda Blvd, Carson, CA 90749-6210	G	8/5/1998
7921	97-047	Pacific Pipeline System LLC	Segment #5	Emidio Pump Station to El Segu, Los Angeles, CA	G	8/17/1998
8157	97-047	Kinder Morgan (Former GATX)	Gaffey Street Terminal	1313 N Gaffey St, San Pedro, CA 90731	G	7/17/2000
8383	97-047	VOPAK Terminal Los Angeles Inc	VopakTerminal Los Angeles	2200 E Pacific Coast Hwy, Wilmington, CA 90744	G	3/11/2002
6949	97-081	Morton Salt/Rohm and Haas	Morton Salt - Long Beach	1050 Pier F Ave, Long Beach, CA 90802	I	6/16/1997
5999	98-009	Douglas Aircraft Co	Torrance Facility	190th St & Normandie Ave, Torrance, CA 90502	I	1/26/1998
7916	98-055	Southern California Water Co.	Goldmedal Plant	13030 S Yukon Ave, Hawthorne, CA 90250	G	7/24/1998
7374	R4-2002-0125	Syart Parking Structures, Inc.	Syart Parking Structures	14201 S Halldale Ave, Gardena, CA 90249	G	7/11/2002
6922	R4-2003-0024	Morton Salt/Rohm and Haas	Bee Chemical Co.	1500 W 178th St, Gardena, CA 90248	I	1/30/2003
8616	R4-2003-0111	Defense Energy Support	Berth 100 Backland Dev. Proj	Regan & Keel St, Los Angeles, CA	G	10/8/2003
6080	R4-2003-0121	Tidelands Oil Production Co.	Wilmington and Terminal Island	420 Henry Ford Ave, Wilmington, CA 90744	I	9/11/2003
6797	R4-2004-0145	Harbor Cogeneration Company	Harbor Cogeneration Company	420 Henry Ford Ave, Wilmington, CA 90744	I	9/2/2004
2171	R94-009	LA City Bureau of Sanitation	Terminal Island WWTP	445 Ferry St, San Pedro, CA 90731	I	10/31/1994
7902	00-011	Port of Los Angeles	Berth 191	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7926	00-011	Port of Los Angeles	Berths 118-120	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7899	00-011	Port of Los Angeles	Berths 121-126	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7901	00-011	Port of Los Angeles	Berths 163-164	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7903	00-011	Port of Los Angeles	Berths 216-221	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7893	00-011	Port of Los Angeles	Berths 51-55	Los Angeles Inner Harbor, San Pedro, CA 90733	I	1/26/2000
7377	00-011	Port of Los Angeles	Pier 400	Pier 400, Los Angeles Harbor, San Pedro, CA 90733	I	1/26/2000
7700	00-011	Port of Los Angeles	West Basin Entrance	Berths 97 To 102, San Pedro, CA 90533	I	1/26/2000
7394	00-042	ExxonMobil Refining Supply Co.	RAS#7-8712	18201 S Crenshaw Blvd, Torrance, CA	I	4/13/2000
5795	00-076	Heinz Pet Products Div.	Heinz Pet Products	1054 Ways St, Terminal Island, CA 90731	I	6/29/2000
6431	00-076	AMC Long Beach Shipyard	Long Beach Naval Shipyard	S.Of Seaside Blvd., Terminal Island, CA 90744	I	6/29/2000
7237	00-106	Texaco Exploration & Productio	Cypress Fee Inglewood Gas Plt.	So. of 90th. St., W. of Darby, Inglewood, CA 90305	I	7/27/2000

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
7822	00-164	Port of Los Angeles	Berths 238-239	Berths 238-239, LA Harbor, San Pedro, CA 90733	I	11/9/2000
8212	00-176	Port of Los Angeles	Berths 167-169	E. Basin Channel and LA Harbor, San Pedro, CA	I	12/7/2000
8213	00-177	Port of Los Angeles	Berths 212-215	Basin within LA Inner Harbor, San Pedro, CA	I	12/7/2000
8214	00-178	Port of Los Angeles	Berths 148-151	Main Channel & Turning Basin, Los Angeles, CA	I	12/7/2000
8324	01-015	Carnival Corporation	Passenger Terminal Facility LB	Port of Long Beach, Long Beach, CA	I	1/25/2001
6609	01-039	Northrop Grumman Corp. Masd	El Segundo Facility	800 N Douglas St, El Segundo, CA 90245	I	3/29/2001
6379	01-039	Rhodia Inc.	Rhodia Inc.	20720 S Wilmington Ave, Long Beach, CA 90810	I	3/29/2001
7591	01-052	Port of Los Angeles	Anaheim St. Viaduct Project	Anaheim St @ Dominguez Channel, Los Angeles, CA 90710	I	4/26/2001
6005	01-052	Los Angeles City of DWP	Harbor Steam Plant,Skim Pond	200 S Fries Ave, Wilmington, CA 90744	I	4/26/2001
907	01-068	Western Fuel Oil Co.	Western Fuel Oil Co.	2100 N Gaffey St, San Pedro, CA 90731	I	5/24/2001
8285	01-077	Alameda Corridor Trans. Author	Fish Harbor Offset Dredging Pr	Los Angeles Inner Harbor, San Pedro, CA	I	5/24/2001
8326	01-130	Port of Los Angeles	Berth 100	425 S Palos Verdes St, San Pedro, CA 90733	I	9/19/2001
5428	74-301	Praxair, Inc.	Praxair, Wilmington	1300 E Pacific Coast Hwy, Wilmington, CA 90744	I	10/21/1974
6155	75-065	Los Angeles City of DWP	Harbor G.S. - Marine Tank Farm	130 W A St, Wilmington, CA 90744	I	7/21/1975
6211	75-149	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N Alameda St, Wilmington, CA 90744	I	12/1/1975
770	76-057	Northrop Grumman Corp. Masd	Hawthorne Facility	1 Northrop Ave, Hawthorne, CA 90250	I	3/22/1976
5764	77-049	Long Beach Generation LLC	Long Beach Generating Station	2665 W Seaside Blvd, Long Beach, CA 90813	I	2/28/1977
2020	77-071	Los Angeles City of DWP	Harbor Generating Station	161 North Island Ave, Wilmington, CA 90744	I	4/25/1977
2171	77-113	LA City Bureau of Sanitation	Terminal Island WWTP	445 Ferry St, San Pedro, CA 90731	I	6/27/1977
6379	78-005	Rhodia Inc.	Rhodia Inc.	20720 S Wilmington Ave, Long Beach, CA 90810	I	1/23/1978
6108	78-012	Shell Oil Products US	Carson Terminal	20945 S Wilmington Ave, Carson, CA 90749	I	1/23/1978
4152	78-018	Gardena, City of	Primm Memorial Swimming Pool	1650 W 160th St, Gardena, CA 90247	I	2/27/1978
5985	78-035	VOPAK Terminal Los Angeles Inc	Petroleum & Chemical Terminal	401 Canal Ave, Wilmington, CA 90744	I	3/27/1978
4581	78-129	Radisson Los Angeles Airport	Radisson Los Angeles Airport	6225 W Century Blvd, Los Angeles, CA 90045	I	11/27/1978
5953	79-057	Riverbanks Bulk Water	Deionized Water, Wilmington	701 North Pioneer Avenue, Wilmington, CA 90744	I	4/23/1979
6108	79-065	Shell Oil Products US	Carson Terminal	20945 S Wilmington Ave, Carson, CA 90749	I	4/23/1979
6103	79-091	ConocoPhillips Company	LA Refinery, Wilmington Plant	1660 W Anaheim St, Wilmington, CA 90744	I	6/25/1979
5960	79-103	Westway Terminal Company	Westway Terminal-Berths 70-71	Berths 70-71, Signal St, San Pedro, CA 90733	I	6/25/1979
5428	79-120	Praxair, Inc.	Praxair, Wilmington	1300 E Pacific Coast Hwy, Wilmington, CA 90744	I	7/23/1979
907	79-139	Western Fuel Oil Co.	Western Fuel Oil Co.	2100 N Gaffey St, San Pedro, CA 90731	I	8/27/1979
5742	79-141	Mobil Oil Corp.	Torrance Refinery	3700 W 190th St, Torrance, CA 90509	I	8/27/1979
5354	79-146	Metropolitan Stevedore Co.	Metropolitan Stevedore Co.	1045 Pier G Ave, Berth 212, Long Beach, CA 90802	I	9/24/1979
6362	79-153	Southern Ca. Marine Institute	Southern Ca. Marine Institute	820 S Seaside Ave, Terminal Island, CA 90731	I	9/24/1979
5427	79-175	Shell Oil Products US	L.A. Refining Co. (Wilmington)	2101 E Pacific Coast Hwy, Wilmington, CA 90744	I	11/26/1979
5935	80-010	Kinder Morgan (Former GATX)	Los Angeles Harbor Terminal	1900 Wilmington-San Pedro Road, San	I	3/24/1980

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
				Pedro, CA 90731		
6155	80-01901	Los Angeles City of DWP	Harbor G.S. - Marine Tank Farm	130 W A St, Wilmington, CA 90744	I	5/19/1980
5424	80-031	BP West Coast Products LLC	Carson Refinery	1801 E Sepulveda Blvd, Carson, CA 90749	I	7/28/1980
6211	80-04405	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N Alameda St, Wilmington, CA 90744	I	8/25/1980
770	80-05605	Northrop Grumman Corp. Masd	Hawthorne Facility	1 Northrop Ave, Hawthorne, CA 90250	I	10/27/1980
6546	80-059	California Sulphur Co.	Sulfur Pelletizing, Wilmington	2509 E Grant St, Wilmington, CA 90744	I	11/24/1980
6571	81-019	BP Wilmington Calciner	BP Wilmington Plant	1175 Carrack Ave, Wilmington, CA 90748	I	7/27/1981
6609	82-001	Northrop Grumman Corp. Masd	El Segundo Facility	800 N Douglas St, El Segundo, CA 90245	I	1/25/1982
6005	82-004	Los Angeles City of DWP	Harbor Steam Plant,Skim Pond	200 S Fries Ave, Wilmington, CA 90744	I	1/25/1982
1558	82-031	ExxonMobil Oil Corporation	Southwestern Terminal-Area I	799 S Seaside Ave, Terminal Island, CA 90731	I	5/24/1982
6007	82-035	Greene's Ready Mixed Concrete	Greene's Ready Mixed Concrete	19030 S Normandie Ave, Torrance, CA 90502	I	6/28/1982
6362	82-047	Southern Ca. Marine Institute	Southern Ca. Marine Institute	820 S Seaside Ave, Terminal Island, CA 90731	I	7/26/1982
4192	82-071	Kinder Morgan (Former GATX)	San Pedro Marine Terminal	1363 N Gaffey St, San Pedro, CA 90731	I	9/27/1982
6643	82-074	BP West Coast Products LLC	Marine Terminal 1,Berth 121,LB	300 Pier "T", Berth 121, Long Beach, CA 90801	I	10/25/1982
1511	82-077	Shell Oil Products US	Carson Sulfur Recovery Plant	23208 S Alameda St, Carson, CA 90745	I	11/22/1982
6004	82-078	Los Angeles City of DWP	Harbor Steam Plant,N Skim Tank	100 N Fries Ave, Wilmington, CA 90744	I	11/22/1982
5244	83-002	Kinder Morgan (Former GATX)	Carson Terminal	2000 E Sepulveda Blvd, Carson, CA 90810	I	1/24/1983
4420	83-007	Dayton Superior specialty Chem	Edoco	22039 S Westward Ave, Carson, CA 90810	I	2/28/1983
4152	83-012	Gardena, City of	Primm Memorial Swimming Pool	1650 W 160th St, Gardena, CA 90247	I	3/28/1983
6078	83-014	The Jankovich Co.	The Jankovich Co.-Berth 74	Berth 74, San Pedro, CA 90731	I	3/28/1983
6379	83-024	Rhodia Inc.	Rhodia Inc.	20720 S Wilmington Ave, Long Beach, CA 90810	I	4/25/1983
6023	83-029	BP West Coast Products LLC	Long Beach Marine Terminal 3	1400 W Pier C St, Long Beach, CA 90813	I	6/27/1983
2061	83-030	Southwest Marine, Inc.	Southwest Marine, Inc.	985 S Seaside Ave, Terminal Island, CA 90731-7331	I	6/27/1983
6417	83-032	Honeywell Inc.	Torrance Facility	2525 W 190th St, Torrance, CA 90509-2960	I	6/27/1983
5985	83-033	VOPAK Terminal Los Angeles Inc	Petroleum & Chemical Terminal	401 Canal Ave, Wilmington, CA 90744	I	6/27/1983
6089	84-005	LA Co Dept of Public Works	Dominguez Gap Barrier Project	Along E & F Sts, & Alameda St, Wilmington, CA 90744	I	1/23/1984
5953	84-019	Riverbanks Bulk Water	Deionized Water, Wilmington	701 North Pioneer Avenue, Wilmington, CA 90744	I	2/27/1984
6520	84-021	Hitco Carbon Composites, Inc.	Hitco/Defense Prod Div,	1600 W 135th St, Gardena, CA 90249	I	2/27/1984
5795	84-029	Heinz Pet Products Div.	Heinz Pet Products	1054 Ways St, Terminal Island, CA 90731	I	3/19/1984
5796	84-030	Chicken of the Sea Int.	Plant Nos. 1 & 2	338 Cannery St, San Pedro, CA 90731	I	3/19/1984
6677	84-033	Petro Diamond Terminal Company	Marine Terminal, Berth 83, LB	1920 Lugger Way, Long Beach, CA 90813	I	4/23/1984

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6465	84-037	Redman Equipment & Mfg Co	Redman Equipment & Mfg Co	19800 Normandie Ave, Torrance, CA 90502	I	4/23/1984
2165	84-048	Ultramar Inc.	Marine Term, Berth 164	961 La Paloma Ave, Wilmington, CA 90744	I	5/21/1984
5742	84-052	Mobil Oil Corp.	Torrance Refinery	3700 W 190th St, Torrance, CA 90509	I	5/21/1984
5915	84-062	Shore Terminal LLC	Wilmington Marine Terminal	841 La Paloma St #Berth 163, Wilmington, CA 90744	I	6/25/1984
1449	84-063	United States Borax & Chem Cor	Wilmington Plant	300 Falcon St, Wilmington, CA 90744	I	6/25/1984
6431	84-071	AMC Long Beach Shipyard	Long Beach Naval Shipyard	S.Of Seaside Blvd., Terminal Island, CA 90744	I	9/17/1984
6108	84-082	Shell Oil Products US	Carson Terminal	20945 S Wilmington Ave, Carson, CA 90749	I	9/17/1984
5424	84-083	BP West Coast Products LLC	Carson Refinery	1801 E Sepulveda Blvd, Carson, CA 90749	I	9/17/1984
6103	84-084	ConocoPhillips Company	LA Refinery, Wilmington Plant	1660 W Anaheim St, Wilmington, CA 90744	I	9/17/1984
2171	84-09804	LA City Bureau of Sanitation	Terminal Island WWTP	445 Ferry St, San Pedro, CA 90731	I	10/22/1984
5428	84-105	Praxair, Inc.	Praxair, Wilmington	1300 E Pacific Coast Hwy, Wilmington, CA 90744	I	11/19/1984
5354	84-107	Metropolitan Stevedore Co.	Metropolitan Stevedore Co.	1045 Pier G Ave, Berth 212, Long Beach, CA 90802	I	11/19/1984
5764	84-114	Long Beach Generation LLC	Long Beach Generating Station	2665 W Seaside Blvd, Long Beach, CA 90813	I	11/19/1984
6211	85-003	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N Alameda St, Wilmington, CA 90744	I	1/28/1985
6005	85-004	Los Angeles City of DWP	Harbor Steam Plant,Skim Pond	200 S Fries Ave, Wilmington, CA 90744	I	1/28/1985
6155	85-005	Los Angeles City of DWP	Harbor G.S. - Marine Tank Farm	130 W A St, Wilmington, CA 90744	I	1/28/1985
5953	85-010	Riverbanks Bulk Water	Deionized Water, Wilmington	701 North Pioneer Avenue, Wilmington, CA 90744	I	1/28/1985
907	85-040	Western Fuel Oil Co.	Western Fuel Oil Co.	2100 N Gaffey St, San Pedro, CA 90731	I	8/26/1985
6707	85-044	Long Beach, City of	Southeast Resource Recovery	120 Henry Ford Ave, Long Beach, CA 90802	I	8/26/1985
5935	85-046	Kinder Morgan (Former GATX)	Los Angeles Harbor Terminal	1900 Wilmington-San Pedro Road, San Pedro, CA 90731	I	8/26/1985
5960	85-047	Westway Terminal Company	Westway Terminal-Berths 70-71	Berths 70-71, Signal St, San Pedro, CA 90733	I	8/26/1985
5999	86-078	Douglas Aircraft Co	Torrance Facility	190th St & Normandie Ave, Torrance, CA 90502	I	10/28/1986
6571	86-091	BP Wilmington Calciner	BP Wilmington Plant	1175 Carrack Ave, Wilmington, CA 90748	I	11/24/1986
6759	87-005	Permalite Inc.	Permalite Inc.	230 E Alondra Blvd, Carson, CA 90248	I	1/26/1987
6609	87-024	Northrop Grumman Corp. Masd	El Segundo Facility	800 N Douglas St, El Segundo, CA 90245	I	2/23/1987
770	87-034	Northrop Grumman Corp. Masd	Hawthorne Facility	1 Northrop Ave, Hawthorne, CA 90250	I	3/23/1987
6007	87-037	Greene's Ready Mixed Concrete	Greene's Ready Mixed Concrete	19030 S Normandie Ave, Torrance, CA 90502	I	3/23/1987
6773	87-042	ConocoPhillips Company	Los Angeles Lub. Plant	13707 S Broadway, Los Angeles, CA 90061	I	4/27/1987
6362	87-080	Southern Ca. Marine Institute	Southern Ca. Marine Institute	820 S Seaside Ave, Terminal Island, CA 90731	I	6/22/1987
6797	87-148	Harbor Cogeneration Company	Harbor Cogeneration Company	420 Henry Ford Ave, Wilmington, CA 90744	I	11/23/1987

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6643	88-005	BP West Coast Products LLC	Marine Terminal 1,Berth 121,LB	300 Pier "T", Berth 121, Long Beach, CA 90801	I	1/25/1988
6080	88-006	Tidelands Oil Production Co.	Wilmington and Terminal Island	420 Henry Ford Ave, Wilmington, CA 90744	I	1/25/1988
5244	88-008	Kinder Morgan (Former GATX)	Carson Terminal	2000 E Sepulveda Blvd, Carson, CA 90810	I	1/25/1988
4192	88-009	Kinder Morgan (Former GATX)	San Pedro Marine Terminal	1363 N Gaffey St, San Pedro, CA 90731	I	1/25/1988
4152	88-010	Gardena, City of	Primm Memorial Swimming Pool	1650 W 160th St, Gardena, CA 90247	I	1/25/1988
6810	88-041	BP West Coast Products LLC	Carson Crude Oil Terminal	24696 Wilmington Ave, Carson, CA 90749	I	3/28/1988
1511	88-042	Shell Oil Products US	Carson Sulfur Recovery Plant	23208 S Alameda St, Carson, CA 90745	I	3/28/1988
6822	88-058	Kinder Morgan (Former GATX)	Berth 172, L.A.Marine Terminal	Berth 172, Wilmington, CA 90744	I	6/27/1988
1558	88-061	ExxonMobil Oil Corporation	Southwestern Terminal-Area I	799 S Seaside Ave, Terminal Island, CA 90731	I	6/27/1988
6546	88-064	California Sulphur Co.	Sulfur Pelletizing, Wilmington	2509 E Grant St, Wilmington, CA 90744	I	6/27/1988
4420	88-065	Dayton Superior specialty Chem	Edoco	22039 S Westward Ave, Carson, CA 90810	I	6/27/1988
6004	88-077	Los Angeles City of DWP	Harbor Steam Plant,N Skim Tank	100 N Fries Ave, Wilmington, CA 90744	I	7/25/1988
5742	88-092	Mobil Oil Corp.	Torrance Refinery	3700 W 190th St, Torrance, CA 90509	I	8/22/1988
6023	88-098	BP West Coast Products LLC	Long Beach Marine Terminal 3	1400 W Pier C St, Long Beach, CA 90813	I	9/26/1988
6841	88-102	Fairchild Holding Corp.	Voi-Shan Redondo Beach	4001 Inglewood Ave, Redondo Beach, CA 90278	I	10/24/1988
5953	89-014	Riverbanks Bulk Water	Deionized Water, Wilmington	701 North Pioneer Avenue, Wilmington, CA 90744	I	2/27/1989
6877	89-067	US Navy Defense Logistics Agen	Defense Fuel Supply Pier 12 Lb	Naval Station, Pier 12, L.B., Long Beach, CA 90731	I	7/24/1989
5796	89-077	Chicken of the Sea Int.	Plant Nos. 1 & 2	338 Cannery St, San Pedro, CA 90731	I	7/24/1989
6895	89-106	Plaskolite West, Inc.	Plaskolite West Inc.	2225 E Del Amo Blvd, Compton, CA 90220	I	10/30/1989
6089	89-127	LA Co Dept of Public Works	Dominguez Gap Barrier Project	Along E & F Sts, & Alameda St, Wilmington, CA 90744	I	12/4/1989
6571	89-128	BP Wilmington Calciner	BP Wilmington Plant	1175 Carrack Ave, Wilmington, CA 90748	I	12/4/1989
6918	90-007	San Pedro Boatworks	San Pedro Boatworks-Berth 44	Berth 44 Outer Harbor, San Pedro, CA 90731	I	1/29/1990
6920	90-009	Al Larson Boat Shop	Al Larson Boat Shop	1046 S Seaside Ave, Terminal Island, CA 90731	I	1/29/1990
6922	90-011	Morton Salt/Rohm and Haas	Bee Chemical Co.	1500 W 178th St, Gardena, CA 90248	I	1/29/1990
5985	90-015	VOPAK Terminal Los Angeles Inc	Petroleum & Chemical Terminal	401 Canal Ave, Wilmington, CA 90744	I	1/29/1990
2165	90-017	Ultramar Inc.	Marine Term, Berth 164	961 La Paloma Ave, Wilmington, CA 90744	I	1/29/1990
5764	90-030	Long Beach Generation LLC	Long Beach Generating Station	2665 W Seaside Blvd, Long Beach, CA 90813	I	2/26/1990
6005	90-041	Los Angeles City of DWP	Harbor Steam Plant,Skim Pond	200 S Fries Ave, Wilmington, CA 90744	I	3/26/1990
6155	90-042	Los Angeles City of DWP	Harbor G.S. - Marine Tank Farm	130 W A St, Wilmington, CA 90744	I	3/26/1990
6949	90-082	Morton Salt/Rohm and Haas	Morton Salt - Long Beach	1050 Pier F Ave, Long Beach, CA 90802	I	7/30/1990
2020	90-098	Los Angeles City of DWP	Harbor Generating Station	161 North Island Ave, Wilmington, CA 90744	I	7/30/1990
5428	90-140	Praxair, Inc.	Praxair, Wilmington	1300 E Pacific Coast Hwy, Wilmington, CA	I	10/22/1990

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				90744		
6998	90-144	Port of Los Angeles	Berths 48-53	Berths 48-53, San Pedro, CA 90731	I	10/22/1990
None	90-148	Alameda Corridor Trans. Author	ACTA-Long Beach Lead Project	1010 N Farragut, Los Angeles, CA	G	5/15/2002
6546	90-162	California Sulphur Co.	Sulfur Pelletizing, Wilmington	2509 E Grant St, Wilmington, CA 90744	I	12/3/1990
7015	91-006	Honeywell Inc.	Honeywell Inc.	17300 S Western Ave, Gardena, CA 90247	I	1/28/1991
1449	91-067	United States Borax & Chem Cor	Wilmington Plant	300 Falcon St, Wilmington, CA 90744	I	6/3/1991
7470	91-092	Water Replenishment District of Southern California	West Basin Observation Well	Columbia St./Madrid Ave., Torrance, CA 90503	G	1/20/1995
7510	91-092	Port of Long Beach	Port Access Demonstration	Ocean Blvd Storm Drain, Long Beach, CA 90802	G	4/25/1995
7631	91-092	Port of Los Angeles	New Dock St Pump Station	New Dock St, Terminal Island, CA 90731	G	7/18/1995
7779	91-092	LA Co Dept of Public Works	West Los Angeles Court Hous	11701 S La Cienega Blvd, Los Angeles, CA 90045	G	12/18/1995
7640	91-092	Port of Los Angeles	Seaside Ave./Navy Way	Seaside Ave/Navy Way, Los Angeles, CA 90731	G	3/12/1996
7706	91-092	Port of Los Angeles	Terminal Island Container	130 Mormon St, Los Angeles, CA 90731	G	9/20/1996
7732	91-092	Caltrans	Dominguez Channel Watershed	911 W 190th St, Gardena, CA 90247	G	11/14/1996
7756	91-092	California Water Service Co.	Well 27901	22937 Avalon Blvd, Carson, CA 90810	G	2/18/1997
7107	91-111	Kinder Morgan (Former GATX)	Gatx, Carson	2000 E Sepulveda Blvd, Carson, CA 90744	G	12/6/1991
7332	91-111	Kinder Morgan (Former GATX)	Berth 118-119	Berth 118-119, San Pedro, CA 90744	G	11/16/1993
7337	91-111	ConocoPhillips Company	LA Refinery, Wilmington	1660 W Anaheim St, Wilmington, CA 90744	G	11/30/1993
7291	91-111	Kinder Morgan (Former GATX)	Berth 172	Berth 172, Wilmington, CA 90744	G	6/21/1994
7678	91-111	California Water Service Co.	Reservoir #1	405 S Maple Ave, Torrance, CA 90501	G	7/3/1996
7680	91-111	California Water Service Co.	Station 203	18800 S Wilmington Ave, Compton, CA 90221	G	7/3/1996
7767	91-111	Kinder Morgan (Former GATX)	Gaffey Street Terminal	1363 N Gaffey St, San Pedro, CA 90731	G	3/14/1997
7104	91-117	Elixir Industries	Elixir Industries	18037 S Broadway, Gardena, CA 90247	I	12/2/1991
7105	91-119	Texaco Refining & Marketing	3960 Artesia Blvd.	3960 Artesia Blvd, Torrance, CA 90509	I	12/2/1991
6004	92-085	Los Angeles City of DWP	Harbor Steam Plant,N Skim Tank	100 N Fries Ave, Wilmington, CA 90744	I	12/7/1992
7355	92-091	Texaco Refining & Marketing	2401 Manhattan Bch B	2401 Manhattan Beach Blvd, Redondo Beach, CA 90277	G	3/31/1994
7253	92-091	Arco Petroleum Products Co.	4000 W. Redondo Beac	4000 W Redondo Beach Blvd, Torrance, CA 90501	G	3/31/1994
7366	92-091	Chevron Products Co.	Heritage Site 21-1344	2186 Redondo Beach Blvd, Torrance, CA 90501	G	3/31/1994
7374	92-091	Syart Parking Structures, Inc.	Syart Parking Structures	14201 S Halldale Ave, Gardena, CA 90249	G	9/5/1994
7426	92-091	Mobil Oil Corp.	Mobil SS#11-Ed5	1403 Redondo Beach Blvd, Gardena, CA 90247	G	10/14/1994
7237	93-001	Texaco Exploration & Productio	Cypress Fee Inglewood Gas Plt.	So. of 90th. St., W. of Darby, Inglewood, CA 90305	I	1/25/1993

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5742	93-003	Mobil Oil Corp.	Torrance Refinery	3700 W 190th St, Torrance, CA 90509	I	1/25/1993
2171	93-014	LA City Bureau of Sanitation	Terminal Island WWTP	445 Ferry St, San Pedro, CA 90731	I	3/1/1993
6520	93-028	Hitco Carbon Composites, Inc.	Hitco/Defense Prod Div,	1600 W 135th St, Gardena, CA 90249	I	5/10/1993
6802	93-035	BP West Coast Products LLC	Long Beach Marine Terminal 2	1300 W Pier B St, Long Beach, CA 90813	I	6/14/1993
7298	93-043	VOPAK Terminal Los Angeles Inc	VOPAK Terminal Los Angeles Inc	2200 E Pacific Coast Hwy, Wilmington, CA 90744	I	7/19/1993
6431	93-045	AMC Long Beach Shipyard	Long Beach Naval Shipyard	S.Of Seaside Blvd., Terminal Island, CA 90744	I	7/19/1993
7325	93-050	SGL Carbon Group	Marine Products Facility	415 Pier 'T' Ave, Terminal Island, CA 90802	I	9/27/1993
5424	93-051	BP West Coast Products LLC	Carson Refinery	1801 E Sepulveda Blvd, Carson, CA 90749	I	9/27/1993
6108	93-073	Shell Oil Products US	Carson Terminal	20945 S Wilmington Ave, Carson, CA 90749	I	12/6/1993
2171	94-008	LA City Bureau of Sanitation	Terminal Island WWTP	445 Ferry St, San Pedro, CA 90731	I	1/31/1994
4420	94-012	Dayton Superior specialty Chem	Edoco	22039 S Westward Ave, Carson, CA 90810	I	2/28/1994
1511	94-024	Shell Oil Products US	Carson Sulfur Recovery Plant	23208 S Alameda St, Carson, CA 90745	I	4/4/1994
7377	94-029	Port of Los Angeles	Pier 400	Pier 400, Los Angeles Harbor, San Pedro, CA 90733	I	4/4/1994
5795	94-035	Heinz Pet Products Div.	Heinz Pet Products	1054 Ways St, Terminal Island, CA 90731	I	5/9/1994
5985	94-036	VOPAK Terminal Los Angeles Inc	Petroleum & Chemical Terminal	401 Canal Ave, Wilmington, CA 90744	I	5/9/1994
7394	94-041	ExxonMobil Refining Supply Co.	RAS#7-8712	18201 S Crenshaw Blvd, Torrance, CA	I	6/13/1994
5999	94-046	Douglas Aircraft Co	Torrance Facility	190th St & Normandie Ave, Torrance, CA 90502	I	6/13/1994
4581	94-051	Radisson Los Angeles Airport	Radisson Los Angeles Airport	6225 W Century Blvd, Los Angeles, CA 90045	I	6/13/1994
6465	94-052	Redman Equipment & Mfg Co	Redman Equipment & Mfg Co	19800 Normandie Ave, Torrance, CA 90502	I	6/13/1994
7403	94-061	Arco Petroleum Products Co.	1800 W. Artesia Blvd	1800 Artesia Blvd, Torrance, CA 90702	I	7/18/1994
6080	94-063	Tidelands Oil Production Co.	Wilmington and Terminal Island	420 Henry Ford Ave, Wilmington, CA 90744	I	7/18/1994
2165	94-064	Ultramar Inc.	Marine Term, Berth 164	961 La Paloma Ave, Wilmington, CA 90744	I	7/18/1994
6643	94-066	BP West Coast Products LLC	Marine Terminal 1,Berth 121,LB	300 Pier "T", Berth 121, Long Beach, CA 90801	I	7/18/1994
5953	94-076	Riverbanks Bulk Water	Deionized Water, Wilmington	701 North Pioneer Avenue, Wilmington, CA 90744	I	8/22/1994
6379	94-092	Rhodia Inc.	Rhodia Inc.	20720 S Wilmington Ave, Long Beach, CA 90810	I	9/26/1994
6089	94-108	LA Co Dept of Public Works	Dominguez Gap Barrier Project	Along E & F Sts, & Alameda St, Wilmington, CA 90744	I	10/31/1994
7466	94-116	Air Products & Chemicals, Inc.	Hydrogen Plant & Related Fac.	700 Henry Ford Ave, Wilmington, CA 90744	I	12/5/1994
770	94-118	Northrop Grumman Corp. Masd	Hawthorne Facility	1 Northrop Ave, Hawthorne, CA 90250	I	12/5/1994
6609	94-119	Northrop Grumman Corp. Masd	El Segundo Facility	800 N Douglas St, El Segundo, CA 90245	I	12/5/1994
5764	94-130	Long Beach Generation LLC	Long Beach Generating Station	2665 W Seaside Blvd, Long Beach, CA 90813	I	12/5/1994

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6677	95-009	Petro Diamond Terminal Company	Marine Terminal, Berth 83, LB	1920 Lugger Way, Long Beach, CA 90813	I	1/23/1995
6362	95-010	Southern Ca. Marine Institute	Southern Ca. Marine Institute	820 S Seaside Ave, Terminal Island, CA 90731	I	1/23/1995
6895	95-026	Plaskolite West, Inc.	Plaskolite West Inc.	2225 E Del Amo Blvd, Compton, CA 90220	I	2/27/1995
2020	95-027	Los Angeles City of DWP	Harbor Generating Station	161 North Island Ave, Wilmington, CA 90744	I	2/27/1995
7498	95-031	Port of Los Angeles	Berths 49-50	Los Angeles Inner Habor, San Pedro, CA 90733	I	2/27/1995
5935	95-036	Kinder Morgan (Former GATX)	Los Angeles Harbor Terminal	1900 Wilmington-San Pedro Road, San Pedro, CA 90731	I	4/3/1995
7298	95-041	VOPAK Terminal Los Angeles Inc	VOPAK Terminal Los Angeles Inc	2200 E Pacific Coast Hwy, Wilmington, CA 90744	I	4/3/1995
6211	95-066	Los Angeles City of DWP	Olympic Tank Farm Skim Pond	1220 N Alameda St, Wilmington, CA 90744	I	6/12/1995
7532	95-071	LA Co Dept of Parks & Recreation	Lennox County Park	10828 S Condon Ave, Los Angeles, CA 90304	I	6/12/1995
5915	95-072	Shore Terminal LLC	Wilmington Marine Terminal	841 La Paloma St #Berth 163, Wilmington, CA 90744	I	6/12/1995
5960	95-090	Westway Terminal Company	Westway Terminal-Berths 70-71	Berths 70-71, Signal St, San Pedro, CA 90733	I	7/17/1995
6822	95-091	Kinder Morgan (Former GATX)	Berth 172, L.A.Marine Terminal	Berth 172, Wilmington, CA 90744	I	7/17/1995
4152	95-097	Gardena, City of	Primm Memorial Swimming Pool	1650 W 160th St, Gardena, CA 90247	I	7/17/1995
7562	95-105	Port of Long Beach	Pier A Marine Termina	Long Beach Inner Harbor, Long Beach, CA 90822	I	7/17/1995
7563	95-106	Port of Long Beach	Pier J Expansion	Long Beach Inner Harbor, Long Beach, CA 90822	I	7/17/1995
7590	95-120	Port of Los Angeles	L.A. Export Terminal-Dumper Pi	711 S Earl St, Terminal Island, CA 90731	I	9/18/1995
7591	95-121	Port of Los Angeles	Anaheim St. Viaduct Project	Anaheim St @ Dominguez Channel, Los Angeles, CA 90710	I	9/18/1995
2061	95-143	Southwest Marine, Inc.	Southwest Marine, Inc.	985 S Seaside Ave, Terminal Island, CA 90731-7331	I	10/30/1995
5428	95-156	Praxair, Inc.	Praxair, Wilmington	1300 E Pacific Coast Hwy, Wilmington, CA 90744	I	12/4/1995
7562	95-162	Port of Long Beach	Pier A Marine Termina	Long Beach Inner Harbor, Long Beach, CA 90822	I	12/4/1995
6571	96-004	BP Wilmington Calciner	BP Wilmington Plant	1175 Carrack Ave, Wilmington, CA 90748	I	1/22/1996
4192	96-010	Kinder Morgan (Former GATX)	San Pedro Marine Terminal	1363 N Gaffey St, San Pedro, CA 90731	I	2/26/1996
6078	96-011	The Jankovich Co.	The Jankovich Co.-Berth 74	Berth 74, San Pedro, CA 90731	I	2/26/1996
7532	96-029	LA Co Dept of Parks & Recreation	Lennox County Park	10828 S Condon Ave, Los Angeles, CA 90304	I	5/6/1996
7697	96-059	Northrop Grumman Sp & Msn Inc.	Space Park Facility	One Space Park Dr, Redondo Beach, CA 90278	I	8/19/1996
7698	96-060	TRW Inc.	Hawthorne Site	14520 Aviation Blvd, Hawthorne, CA 90260	I	8/19/1996

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907	96-064	Western Fuel Oil Co.	Western Fuel Oil Co.	2100 N Gaffey St, San Pedro, CA 90731	I	8/19/1996
6759	96-067	Permalite Inc.	Permalite Inc.	230 E Alondra Blvd, Carson, CA 90248	I	9/30/1996
7700	96-085	Port of Los Angeles	West Basin Entrance	Berths 97 To 102, San Pedro, CA 90533	I	11/4/1996
7745	96-099	Port of Long Beach	Pier T Marine Termina	Long Beach Harbor, Long Beach, CA 90802	I	12/9/1996
6155	97-003	Los Angeles City of DWP	Harbor G.S. - Marine Tank Farm	130 W A St, Wilmington, CA 90744	I	1/27/1997
1449	97-004	United States Borax & Chem Cor	Wilmington Plant	300 Falcon St, Wilmington, CA 90744	I	1/27/1997
7104	97-005	Elixir Industries	Elixir Industries	18037 S Broadway, Gardena, CA 90247	I	1/27/1997
6802	97-006	BP West Coast Products LLC	Long Beach Marine Terminal 2	1300 W Pier B St, Long Beach, CA 90813	I	1/27/1997
6841	97-020	Fairchild Holding Corp.	Voi-Shan Redondo Beach	4001 Inglewood Ave, Redondo Beach, CA 90278	I	3/3/1997
7015	97-022	Honeywell Inc.	Honeywell Inc.	17300 S Western Ave, Gardena, CA 90247	I	3/3/1997
6922	97-023	Morton Salt/Rohm and Haas	Bee Chemical Co.	1500 W 178th St, Gardena, CA 90248	I	3/3/1997
7859	97-043	Port of Long Beach	Anaheim St. Grade Separation	3400 E Anaheim St, Wilmington, CA 90813	G	1/6/1998
7889	97-043	Port of Long Beach	Henry Ford Sewer Pump Station	Pier A, Berth A92, Long Beach, CA 90801	G	4/21/1998
7894	97-043	Caltrans	Schuyler Heim Bridge	Port Of Long Beach, Long Beach, CA 90801	G	4/27/1998
7911	97-043	El Segundo, City of	Pilot Test Well Facility	827 N Douglas St, El Segundo, CA 90245	G	6/25/1998
7929	97-043	Los Angeles City of DWP	Harbor Water Reclamation Proj.	455 Ferry St, San Pedro, CA 90731	G	8/13/1998
7958	97-043	Southern California Water Co.	Chicago & Compton Doty Wells	4707 Compton Blvd, Lawndale, CA 90506	G	10/16/1998
8117	97-043	Port of Los Angeles	West Basin ICTF Project	McFarland & Alameda St, San Pedro, CA 90733	G	12/29/1999
8124	97-043	Pacific Terminals LLC	Systems Wide Pipelines	Dominguez Channel Watershed	G	3/21/2000
8126	97-043	Pacific Terminals LLC	Systems Wide Pipelines	LA River/LB Harbor Watershed	G	3/21/2000
8177	97-043	LA Co Dept of Public Works	Griffith St. Storm Drain Proj	Main St & Broadway, Carson, CA 90745	G	8/9/2000
8195	97-043	Tosco Corp.	Pier 'S', Port of Long Beach	Pier 'S', Port of Long Beach, Long Beach, CA 90802	G	10/2/2000
8026	97-043	Southern California Water Co.	Yukon No. 5	3541 W 111th St, Inglewood, CA 90303	G	11/20/2000
8225	97-043	Los Angeles City of DWP	Harbor Repowering Project 2001	Fries Ave, Los Angeles, CA 90069	G	1/22/2001
8227	97-043	Southern California Water Co.	Southern No. 6	13503 S Vermont Ave, Gardena, CA 90249	G	2/6/2001
8337	97-043	Water Replenishment District of Southern California	Reg. GW mon.-Dominguez Chan.	Dominguez Channel- multi loc, Los Angeles, CA	G	12/19/2001
8368	97-043	Tosco Corp.	42" Pipeline Relocation Proj.	Farragut Ave @Terminal Is Fwy, Wilmington, CA 90744	G	1/25/2002
8364	97-043	Marina Pacific Association	Marina Harbor Apartments	4500 Via Marina, Marina Del Rey, CA	G	1/31/2002
8381	97-043	Southern California Water Co.	129th Street Water Well #2	2931 W 129th St, Gardena, CA 90249	G	3/14/2002
8387	97-043	Port of Los Angeles	Berth 100-110 Backland Project	Front St & Pacific Ave, Los Angeles, CA 90733	G	3/20/2002
8398	97-043	LA Co Dept of Public Works	Termino Ave. Storm Drain Proj.	Termino Ave & Colorado Lagoon, Long Beach, CA 90814	G	5/3/2002
8404	97-043	Charles King Company	L. A. Harbor Siphon Crossing	Berth 234 Terminal Island, Los Angeles, CA 90731	G	5/9/2002

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8414	97-043	Alameda Corridor Trans. Author	Anaheim/Foote Storm Drain Proj	Anaehim & Foote St, Long Beach, CA 90801	G		6/19/2002
8437	97-043	LA Co Dept of Public Works	Dominger Drain & Pump Station	E Torrance & Jamison Blvd, Carson, CA 90745	G		8/27/2002
8051	97-043	Port of Long Beach	Pier S Dewatering	Pier S, Long Beach, CA 90802	G		6/6/2003
8038	97-044	Tesoro Petroleum Co	Target Store-290	2169 Redondo Beach Blvd, Gardena, CA 90249	G		7/19/1999
8077	97-044	Kinder Morgan (Former GATX)	Westway Terminal, Berth 70	Berth 70-71 Signal St, San Pedro, CA 90731	G		11/1/1999
8093	97-044	Port of Long Beach	Pier A Toe Drain Treatment Sys	Pier A, Port of Long Beach, Long Beach, CA 90802	G		11/2/1999
8254	97-044	Chromizing Company	Chromizing Company	2100 W 139th St #90249, Gardena, CA 90249	G		6/22/2001
7732	97-045	Caltrans	Dominguez Channel Watershed	911 W 190th St, Gardena, CA 90247	G		5/12/1997
8163	97-045	Port of Long Beach	Former U. S. Navy Shipyard	South of Ocean Blvd., Terminal Island, CA 90802	G		5/12/1997
7631	97-045	Port of Los Angeles	New Dock St Pump Station	New Dock St, Terminal Island, CA 90731	G		5/12/1997
7510	97-045	Port of Long Beach	Port Access Demonstration	Ocean Blvd Storm Drain, Long Beach, CA 90802	G		5/12/1997
7640	97-045	Port of Los Angeles	Seaside Ave./Navy Way	Seaside Ave/Navy Way, Los Angeles, CA 90731	G		5/12/1997
7756	97-045	California Water Service Co.	Well 27901	22937 Avalon Blvd, Carson, CA 90810	G		5/12/1997
7470	97-045	Water Replenishment District of Southern California	West Basin Observation Well	Columbia St./Madrid Ave., Torrance, CA 90503	G		5/12/1997
7779	97-045	LA Co Dept of Public Works	West Los Angeles Court Hous	11701 S La Cienega Blvd, Los Angeles, CA 90045	G		5/12/1997
7781	97-045	California Water Service Co.	Wells 23201 & 23202	405 Maple Ave, Torrance, CA 90503	G		6/20/1997
7813	97-045	Water Replenishment District of Southern California	Chandler Quarry	26311 E Palos Verdes Dr, Rolling Hills Estates, CA 90274	G		8/7/1997
7818	97-045	Southern California Water Co.	Goldmedal Well	13030 S Yukon Ave, Hawthorne, CA 90250	G		8/13/1997
7819	97-045	Southern California Water Co.	Doty Well	14124 Doty Ave, Hawthorne, CA 90250	G		9/23/1997
7846	97-045	California Water Service Co.	Wells 21902,27501,27701,27901	419 E Carson St, Carson, CA 90745	G		12/2/1997
7866	97-045	Port of Los Angeles	Railroad Signalization #2514	425 S Palos Verdes St, San Pedro, CA 90733-0151	G		3/5/1998
7878	97-045	Southern California Water Co.	Southwest District	17140 S Avalon Blvd #100, Carson, CA 90746	G		3/30/1998
7979	97-045	Port of Long Beach	International Transportation	Pier J Berth J233, Long Beach, CA 90802	G		11/24/1998
8014	97-045	Southern California Water Co.	Dalton Well	17308 Dalton Ave, Gardena, CA 90247	G		4/8/1999
8023	97-045	Los Angeles City Harbor Dept.	Beacon Street Sewer Project	Beacon Street & Crescent Ave, Los Angeles, CA 90731	À	4/30/1	4/30/1999
8036	97-045	West Basin Mun Water Dist	Carson Regional Water Recyclin	21029 S Wilmington Ave, Carson, CA 90810	G		6/4/1999
6089	97-045	LA Co Dept of Public Works	Dominguez Gap Barrier Project	Along E & F Sts, & Alameda St, Wilmington, CA 90744	G		6/11/1999

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
8051	97-045	Port of Long Beach	Pier S Dewatering	Pier S, Long Beach, CA 90802	G	7/2/1999
8053	97-045	Advanco Constructors	Terminal Island WTP	455 Ferry St, San Pedro, CA 90731	G	7/15/1999
8133	97-045	California Water Service Co.	Well 29801	21718 S Alameda St, Long Beach, CA 90810	G	4/7/2000
8188	97-045	AboveNet Communications, Inc.	Silverado Aquifer Testing	2269 E El Segundo Blvd, El Segundo, CA 90245	G	9/1/2000
8235	97-045	Inglewood, City of	City of Inglewood Water System	3600 W 107th St, Inglewood, CA	G	3/13/2001
8300	97-045	Port of Long Beach	Pier T Terminal Development	925 Harbor Plaza, Long Beach, CA 90802	G	7/23/2001
8318	97-045	Port of Long Beach	Piers G/J Terminal Project	Piers G/J Site	G	9/7/2001
8332	97-045	Los Angeles City of DWP	Anaheim Emergency Storm Drain	Anaheim & Schley Ave, Los Angeles, CA 90731	G	10/12/2001
8334	97-045	Ultramar Inc.	Ultramar DWP Marine Tank Farm	130 W A St, Wilmington, CA 90744	G	10/24/2001
8408	97-045	Thums Long Beach Company	Power Plant @Port of LongBeach	1401 Pier D St, Long Beach, CA 90802	G	5/24/2002
8540	97-045	Southern California Water Co.	Doty Wells #1 & #2	14124 Doty Ave, Hawthorne, CA 90250	G	2/20/2003
8560	97-045	Inglewood, City of	Well No. 6	3901 102nd St, Inglewood, CA 90303	G	4/1/2003
8616	97-045	Defense Energy Support	Berth 100 Backland Dev. Proj	Regan & Keel St, Los Angeles, CA	G	7/23/2003
7355	97-046	Texaco Refining & Marketing	2401 Manhattan Bch B	2401 Manhattan Beach Blvd, Redondo Beach, CA 90277	G	5/12/1997
7253	97-046	Arco Petroleum Products Co.	4000 W. Redondo Beac	4000 W Redondo Beach Blvd, Torrance, CA 90501	G	5/12/1997
7366	97-046	Chevron Products Co.	Heritage Site 21-1344	2186 Redondo Beach Blvd, Torrance, CA 90501	G	5/12/1997
7374	97-046	Syart Parking Structures, Inc.	Syart Parking Structures	14201 S Halldale Ave, Gardena, CA 90249	G	5/12/1997
7565	97-046	Defense Fuel Support Point	DFSP San Pedro-Pump House Area	3171 N Gaffey St, San Pedro, CA 90731-1099	G	2/27/1998
7566	97-046	US Navy Region Southwest	Former LB Naval Sta, NEX Gas S	Coffman Ave, Long Beach, CA 90802	G	11/10/1998
8234	97-046	E & F ARCO Gas Station	E & F ARCO Gas Station	15922 Inglewood Ave, Lawndale, CA 90260	G	3/13/2001
8289	97-046	Calclean Inc.	Calclean Inc. (Hawthorne)	13815 S Crenshaw Blvd, Hawthorne, CA	G	6/26/2001
8320	97-046	Unocal/Arco	Unocal/Arco Hawthorne	4410 W Imperial Hwy, Hawthorne, CA 90304	G	10/11/2001
8357	97-046	Calclean Inc.	Calclean Inc. (Carson)	16820 S Figueroa St, Carson, CA	G	1/18/2002
8388	97-046	Calclean Inc.	Calclean Inc. (Gardena)	1344 W Redondo Beach Blvd, Gardena, CA	G	4/10/2002
8372	97-046	UNOCAL	Unocal Service Station #7196	3101 W El Segundo Blvd, Hawthorne, CA 90250	G	5/24/2002
7291	97-047	Kinder Morgan (Former GATX)	Berth 172	Berth 172, Wilmington, CA 90744	G	5/12/1997
7767	97-047	Kinder Morgan (Former GATX)	Gaffey Street Terminal	1363 N Gaffey St, San Pedro, CA 90731	G	5/12/1997
7107	97-047	Kinder Morgan (Former GATX)	Gatx, Carson	2000 E Sepulveda Blvd, Carson, CA 90744	G	5/12/1997
7337	97-047	ConocoPhillips Company	LA Refinery, Wilmington	1660 W Anaheim St, Wilmington, CA 90744	G	5/12/1997
7678	97-047	California Water Service Co.	Reservoir #1	405 S Maple Ave, Torrance, CA 90501	G	5/12/1997
7680	97-047	California Water Service Co.	Station 203	18800 S Wilmington Ave, Compton, CA 90221	G	5/12/1997
7804	97-047	Northrop Grumman Corp. Masd	West Complex Facility	1 Hornet Way, El Segundo, CA 90245	G	5/12/1997

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
7495	97-047	Los Angeles City of DWP	Marine Tank Farm	130 W A St, Wilmington, CA 90744	G	7/25/1997
7462	97-047	Southern California Edison Co.	El Real Pumping Station	1007 E Lomita Blvd, Wilmington, CA 90744	G	7/28/1997
7840	97-047	Arco Petroleum Products Co.	Los Angeles Refinery	1801 E Sepulveda Blvd, Carson, CA 90749-6210	G	11/13/1997
7897	97-047	Shell Oil Products US	Mormon Island Marine Terminal	Berths 167,168,169-Mormon Is, Wilmington, CA 90744	G	4/24/1998
7886	97-047	Pacific Pipeline System LLC	Pacific Pipeline Project (Haw)	5000 El Segundo Blvd, Hawthorne, CA 90250	G	5/4/1998
7930	97-047	Tosco Corp.	L.A. Terminal East/Tank # 3403	13500 S Broadway, Los Angeles, CA 90061	G	8/17/1998
7931	97-047	Kinder Morgan SFPP, L.P.	Storage Tanks # 2, 5, and 7	20410 S Wilmington Ave, Carson, CA 90810	G	8/18/1998
7952	97-047	ExxonMobil Oil Corporation	Southwestern Terminal-Area I	799 S Seaside Ave, Terminal Island, CA 90731	G	9/23/1998
7993	97-047	Shell Oil Products US	Equilon Marine Terminal	Pier B Berth 84, Long Beach, CA 90813	G	12/24/1998
7996	97-047	Mike's Main Channel Marine	Mike's Main Channel Marine	Berth 73A, San Pedro, CA 90731	G	1/13/1999
8000	97-047	ExxonMobil Oil Corporation	Southwestern Terminal II	510 S Pilchard St, Terminal Island, CA 90731	G	2/1/1999
8008	97-047	Kinder Morgan SFPP, L.P.	Carson to Norwalk Project	14-mile long pipeline, Carson, CA	G	3/26/1999
8045	97-047	Los Angeles City of DWP	Harbor Water Reclamation Proj.	445 Ferry St, San Pedro, CA 90731	G	6/4/1999
8094	97-047	Pacific Terminals LLC	Systems Wide Pipelines	Dominguez Channel Watershed	G	11/29/1999
8095	97-047	Pacific Terminals LLC	Systems Wide Pipelines	LA River/LB Harbor Watershed	G	11/29/1999
8156	97-047	Kinder Morgan (Former GATX)	Carson Terminal	2000 E Sepulveda Blvd, Carson, CA 90810	G	5/23/2000
8170	97-047	Kinder Morgan SFPP, L.P.	Watson Station	20410 Wilmington Ave, Carson, CA 90810	G	8/7/2000
8221	97-047	VOPAK Terminal Los Angeles Inc	VopakTerminal Los Angeles	2200 E Pacific Coast Hwy, Wilmington, CA 90744	G	1/4/2001
8224	97-047	Kinder Morgan (Former GATX)	Tank 23570, Carson Terminal	2000 E Sepulveda Blvd., Carson, CA 90810	G	1/17/2001
8236	97-047	Los Angeles City of DWP	Harbor Repowering Proj.-2001	Fries Ave @ W. "A" St, Los Angeles, CA 90744	G	3/13/2001
8249	97-047	Tosco Corp.	Pier 'S', Port of Long Beach	Pier 'S', Port of Long Beach, Long Beach, CA 90802	G	4/10/2001
8323	97-047	Kinder Morgan (Former GATX)	Liquid Terminals LLC - Carson	2000 E Sepulveda Blvd, Carson, CA 90810	G	9/17/2001
8325	97-047	BP West Coast Products LLC	Marine Terminal #3	1400 Pier C St, Long Beach, CA 90813	G	9/26/2001
8377	97-047	Kinder Morgan Liquids Terminal	Gaffey Street Terminal	1363 N Gaffey St, San Pedro, CA 90731	G	2/26/2002
8467	97-047	Shell Oil Products US	Mormon Island Marine Terminal	167 Berth 167-168, Wilmington, CA 90744	G	10/1/2002
8594	97-047	Ultramar Inc.	Valero Wilmington Refinery	2402 E Anaheim St, Wilmington, CA 90744	G	6/6/2003
8597	97-047	Shell Oil Products US	Equilon Marine Terminal-Pier B	Pier B, Berth 84, Long Beach, CA 90813	G	6/11/2003
8611	97-047	ExxonMobil Oil Corporation	LA Channel Crossing Pipeline	E Basin & Main Channels, Wilmington, CA 90731	G	7/18/2003
6797	97-053	Harbor Cogeneration Company	Harbor Cogeneration Company	420 Henry Ford Ave, Wilmington, CA 90744	I	5/12/1997
6918	97-059	San Pedro Boatworks	San Pedro Boatworks-Berth 44	Berth 44 Outer Harbor, San Pedro, CA 90731	I	5/12/1997
1558	97-060	ExxonMobil Oil Corporation	Southwestern Terminal-Area I	799 S Seaside Ave, Terminal Island, CA 90731	I	5/12/1997

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6810	97-075	BP West Coast Products LLC	Carson Crude Oil Terminal	24696 Wilmington Ave, Carson, CA 90749	I	6/16/1997
5796	97-077	Chicken of the Sea Int.	Plant Nos. 1 & 2	338 Cannery St, San Pedro, CA 90731	I	6/16/1997
5354	97-078	Metropolitan Stevedore Co.	Metropolitan Stevedore Co.	1045 Pier G Ave, Berth 212, Long Beach, CA 90802	I	6/16/1997
6005	97-080	Los Angeles City of DWP	Harbor Steam Plant,Skim Pond	200 S Fries Ave, Wilmington, CA 90744	I	6/16/1997
6773	97-082	ConocoPhillips Company	Los Angeles Lub. Plant	13707 S Broadway, Los Angeles, CA 90061	I	6/16/1997
6707	97-084	Long Beach, City of	Southeast Resource Recovery	120 Henry Ford Ave, Long Beach, CA 90802	I	6/16/1997
7403	97-109	Arco Petroleum Products Co.	1800 W. Artesia Blvd	1800 Artesia Blvd, Torrance, CA 90702	I	8/25/1997
7590	97-109	Port of Los Angeles	L.A. Export Terminal-Dumper Pi	711 S Earl St, Terminal Island, CA 90731	I	8/25/1997

Tabel X.X. California Regional Water Quality Control Board – Los Angeles District, NPDES Discharge Permit Records for Dischargers into the Los Angeles River.

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
			ACTIVE PERMITS			
8971	R4-2002-0107	Monterey Park City	Well #6 Treatment Facility	2450 N. Charlotte Ave, Rosemead, CA	G	3/29/2006
6948	01-182	Alhambra, City of	Mun Separate Storm Sewer, MS4	, Alhambra, CA	G	12/13/2001
6948	01-182	Arcadia, City of	Mun Separate Storm Sewer, MS4	, Arcadia, CA	G	12/13/2001
6948	01-182	Bell, City of	Mun Separate Storm Sewer, MS4	, Bell, CA	G	12/13/2001
6948	01-182	Beverly Hills, City of	Mun Separate Storm Sewer, MS4	, Beverly Hills, CA	G	12/13/2001
6948	01-182	Bradbury, City of	Mun Separate Storm Sewer, MS4	, Bradbury, CA	G	12/13/2001
6948	01-182	Burbank, City of	Mun Separate Storm Sewer, MS4	, Burbank, CA	G	12/13/2001
6948	01-182	Calabasas, City of	Mun Separate Storm Sewer, MS4	, Calabasas, CA	G	12/13/2001
6948	01-182	Carson, City of	Mun Separate Storm Sewer, MS4	, Carson, CA	G	12/13/2001
6948	01-182	Claremont, City of	Mun Separate Storm Sewer, MS4	, Claremont, CA	G	12/13/2001
6948	01-182	Cudahy, City of	Mun Separate Storm Sewer, MS4	, Cudahy, CA	G	12/13/2001
6948	01-182	Culver City, City of	Mun Separate Storm Sewer, MS4	, Culver City, CA	G	12/13/2001
6948	01-182	Diamond Bar, City of	Mun Separate Storm Sewer, MS4	, Diamond Bar, CA	G	12/13/2001
6948	01-182	Glendale, City of	Mun Separate Storm Sewer, MS4	, Glendale, CA	G	12/13/2001
6948	01-182	Huntington Park, City of	Mun Separate Storm Sewer, MS4	, Huntington Park, CA	G	12/13/2001
6948	01-182	La Canada Flintridge, City of	Mun Separate Storm Sewer, MS4	, La Canada Flintridge, CA	G	12/13/2001
6948	01-182	LA Co Dept of Public Works	Mun Separate Storm Sewer, MS4	, Los Angeles County, CA	G	12/13/2001
6948	01-182	LA Co Flood Control District	Mun Separate Storm Sewer, MS4	, Los Angeles County, CA	G	12/13/2001
6948	01-182	Los Angeles, City of	Mun Separate Storm Sewer, MS4	, Los Angeles, CA	G	12/13/2001
6948	01-182	Lynwood, City Of	Mun Separate Storm Sewer, MS4	, Lynwood, CA	G	12/13/2001
6948	01-182	Montebello, City of	Mun Separate Storm Sewer, MS4	, Montebello, CA	G	12/13/2001
6948	01-182	Monterey Park, City of	Mun Separate Storm Sewer, MS4	, Monterey Park, CA	G	12/13/2001
6948	01-182	Paramount, City of	Mun Separate Storm Sewer, MS4	, Paramount, CA	G	12/13/2001
6948	01-182	Pasadena, City of	Mun Separate Storm Sewer, MS4	, Pasadena, CA	G	12/13/2001
6948	01-182	San Fernando, City of	Mun Separate Storm Sewer, MS4	, San Fernando, CA	G	12/13/2001
6948	01-182	San Marino, City of	Mun Separate Storm Sewer, MS4	, San Marino, CA	G	12/13/2001
6948	01-182	Sierra Madre, City of	Mun Separate Storm Sewer, MS4	, Sierra Madre, CA	G	12/13/2001
6948	01-182	South Gate, City Of	Mun Separate Storm Sewer, MS4	, South Gate, CA	G	12/13/2001
6948	01-182	South Pasadena, City of	Mun Separate Storm Sewer, MS4	, South Pasadena, CA	G	12/13/2001
6948	01-182	Vernon, City of	Mun Separate Storm Sewer, MS4	, Vernon, CA	G	12/13/2001
6948	01-182	Walnut, City of	Mun Separate Storm Sewer, MS4	, Walnut, CA	G	12/13/2001
6948	01-182	West Hollywood, City of	Mun Separate Storm Sewer, MS4	All Storm Drains, West Hollywood, CA	G	12/13/2001
6948	01-182	Westlake Village, City of	Mun Separate Storm Sewer, MS4	, Westlake Village, CA	G	12/13/2001

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
8783	2004-0008-DWQ	Long Beach, City of	DHHS Vector Control Program	2525 Grand Ave #220, Long Beach, CA 90815	G	7/2/2004
8787	2004-0009-DWQ	Calabasas Park Homeowners Association	Calabasas Lake	26135 Mureau Rd, Calabasas, CA 913023172	G	10/22/2004
9017	93-010	K. Hovnanian at Aliso LLC	Cagney Ranch Residential Development	18000 Sesnon Rd, Granada Hills, CA	G	1/18/2006
6659	96-018	Chevron U.S.A. Inc.	Van Nuys Terminal	15359 Oxnard St, Van Nuys, CA 91411	I	4/1/1996
7316	97-043	Burbank, City of Public Service	Reservoir Forebay	2030 N. Hollywood Way, Burbank, CA 91503	G	9/12/1997
8143	97-043	Southern California Water Co.	Nadeau Site	7836 Walnut Dr, Los Angeles, CA 90001	G	6/12/2000
7063	97-045	550 S. Hope Street Associates	550 S. Hope St. Building	550 S. Hope St, Los Angeles, CA 90071	G	5/12/1997
8244	97-047	Los Angeles City of DWP	Valley Generating Station	1801 Sheldon St, Sun Valley, CA 91352	G	3/30/2001
4551	98-053	Los Angeles City of Rec&Parks	Los Angeles Zoo Griffith Park	4700 Western Heritage Dr, Los Angeles, CA 90027	I	6/29/1998
7679	98-055	Dba "Ultimate"	Dba "Ultimate"	3600 S. Grand Ave, Los Angeles, CA 91746	G	6/29/1998
8052	99-060	Long Beach, City of	Long Beach City	Citywide, Long Beach, CA 90802	G	6/30/1999
8484	R4-2002-0030	Los Angeles, City of	Hollywood Dist St. Maint Yard	6640 Romaine St, Los Angeles, CA	G	9/26/2002
8740	R4-2002-0030	Pacific State Logistics Mgmt	Former Pacific Trans. Facility	10869 Drury Ln, Lynwood, CA 90262	G	4/29/2004
8823	R4-2002-0030	Northrop Grumman Corp. Masd	Fmr E. Complex, Plnt 1 Bl 1-1	1 Northrop Ave, Hawthorne, CA	G	12/10/2004
8822	R4-2002-0030	Northrop Grumman Corp. Masd	Fmr E. Complex, Plnt 3 Bl 3-10	1 Northrop Ave, Hawthorne, CA	G	12/10/2004
8315	R4-2002-0107	Univar USA Inc.	Former Vopak USA Inc.	1363 S. Bonnie Beach Pl, Los Angeles, CA 90023	G	5/23/2002
7837	R4-2002-0107	Newlowe Properties c/o HMC	Newlowe Properties c/o HMC	3378 San Fernando Rd, Los Angeles, CA 90065	G	5/23/2002
7637	R4-2002-0107	Los Angeles City of DWP	Pollock Wells Treatment Plant	2660 Fletcher Dr, Los Angeles, CA 90039	G	5/23/2002
8068	R4-2002-0107	Caltrans	LA-105 Garfield/Ardis Ave	LA-105 Garfield/Ardis Ave., Downey, CA 90242	G	1/7/2003
8584	R4-2002-0107	Monterey Park, City of	Delta Plant	2657 Delta Ave, Rosemead, CA 91770	G	5/9/2003
8152	R4-2002-0107	DTSC/England & Assoc.	Former Southland Oil Site	5619 Randolph St, Commerce, CA 90040	G	9/15/2004
9037	R4-2002-0107	City of Alhambra	Groundwater Treatment Plant	512 S. Granada Ave, Alhambra, CA 91801	G	5/4/2006
7212	R4-2002-0125	Interstate Brands Corp.	Interstate Brands	6841 San Fernando Rd, Glendale, CA 91201	G	7/11/2002
8485	R4-2002-0125	Davis Inc.	Davis Inc.	1365 Obispo Ave, Long Beach, CA 90804	G	10/21/2002
8562	R4-2002-0125	G & M Oil Co.	G & M Oil Co. Station #57	4346 E. Imperial Hwy, Lynwood, CA 90262	G	7/8/2003
8716	R4-2002-0125	Hankey Investment Company	Midway Ford	3737 Beverly Blvd, Los Angeles, CA 90004	G	3/17/2004
8382	R4-2002-0185	Home Depot, USA, Inc.	Former ITT Aerospace Controls	1200 Flower St, Burbank, CA	I	12/12/2002
7839	R4-2003-0094	Los Angeles City of DWP	Tunnel # 105	Aqueduct, Newhall, CA 91321	I	7/10/2003
8147	R4-2003-0108	Compton Municipal Water Dept.	Municipal Water Supply Wells	480 W. Compton Blvd, Compton, CA 90221	G	9/15/2003
8666	R4-2003-0108	Southern California Water	Bissell Plant	6612 Bissell St, Bell, CA 90210	G	10/4/2003
7708	R4-2003-0108	Bell Gardens, City of, DPW	Domestic Water Well	N.E. Corner Florence Pl., Bell Gardens, CA 90201	G	10/23/2003
7830	R4-2003-0108	California Water Service Co.	Wells 21501 & 21502	21718 Alameda, Long Beach, CA	G	10/23/2003

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
7151	R4-2003-0108	Pasadena, City of	Garfield Well	586 N. Garfield Ave, Pasadena, CA 91101	G	11/17/2003
7942	R4-2003-0108	Walnut Park Mutual Water Co.	Well # 11	2460 E. Florence Ave, Huntington Park, CA 90255	G	11/26/2003
8689	R4-2003-0108	Southern California Water Co.	Belhaven Plant	11230 S. Belhaven Ave, Los Angeles, CA 90059	G	12/10/2003
8338	R4-2003-0108	Water Replenishment District of Southern California	Reg. GW monitor - LA River	LA River Watershed- multi loc, Los Angeles, CA	G	12/12/2003
8184	R4-2003-0108	Southern California Water Co.	Gage Site Water Wells	6112 E. Gage Ave, Bell Gardens, CA 90201	G	12/23/2003
8385	R4-2003-0108	Southern California Water Co.	Otis Well No. 3	6424 S. Otis Ave, Bell, CA	G	1/14/2004
8278	R4-2003-0108	Pasadena, City of	Well #58	3000 E. Alameda St, Pasadena, CA 91107	G	2/4/2004
8704	R4-2003-0108	California Water Service Co.	Dominguez 27201, 29001 & 29701	, Rancho Dominguez, CA 90221	G	2/20/2004
8718	R4-2003-0108	California Water Service Co.	13 East L.A. water wells	13 wells in East LA & Commerce, East Los Angeles, CA	G	2/25/2004
8717	R4-2003-0108	California Water Service Co.	Rio Hondo Water Supply Wells	, Commerce, CA 90040	G	2/25/2004
8141	R4-2003-0108	Southern California Water Co.	Priory Site	5446 Priory St, Bell Gardens, CA 90201	G	3/12/2004
8730	R4-2003-0108	Southern California Water Co.	Converse Plant	6360 Converse Ave, Los Angeles, CA	G	3/26/2004
7317	R4-2003-0108	Pico Water District	Various wells	4852 Church St, Pico Rivera, CA 90660	G	3/30/2004
8134	R4-2003-0108	Southern California Water Co.	Goodyear Site	1127 E. 61st St, Los Angeles, CA 90011	G	4/12/2004
8729	R4-2003-0108	Southern California Water Co.	Watson Plant	7026 Walker Ave, Bell, CA	G	4/23/2004
8751	R4-2003-0108	Southern California Water Co.	Willowbrook Plant	12315 Willowbrook Ave, Los Angeles, CA 90222	G	5/18/2004
8750	R4-2003-0108	Southern California Water Co.	McKinley Well	8143 Mckinley Ave, Paramount, CA 90723	G	5/20/2004
8762	R4-2003-0108	Southern California Water Co.	Clara Well Plant	6440 Clara St, Bell Gardens, CA 90201	G	6/24/2004
8793	R4-2003-0108	Southern California Water Co.	Miramonte Site	1609 E. Nadeau St, Los Angeles, CA 90001	G	8/10/2004
8899	R4-2003-0108	Signal Hill,City Of	Well No. 7	6576 Orange Ave, Long Beach, CA 90805	G	5/24/2005
8933	R4-2003-0108	City of Alhambra, DPW	Well No. 12	414 San Pascual Dr, Alhambra, CA	G	7/22/2005
8995	R4-2003-0108	City of Glendale	Glorietta Well Nos 3,4,6 and Verdugo Well Nos. A & B	various locations, Glendale, CA	G	12/1/2005
9020	R4-2003-0108	Golden State Water Co	Saxon Well #4	409 E. Saxon Avenue, San Gabriel, CA	G	1/25/2006
9101	R4-2003-0108	City of Monrovia DPW	Groundwater Treatment Plant	2655 South Myrtle Ave, Monrovia, CA 91016	G	6/1/2006
9105	R4-2003-0108	City of Lynwood	Well #19	2600 Industry Way, Lynwood, CA 90262	G	6/2/2006
9167	R4-2003-0108	Crescenta Valley Water District	Well No. 2 Rehab & Startup Project	4029 Lowell Ave, La Crescentra, CA 91214	G	9/7/2006
9172	R4-2003-0108	Maywood Mututal Water Company	52nd Street Well	4421 E. 52nd Street, Maywood, CA 90270	G	9/13/2006
9216	R4-2003-0108	City of Arcadia	Colorado Well Aquifer Testing, Development and Startup	500 W. Colorado St, Arcadia, CA 91007	G	12/13/2006
9229	R4-2003-0108	Tract 180 Water Company	Wells # 5 & 6	4566 Florence Ave, Cudahy, CA 90201	G	2/20/2007
9243	R4-2003-0108	Park Water Company	Well No. 19C	1743 E. 118th St, Compton, CA 90059	G	3/20/2007

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6917	R4-2003-0111	CarrAmerica Realty Corp.	CarrAmerica Office Building	5550 Topanga Canyon Blvd, Woodland Hills, CA 91367	G	8/7/2003
8269	R4-2003-0111	Los Angeles City of DWP	Sepulveda Trunk Line Project	Rinaldi St/Midwood Dr., Granada Hills, CA 91345	G	8/7/2003
7792	R4-2003-0111	Douglas Emmett Warner CtrTower	Plaza 3, Warner Center	21650 Oxnard St, Woodland Hills, CA 91367	G	11/4/2003
6926	R4-2003-0111	Douglas Emmett Warner CtrTower	Plaza 6, Warner Center	21700 Oxnard St, Woodland Hills, CA 91367	G	11/4/2003
8024	R4-2003-0111	United Storm Water, Inc.	Storm Drain Cleaning I	105 Freeway @ 110 Freeway, Los Angeles, CA 90061	G	12/17/2003
7407	R4-2003-0111	Washington Mutual	Sherman Oaks Branch	13949 Ventura Blvd, Sherman Oaks, CA 91423	G	1/9/2004
7480	R4-2003-0111	Jet Propulsion Laboratory	Jet Propulsion Lab.	4800 Oak Grove Dr #M/S171-225, Pasadena, CA 91109	G	3/2/2004
7611	R4-2003-0111	G & K Management Co., Inc.	Grand Promenade	225 S. Grand Ave, Los Angeles, CA 90012	G	3/5/2004
6833	R4-2003-0111	Douglas Emmett & Company	Trillium - 6320 Canoga Ave.	6320 Canoga Ave #220, Woodland Hills, CA 91367	G	3/16/2004
7794	R4-2003-0111	21300 Victory Blvd. Ltd. Co.	Warner Corporate Center	21300 Victory Blvd, Woodland Hills, CA 91367	G	3/24/2004
7560	R4-2003-0111	Maguire Properties	One California Plaza	300 S. Grand Ave, Los Angeles, CA 90071	G	3/25/2004
8433	R4-2003-0111	Pacific Pipeline System LLC	West Hynes Station	5900 Cherry Ave, Long Beach, CA 90805	G	3/25/2004
8260	R4-2003-0111	Los Angeles City of DWP	Burbank Trunk Line	Magnolia & Burbank Blvd, Burbank, CA 91316	G	5/19/2004
7299	R4-2003-0111	Children's Hospital LosAngeles	Children's Hospital	4616 De Longpre Ave, Los Angeles, CA 90033	G	5/20/2004
8749	R4-2003-0111	Los Angeles City	Eagle Rock Interceptor Sewer	Eagle Rock/York Blvd, Los Angeles, CA 90041	G	6/22/2004
8172	R4-2003-0111	Mammoth Apartments, LLC	Mammoth Apartments	4328 Mammoth Ave, Sherman Oaks, CA 91423	G	7/29/2004
6882	R4-2003-0111	GLB Cahuenga LP	California Credit Union	3330 Cahuenga Blvd, Los Angeles, CA 90068	G	8/20/2004
6722	R4-2003-0111	Jamison Properties	Encino Executive Plaza	16501 Ventura Blvd, Encino, CA 91436	G	8/26/2004
7013	R4-2003-0111	L & R Auto Parks, Inc.	Parking Structure 220 S.Spring	220 S. Spring St, Los Angeles, CA 90053	G	9/13/2004
8832	R4-2003-0111	Mikhail Segal	Prop.18-Unit Courtyard Housing	841 Westmount Dr, West Hollywood, CA 90069	G	12/3/2004
8843	R4-2003-0111	Pasadena, City of	Wilson Tunnel Drain	Rosemont & Washington Blvd, Pasadena, CA 91103	G	12/21/2004
8849	R4-2003-0111	Los Angeles City Dept Of Water	City Trunk Line South	Ventura Bl. & Coldwater Canyon, Los Angeles, CA	G	2/10/2005
8864	R4-2003-0111	Trammell Crow Residential	Universal City Apts. Holdings	4055 Lankershim Blvd, Los Angeles, CA 90164	G	2/17/2005
8870	R4-2003-0111	Mr. Auto	Mr. Auto	1924 E. Compton Blvd, Compton, CA 90221	G	3/25/2005

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8890	R4-2003-0111	Meta Housing Corporation	Northwest Gateway Apts.	1304 W. Second St, Los Angeles, CA 90026	G	5/4/2005
8946	R4-2003-0111	Bond Chinatown Ventures LLC	Blossom Plaza Project	900 N Broadway, Los Angeles, CA 90012	G	8/30/2005
8990	R4-2003-0111	Aquarium of the Pacific	Saltwater Well	100 Aquarium Way, Long Beach, CA 90802	G	12/20/2005
8880	R4-2003-0111	Los Angeles Unified School District	Vista Hermosa Project	Beaudry and First Street, Los Angeles, CA	G	12/27/2005
9014	R4-2003-0111	City of Los Angeles DWP	Hansen Area Water Recycling Pipeline Project	11801 Sheldon St, Sun Valley, CA 91352	G	1/19/2006
9012	R4-2003-0111	K. Hovnanian	Cagney Ranch Residential Develop Proj.	18700 Sesnon Blvd, Granada Hills, CA 91344	G	2/6/2006
9038	R4-2003-0111	AvalonBay Communities, Inc.	AvalonBay Communities	16328-16352 Ventura Blvd, Encino, CA 91436	G	2/24/2006
9175	R4-2003-0111	Schaffel Development Co. Inc.	Longridge Condominium Project	4237 Longridge Ave, Studio City, CA	G	6/29/2006
9171	R4-2003-0111	Occidental College	New Campus Residence Hall	1600 Campus Rd, Los Angeles, CA 90041	G	9/8/2006
9177	R4-2003-0111	Island Environkmental Services	110/105 Freeway Interchange SW Mgmnt Proj	110/105 Freeway Interchange, Los Angeles, CA 91769	G	9/27/2006
9201	R4-2003-0111	One World Trade Center	One World Trade Center	One World Trade Center, Long Beach, CA 90831	G	11/8/2006
9203	R4-2003-0111	Long Beach Memorial Medical Center	Miller Children's Hospital	2801 Atlantic Avenue, Long Beach, CA 90806	G	11/14/2006
9212	R4-2003-0111	10921 Wipple LLC	Occidental Plaza Commercial Dev. Project	4414-4430 York Blvd, Los Angeles, CA 90041	G	12/11/2006
9249	R4-2003-0111	US General Sevices Administration	Junipero Serra State Blvd Demolition Project	107 S. Broadway, Los Angeles, CA	G	4/6/2007
7752	R4-2003-0120	Lincoln Avenue Water Co.	South Coulter Water Treatment	564 W. Harriet St, Altadena, CA 91001	I	9/11/2003
8702	R4-2004-0029	Metropolitan Transit Authority	Eastside Light Rail Trans Proj	Alameda/Soto/Clarence, Los Angeles, CA	I	1/29/2004
7588	R4-2004-0058	Metropolitan Water Dist. Of SC	Greg Avenue Power Plant	7554 Greg Ave, Sun Valley, CA 91352	G	4/4/2004
8252	R4-2004-0058	Southern California Water Co.	San Gabriel Plant	2630 S. San Gabriel Blvd, Rosemead, CA 91770	G	7/29/2004
7652	R4-2004-0058	Coast Packing Co.	Coast Packing Co.	3275 E. Vernon Ave, Vernon, CA 90058	G	8/18/2004
6008	R4-2004-0058	Sierracin/Sylmar Corp.	Sierracin.Sylmar Corp.	12780 San Fernando Rd, Sylmar, CA 91342	G	9/1/2004
8262	R4-2004-0058	Los Angeles City of DWP	Burbank Trunk Line	Magnolia & Burbank Blvd, Burbank, CA 91316	G	11/9/2004
2937	R4-2004-0058	Hermetic Seal Corp.	Hermetic Seal Corp.	4232 Temple City Blvd, Rosemead, CA 91770	G	8/11/2005
8060	R4-2004-0058	Warner Brothers Inc.	Warner Brothers Studio Facilit	4000 Warner Blvd, Burbank, CA 91522	G	2/28/2006
6762	R4-2004-0058	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	G	6/29/2006
6453	R4-2004-0058	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	G	7/27/2006
8240	R4-2004-0058	Southern California Water Co.	Century Plant	7128 Century Blvd, Paramount, CA 90723	G	2/27/2007
6710	R4-2004-0069	BP West Coast Products LLC	East Hynes Facility	5905 Paramount Blvd, Long Beach, CA 90805	I	5/6/2004
8761	R4-2004-0075	ConocoPhillips Company	Former 76 Station No. 3472	3501 W. Third St., Los Angeles, CA	I	5/6/2004

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8721	R4-2004-0109	Los Angeles City of DWP	City Trunk Line-South	Los Angeles, Los Angeles, CA	G	9/30/2004
8358	R4-2004-0109	BP West Coast Products LLC	East Hynes Terminal	5905 Paramount Blvd, Long Beach, CA 90805	G	10/18/2004
8801	R4-2004-0109	Los Angeles City of DWP	Parthenia Trunk Line	Parthenia & Burnet & Roscoe Blvd, Los Angeles, CA 91402	G	10/22/2004
8454	R4-2004-0109	Shell Oil Products US	Shell Van Nuys Terminal	8100 Haskell Avenue, Van Nuys, CA 91406	G	10/22/2004
7770	R4-2004-0109	BP West Coast Products LLC	West Hynes Pump Station	5900 Cherry Ave, Long Beach, CA 90805	G	10/22/2004
8160	R4-2004-0109	Mobil Oil Corp.	Vernon Terminal	2709 E. 37th St, Vernon, CA 90058	G	10/25/2004
8245	R4-2004-0109	Los Angeles City of DWP	Sepulveda Trunk Line Project	Rinaldi St/Midwood Dr., Granada Hills, CA 91345	G	11/1/2004
8554	R4-2004-0109	Los Angeles City of DWP	River Supply Conduit	Crystal Springs & Western Heri, Los Angeles, CA 90027	G	11/9/2004
8942	R4-2004-0109	BP West Coast Products LLC	ARCO Vinvale Terminal	8601 S. Garfield Ave, South Gate, CA 90280	G	9/8/2005
6027	R4-2004-0111	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	7/15/2004
6984	R4-2004-0141	Dial Corp, The	Southwest Grease Business	5832 S. Garfield Ave, Commerce, CA 90040	I	9/2/2004
4671	R4-2004-0142	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	9/2/2004
6079	R4-2004-0171	Owens-Brockway Glass Container	Glass Container Div, Vernon	2901 Fruitland Ave, Vernon, CA 90058	I	12/13/2004
8840	R4-2004-0178	ConocoPhillips Company	76 Station No. 0971	427 N. Crescent Dr, Beverly Hills, CA	I	1/13/2005
6010	R4-2005-0008	Kaiser Aluminum Fabricated Products, LLC	Los Angeles, California Plant	6250 E. Bandini Blvd, Los Angeles, CA 90040	I	1/27/2005
6742	R4-2005-0027	Metropolitan Water Dist. Of SC	Rio Hondo Power Plant	9840 Miller Way, South Gate, CA 90280	I	5/5/2005
5841	R4-2005-0028	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E. Victoria St, Compton, CA 90220	I	5/5/2005
7655	R4-2005-0029	Hexion Specialty Chemicals, Inc.	Hexion Specialty Chemicals, Inc.(formerly Resolution Specialty Materials)	2801 Lynwood Rd, Lynwood, CA 90262	I	5/5/2005
8881	R4-2005-0030	ConocoPhillips Company	76 Station No. 3645	15410 Ventura Blvd, Sherman Oaks, CA	G	6/1/2005
9068	R4-2005-0030	The Reeves Trust	The Reeves Trust Property	11840 Foothill Blvd, Los Angeles, CA	G	5/1/2006
6027	R4-2006-0008	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	1/19/2006
6027	R4-2006-0036	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	4/28/2006
6521	R4-2006-0065	Lubricating Specialties Co.	Pico Rivera, Oil Blending	8015 Paramount Blvd, Pico Rivera, CA 90660	I	9/2/2006
8102	R4-2006-0081	Los Angeles Turf Club	Santa Anita Park	285 W. Huntington Dr, Arcadia, CA 91006	I	11/9/2006
4424	R4-2006-0085	Burbank, City of Public Works	Burbank WWRP	7040 N. Lake St, Burbank, CA 91502	I	12/29/2006
4424	R4-2006-0085	Burbank, City of Public Works	Burbank WWRP	7040 N. Lake St, Burbank, CA 91502	I	12/29/2006
5695	R4-2006-0091	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	2/2/2007
5675	R4-2006-0092	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	2/2/2007
			HISTORICAL PERMITS			
6947	90-078	Wakefield of California, Inc.	Figueroa Plaza	201 N. Figueroa St., Los Angeles, CA 90012	I	6/18/1990
7260	92-091	Mobil Oil Corp.	Mobil SS#11-164	12904 Ventura Blvd, North Hollywood, CA	G	6/4/1993

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				91609		
7670	00-023	C. C. Associates	C. C. Associates	22330 Sherman Way, Canoga Park, CA 91303	I	3/2/2000
7394	00-042	ExxonMobil Refining Supply Co.	RAS#7-8712	18201 S Crenshaw Blvd, Torrance, CA	I	4/13/2000
8059	00-046	Las Virgenes MWD	Tapia WRF	731 Malibu Canyon Rd, Calabasas, CA 91302	I	4/13/2000
7759	00-168	LA Co Metro Trans Authority	Segments 1,2A,2B,3 Operations	Greater Los Angeles, Los Angeles, CA 90017	I	11/9/2000
8228	01-012	Bodycote Thermal Processing	Huntington Park Facility	3370 Benedict Way, Huntington Park, CA 90255	I	1/11/2001
7865	01-068	Pacific Refining Co.	Former Western Fuel Oil	2100 N Gaffey St, San Pedro, CA 90731	I	5/24/2001
8787	01-12DWQ	Calabasas, City of	Aquatic Pesticide/Weed Control	26135 Mureau Rd, Calabasas, CA 91302-3172	G	4/3/2002
642	01-153	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	10/25/2001
6181	75-106	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E Artesia Blvd, Long Beach, CA 90805	I	8/18/1975
4671	76-004	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	1/19/1976
6224	76-007	Broadway-Glendale	Broadway-Glendale	650 W Broadway, Glendale, CA 91204	I	1/19/1976
5139	76-008	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	1/19/1976
2439	76-010	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	I	1/19/1976
6236	76-043	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	I	3/22/1976
6242	76-067	Filtrol Corp.	Filtrol Corp.	3305 E Bandini Blvd, Los Angeles, CA 90023	I	4/26/1976
6027	76-146	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	9/27/1976
6010	76-166	Kaiser Aluminum & Chemical	Kaiser Aluminum & Chemical	6250 E Bandini Blvd, Los Angeles, CA 90040	I	10/25/1976
6181	76-17703	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E Artesia Blvd, Long Beach, CA 90805	I	10/25/1976
642	77-060	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	3/28/1977
4424	77-104	Burbank, City of Public Works	Burbank WWRP	7040 N Lake St, Burbank, CA 91502	I	6/27/1977
5675	77-142	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	7/25/1977
6453	79-026	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	I	2/26/1979
6464	79-082	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	I	6/25/1979
6181	80-01902	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E Artesia Blvd, Long Beach, CA 90805	I	5/19/1980
5695	80-020	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	5/19/1980
6522	80-027	Exxon Co., U.S.A.	Exxon Company U.S.A.	19350 S Alameda St, Rancho Dominguez, CA 90221	I	7/28/1980
5675	80-03302	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	7/28/1980
6224	80-04406	Broadway-Glendale	Broadway-Glendale	650 W Broadway, Glendale, CA 91204	I	8/25/1980
5139	80-04407	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	8/25/1980
2439	80-04413	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	I	8/25/1980
4671	80-04414	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	8/25/1980

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6236	80-05601	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	I	10/27/1980
4551	81-011	Los Angeles City of Rec&Parks	Los Angeles Zoo Griffith Park	4700 Western Heritage Dr, Los Angeles, CA 90027	I	4/27/1981
6284	81-025	Foto-Kem Industries, Inc	Movie Film Lab, Burbank	2800 West Olive Ave, Burbank, CA 91505	I	7/27/1981
6289	81-055	J. C. Penney Company, Inc.	Glendale Facility	333 W Colorado St, Glendale, CA 91210	I	11/23/1981
1265	82-020	Kaiser Marquardt, Inc.	Ramjet Testing, Van Nuys	16555 Saticoy St, Van Nuys, CA 91406	I	4/26/1982
642	82-021	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	4/26/1982
6079	82-023	Owens-Brockway Glass Container	Glass Container Div, Vernon	2901 Fruitland Ave, Vernon, CA 90058	I	4/26/1982
6637	82-045	Consolidated Drum Recondition	Oil Drum Recycling, South Gate	9316 S Atlantic Ave, South Gate, CA 90280	I	7/26/1982
4135	82-065	Los Angeles City of DWP	General Office Building	111 N Hope St, Los Angeles, CA 90012	I	1/26/1982
5755	82-070	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	I	9/27/1982
5988	83-008	MCA / Universal City Studios	Universal City Studios	100 Universal City Plaza, Universal City, CA 91608	I	2/28/1983
6659	83-011	Chevron U.S.A. Inc.	Van Nuys Terminal	15359 Oxnard St, Van Nuys, CA 91411	I	3/28/1983
6416	83-039	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	I	7/25/1983
5841	83-071	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E Victoria St, Compton, CA 90220	I	12/19/1983
6203	84-015	Bank Of America	Nt & Sa L.A. Data Center	1000 W Temple St, Los Angeles, CA 90012	I	2/27/1984
6464	84-045	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	I	5/21/1984
6027	84-085	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	9/17/1984
6453	84-097	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	I	10/22/1984
5675	84-09802	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	10/22/1984
5695	84-09803	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	10/22/1984
4424	85-001	Burbank, City of Public Works	Burbank WWRP	7040 N Lake St, Burbank, CA 91502	I	1/28/1985
6010	85-012	Kaiser Aluminum & Chemical	Kaiser Aluminum & Chemical	6250 E Bandini Blvd, Los Angeles, CA 90040	I	2/25/1985
6702	85-026	Quaker State Oil Refining Corp	Lubricating Oil Packaging	19501 Stanta Fe Avenue, Rancho Dominguez, CA 90221	I	5/20/1985
6181	85-027	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E Artesia Blvd, Long Beach, CA 90805	I	5/20/1985
5695	85-034	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	6/24/1985
6705	85-042	WRC Properties, Inc.	Office Building, LA	6500 Wilshire Blvd, Los Angeles, CA 90048	I	8/26/1985
6710	85-057	BP West Coast Products LLC	East Hynes Facility	5905 Paramount Blvd, Long Beach, CA 90805	I	10/28/1985
4671	85-061	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	10/28/1985
6713	85-064	Cornerstone Suburban Office,Lp	First Financial Plaza	16830 Ventura Blvd, Encino, CA 91436	I	11/25/1985
5139	85-065	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	11/25/1985
6722	86-005	Jamison Properties	Encino Executive Plaza	16501 Ventura Blvd, Encino, CA 91436	I	1/27/1986
6224	86-030	Broadway-Glendale	Broadway-Glendale	650 W Broadway, Glendale, CA 91204	I	6/23/1986
2439	86-035	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	I	6/23/1986

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6236	86-037	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	I	6/23/1986
6284	86-053	Foto-Kem Industries, Inc	Movie Film Lab, Burbank	2800 West Olive Ave, Burbank, CA 91505	I	7/28/1986
6742	86-069	Metropolitan Water Dist. Of SC	Rio Hondo Power Plant	9840 Miller Way, South Gate, CA 90280	I	9/22/1986
6746	86-075	First American Title Co.of L.A	First American Title Co.of L.A	520 N Central Ave, Glendale, CA 91203	I	10/28/1986
6761	87-007	Lubricating Specialties Co.	Lubricating Specialties Co.	3365 Slauson Ave, Vernon, CA 90058	I	1/26/1987
6762	87-008	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	I	1/26/1987
6079	87-021	Owens-Brockway Glass Container	Glass Container Div, Vernon	2901 Fruitland Ave, Vernon, CA 90058	I	2/23/1987
1265	87-023	Kaiser Marquardt, Inc.	Ramjet Testing, Van Nuys	16555 Saticoy St, Van Nuys, CA 91406	I	2/23/1987
4135	87-058	Los Angeles City of DWP	General Office Building	111 N Hope St, Los Angeles, CA 90012	I	5/18/1987
642	87-060	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	5/18/1987
5755	87-081	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	I	6/22/1987
6242	87-106	Filtrol Corp.	Filtrol Corp.	3305 E Bandini Blvd, Los Angeles, CA 90023	I	7/27/1987
5139	88-075	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	7/25/1988
6833	88-085	Trillium Property, LLC	Office Building	6320 Canoga Ave #1610, Woodland Hills, CA 91367	I	8/22/1988
5988	88-099	MCA / Universal City Studios	Universal City Studios	100 Universal City Plaza, Universal City, CA 91608	I	9/26/1988
5841	88-125	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E Victoria St, Compton, CA 90220	I	11/28/1988
6854	89-003	Los Angeles Times	Parking Structure 213 S.Spring	213 S Spring St, Los Angeles, CA 90053	I	1/23/1989
6856	89-013	Bethlehem Steel Corp.	Vernon Industry Plaza	3300 E Slauson, Vernon, CA 90058	I	2/27/1989
6464	89-059	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	I	6/26/1989
6878	89-068	Central Associates	Central Bank Office Building	411 N Central Ave, Glendale, CA 91203	I	7/24/1989
6882	89-072	Los Angeles Teachers Credit Un	Taft Building	3330 Cahuenga Blvd, Los Angeles, CA 90068	I	7/24/1989
6416	89-073	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	I	7/24/1989
6885	89-083	Robert Chan	B.C. Plaza	711 N Broadway, Los Angeles, CA 90012	I	8/28/1989
6894	89-105	Smith & Hricik	550 N. Brand Office Building	550 N Brand Blvd, Glendale, CA 91203	I	10/30/1989
6903	89-121	Glendale Memorial Hospital	Health Center	1420 S Central Ave, Glendale, CA 91204	I	12/4/1989
6915	90-004	Chin Lee Group, Inc	Carbon Cannister Water Trt Sys	861 N Springs St, Los Angeles, CA 90012	I	1/29/1990
6917	90-006	CarrAmerica Realty Corp.	CarrAmerica Office Building	5550 Topanga Canyon Blvd, Woodland Hills, CA 91367	I	1/29/1990
6926	90-024	Douglas Emmett Warner CtrTower	Plaza 6, Warner Center	21700 Oxnard St, Woodland Hills, CA 91367	I	1/29/1990
6931	90-039	Unocal Corp.	Unocal SS #2058	13464 Ventura Blvd, Sherman Oaks, CA 91423	I	3/26/1990
5675	90-044	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	3/26/1990
6742	90-058	Metropolitan Water Dist. Of SC	Rio Hondo Power Plant	9840 Miller Way, South Gate, CA 90280	I	5/21/1990
6942	90-067	Thrifty Oil Co.	Thrifty Oil Co. # 132	18266 Ventura Blvd, Tarzana, CA 91356	I	6/18/1990

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6972	90-108	Capital & Conuties U.S.A.,Inc.	Capital & Counties U.S.A.,Inc.	800 W 6th St #880, Los Angeles, CA 90017	I	8/20/1990
6973	90-109	LJR Partners LP	Pacific Condo Association	850 East Ocean Blvd., Long Beach, CA 90802	I	8/20/1990
6289	90-116	J. C. Penney Company, Inc.	Glendale Facility	333 W Colorado St, Glendale, CA 91210	I	8/20/1990
6984	90-125	Dial Corp, The	Southwest Grease Business	5832 S Garfield Ave, Commerce, CA 90040	I	9/24/1990
6986	90-127	Mitsui Fudosan (U.S.A.) Inc.	Sanwa Bank Plaza/Mitsui Fudosa	601 S Figueroa St, Los Angeles, CA 90017	I	9/24/1990
6989	90-130	Unocal Corp.	Unocal SS #3459	12080 Ventura Blvd, Studio City, CA 91602	I	9/24/1990
6994	90-137	Los Angeles Times	Parking Structure 205 W. 2nd.	205 W Second St, Los Angeles, CA 90053	I	10/22/1990
6522	90-142	Exxon Co., U.S.A.	Exxon Company U.S.A.	19350 S Alameda St, Rancho Dominguez, CA 90221	I	10/22/1990
7005	90-159	Maguire Partners	The Gas Company Tower	555 W 5th St #5050, Los Angeles, CA 90013	I	12/3/1990
4424	90-164	Burbank, City of Public Works	Burbank WWRP	7040 N Lake St, Burbank, CA 91502	I	12/3/1990
7013	91-004	L & R Auto Parks, Inc.	Parking Structure 220 S.Spring	220 S Spring St, Los Angeles, CA 90053	I	1/28/1991
7014	91-005	Douglas Emmett Joint Venture	Douglas Emmett Joint Venture	800 N Brand Blvd, Glendale, CA 91203	I	1/28/1991
6637	91-010	Consolidated Drum Recondition	Oil Drum Recycling, South Gate	9316 S Atlantic Ave, South Gate, CA 90280	I	1/28/1991
7037	91-044	Los Angeles City of Rec&Parks	Hollenbeck Park Lake	416 S St. Louis St, Los Angeles, CA 90033	I	4/22/1991
7046	91-065	Thrifty Oil Co.	Thrifty Oil #236	12500 Ventura Blvd, Studio City, CA 91604	I	6/3/1991
7050	91-081	Altadena Texaco Market	Altadena Texaco Mark	340 W Pacific Coast Hwy, Long Beach, CA 90806	I	7/22/1991
7051	91-082	Arco Petroleum Products Co.	Arco Station #5028	124 W Pacific Coast Hwy, Long Beach, CA 90806	I	7/22/1991
7063	91-092	550 S. Hope Street Associates	550 S. Hope St. Building	550 S Hope St, Los Angeles, CA 90071	G	8/16/1991
7098	91-092	Two Calif Plaza/Arden Realty	Two Calif Plaza/Equity Office	350 S Grand Ave, Los Angeles, CA 90071	G	12/30/1991
7117	91-092	Los Angeles Times	Office Bldg. 145 S. Spring	145 S Spring St, Los Angeles, CA 90053	G	1/6/1992
7099	91-092	Jones Lang la Salle	Bank of America Harbor Bldg	333 S Beaudry Ave, Los Angeles, CA 90017	G	1/23/1992
7127	91-092	Grand Central Square	Parking Structure	320 W 3rd St, Los Angeles, CA 90013	G	2/5/1992
7126	91-092	Glendale, City of	Wells A & B Verdugo Pick-Up	1720 Canada Blvd, Glendale, CA 91206	G	2/11/1992
7151	91-092	Pasadena, City of	Garfield Well	586 N Garfield Ave, Pasadena, CA 91101	G	4/27/1992
7227	91-092	LA Co Parking Authority	Walt Disney Hall Parking	111 S Grand Ave, Los Angeles, CA 90012	G	12/23/1992
7302	91-092	Lucky Stores, Inc.	Lucky Supermarket #616	4211 Eagle Rock Blvd., Eagle Rock, CA 90065	G	4/23/1993
7273	91-092	Los Angeles County I.S.D.	W. San Fernando Courthouse	9425 Penfield Ave, Chatsworth, CA	G	5/14/1993
7295	91-092	South Gate, City Of	South Gate Park Reservoir	South Gate Park, South Gate, CA 90280	G	7/12/1993
7304	91-092	South Gate, City Of	Well-Head Wts Const.	10242 Lee Ln, South Gate, CA 90280	G	8/9/1993
7316	91-092	Burbank, City of Public Service	Reservoir Forebay	2030 N Hollywood Way, Burbank, CA 91503	G	9/10/1993
7317	91-092	Pico Water District	Various wells	4852 Church St, Pico Rivera, CA 90660	G	9/10/1993
7299	91-092	Children's Hospital LosAngeles	Children's Hospital	4616 De Longpre Ave, Los Angeles, CA 90033	G	10/6/1993
7132	91-092	Burbank, City of Public Service	Burbank Public Service Dept	164 W Mangolia Blvd, Burbank, CA 91503	G	12/31/1993

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7611	91-092	G & K Management Co., Inc.	Grand Promenade	225 S Grand Ave, Los Angeles, CA 90012	G	6/20/1994
7399	91-092	APW Zero Cases	Zero Corp.- Zero West Division	777 Front St, Burbank, CA 91502	G	7/19/1994
7441	91-092	California American Water Co.	Arlington Well # 2	5107 Arlington Ave, Los Angeles, CA 90043	G	9/26/1994
7407	91-092	Washington Mutual	Sherman Oaks Branch	13949 Ventura Blvd, Sherman Oaks, CA 91423	G	12/29/1994
7499	91-092	LA Co Dept of Public Works	Woodcliff Drain Project	4200 Woodcliff Rd, Sherman Oaks, CA 91403	G	3/21/1995
7517	91-092	LA Co Dept of Public Works	Storm Drain Project 9037	500 20th St, Long Beach, CA 90806	G	4/25/1995
7560	91-092	Maguire Properties	One California Plaza	300 S Grand Ave, Los Angeles, CA 90071	G	8/31/1995
7587	91-092	California American Water Co.	San Marino Wells Projects	Canterbury Rd. & Lambardy Rd., San Marino, CA 91108	G	9/22/1995
7668	91-092	Lynwood, City Of	Water Well #21	Wright Rd. & Josephine, Lynwood, CA 90262	G	5/2/1996
7704	91-092	Caltrans	Caltrans-Route 105	West Bound Route 105, Paramount, CA 90723	G	9/11/1996
7708	91-092	Bell Gardens, City of, DPW	Domestic Water Well	N.E. Corner Florence Pl., Bell Gardens, CA 90201	G	10/16/1996
7731	91-092	Caltrans	Los Angeles River Watershed	2187 Riverside Dr, Los Angeles, CA 90039	G	11/14/1996
7761	91-092	Los Angeles, City of	Oro Vista Project	Oro Vista Ave., Los Angeles, CA 91040	G	3/12/1997
5695	91-102	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	9/9/1991
7501	91-111	Southern California Gas Co.	Line 765	Wardlow Rd. / Santa Fe Ave, Long Beach, CA 90802	G	3/10/1995
7663	91-111	Southern California Gas Co.	Southern California Gas Co.	NW Corner Spence St. & 74th St, Los Angeles, CA 90023	G	5/9/1996
7770	91-111	BP West Coast Products LLC	West Hynes Pump Station	5900 Cherry Ave, Long Beach, CA 90805	G	3/17/1997
7120	92-002	Arco Petroleum Products Co.	Arco Station #1691	740 W Rosecrans Blvd, Compton, CA 90222	I	1/27/1992
7121	92-003	Grand Rent-A-Car Corp.	Grand Rent-A-Car	1207 W Third St, Los Angeles, CA 90017	I	1/27/1992
6236	92-011	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	I	3/9/1992
6224	92-022	Broadway-Glendale	Broadway-Glendale	650 W Broadway, Glendale, CA 91204	I	4/20/1992
7166	92-031	Mobil Oil Corp.	Mobil SS#11-F3b	19650 Sherman Way, Reseda, CA 91335	I	6/1/1992
7167	92-032	Shell Oil Products US	4236 Eagle Rock Blvd	4236 Eagle Rock Blvd, Los Angeles, CA	I	6/1/1992
6710	92-037	BP West Coast Products LLC	East Hynes Facility	5905 Paramount Blvd, Long Beach, CA 90805	I	6/1/1992
7190	92-055	Mobil Oil Corp.	Mobil SS#11-Mxy	2601 Atlantic Ave, Long Beach, CA 90806	I	8/31/1992
7210	92-073	Southern California Edison Co.	Compton Service Center	700 N Bullis Rd, Compton, CA 90224	I	10/19/1992
7212	92-075	Interstate Brands Corp.	Interstate Brands	6841 San Fernando Rd, Glendale, CA 91201	I	10/19/1992
7248	92-091	J & M Oil Co., Inc.	J & M Oil Co., Inc.	11515 Atlantic Ave., Lynwood, CA 90262	G	4/19/1993
7609	92-091	Former Shell SS/Equilon Enter.	Hanna's Arco (former Shell SS)	918 N SOTO ST, Los Angeles, CA 90033	G	8/24/1993
6826	92-091	Exxon Co., U.S.A.	Exxon Ss#3733	6000 Canoga Ave, Woodland Hills, CA 91605	G	10/22/1993
7342	92-091	Arco Petroleum Products Co.	Arco Station #5206	12525 Hadley St, Whittier, CA 90601	G	12/10/1993

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7521	92-091	LA Unified School District	Tank Leak Site- Elem. School	309 Lucas Ave, Los Angeles, CA 90017	G	5/12/1995
7528	92-091	Chevron U.S.A. Inc.	44 Service Stations	10340 Rosecrans, Bellflower, CA 90706	G	5/23/1995
7606	92-091	Gelb Enterprises	Former Marlin'S Shel	22021 Ventura Blvd, Woodland Hills, CA 91367	G	10/31/1995
7642	92-091	Lasmo Petroleum Inc.	Carson Tank Farm	21000 S Figueroa St, Carson, CA 90037	G	3/4/1996
7677	92-091	Refiners Marketing Co.	Former Refiners Mark	100 S Seaside Ave, Terminal Island, CA 90731	G	6/5/1996
7721	92-091	Los Angeles City of DWP	Main St. & Garnada	630 N Main & 18144 Dovenshire, Los Angeles, CA 90051	G	11/22/1996
7739	92-091	Spring St. Redevelopment LLC	Sprint St. Redevelop	1825 E Spring St, Long Beach, CA 90802	G	12/16/1996
7760	92-091	ExxonMobil Oil Corporation	Mobil SS#11-FRN	16461 Ventura Blvd, Encino, CA 91436	G	3/27/1997
6027	92-092	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	12/7/1992
7238	93-002	Walt Disney Co., The	Walt Disney Co.	500 S Buena Vista St, Burbank, CA 91521	I	1/25/1993
7264	93-015	Boeing Company	Rocketdyne Div.	6633 Canoga Ave, Canoga Park, CA 91309	I	4/5/1993
7267	93-024	Union Station Gateway, Inc.	Gateway Center Construction	S.E. of Macy St. & Vignes St., Los Angeles, CA 90012	I	4/5/1993
6284	93-052	Foto-Kem Industries, Inc	Movie Film Lab, Burbank	2800 West Olive Ave, Burbank, CA 91505	I	9/27/1993
7353	94-002	Hilton Glendale	Hilton Glendale	100 W Glenoaks Blvd, Glendale, CA 91202	I	1/31/1994
5139	94-003	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	1/31/1994
6010	94-004	Kaiser Aluminum & Chemical	Kaiser Aluminum & Chemical	6250 E Bandini Blvd, Los Angeles, CA 90040	I	1/31/1994
6746	94-011	First American Title Co.of L.A	First American Title Co.of L.A	520 N Central Ave, Glendale, CA 91203	I	2/28/1994
5841	94-022	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E Victoria St, Compton, CA 90220	I	4/4/1994
1265	94-023	Kaiser Marquardt, Inc.	Ramjet Testing, Van Nuys	16555 Saticoy St, Van Nuys, CA 91406	I	4/4/1994
7394	94-041	ExxonMobil Refining Supply Co.	RAS#7-8712	18201 S Crenshaw Blvd, Torrance, CA	I	6/13/1994
7395	94-042	Aratex Services, Inc.	Aratex Services, Inc	702 W Anaheim St, Long Beach, CA 90813	I	6/13/1994
5755	94-047	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	I	6/13/1994
7652	94-058	Coast Packing Co.	Coast Packing Co.	3275 E Vernon Ave, Vernon, CA 90058	G	3/26/1996
7679	94-058	Dba "Ultimate"	Dba "Ultimate"	3600 S Grand Ave, Los Angeles, CA 91746	G	6/28/1996
6683	94-058	Glendale II Associates, Ltd.	Glendale Galleria Office	2148 Glendale Galleria, Glendale, CA 91210	G	10/24/1996
7720	94-058	J. C. Penney Company, Inc.	Glendale Facility	333 W Colorado St, Glendale, CA 91210	G	11/8/1996
6008	94-058	Sierracin/Sylmar Corp.	Sierracin.Sylmar Corp.	12780 San Fernando Rd, Sylmar, CA 91342	G	3/25/1997
7774	94-058	Los Angeles City Of Gen. Serv.	Los Angeles City Hall	200 N Spring St, Los Angeles, CA 90012	G	3/31/1997
7778	94-058	Glendale Adventist Med. Center	Chevy Chase Facility	801 S Chevy Chase, Glendale, CA 91205	G	4/18/1997
6762	94-058	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	G	10/29/1997
7238	94-058	Walt Disney Co., The	Walt Disney Co.	500 S Buena Vista St, Burbank, CA 91521	G	10/29/1997
6878	94-058	Central Associates	Central Bank Office Building	411 N Central Ave, Glendale, CA 91203	G	12/3/1997
6894	94-058	Smith & Hricik	550 N. Brand Office Building	550 N Brand Blvd, Glendale, CA 91203	G	12/24/1997
6416	94-058	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	G	12/24/1997
5755	94-058	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	G	1/14/1998

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7353	94-058	Hilton Glendale	Hilton Glendale	100 W Glenoaks Blvd, Glendale, CA 91202	G	1/14/1998
2439	94-058	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	G	1/23/1998
7448	94-058	Glendale Adventist Med. Center	Physicians Medical Terrace	1509 Wilson Terrace, Glendale, CA 91205	G	1/26/1998
7862	94-058	WRC Properties, Inc.	Office Bldg.- 330 N. Brand	330 N Brand Blvd, Glendale, CA 91203	G	1/27/1998
6903	94-058	Glendale Memorial Hospital	Health Center	1420 S Central Ave, Glendale, CA 91204	G	2/10/1998
5139	94-058	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	G	5/14/1998
7014	94-058	Douglas Emmett Joint Venture	Douglas Emmett Joint Venture	800 N Brand Blvd, Glendale, CA 91203	G	5/14/1998
6236	94-058	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	G	5/14/1998
6746	94-058	First American Title Co.of L.A	First American Title Co.of L.A	520 N Central Ave, Glendale, CA 91203	G	5/14/1998
6464	94-058	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	G	5/14/1998
7588	94-058	Metropolitan Water Dist. Of SC	Greg Avenue Power Plant	7554 Greg Ave, Sun Valley, CA 91352	G	6/5/1998
6224	94-058	Macy's West	Macy's West Glendale	650 W Broadway, Glendale, CA 90031	G	6/8/1998
7402	94-060	J. A. B. Holdings, Inc.	J. A. B. Holdings	9401 Whitmore St, El Monte, CA 91731	I	7/18/1994
6464	94-067	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	I	7/18/1994
6203	94-071	Bank Of America	Nt & Sa L.A. Data Center	1000 W Temple St, Los Angeles, CA 90012	I	7/18/1994
7037	94-091	Los Angeles City of Rec&Parks	Hollenbeck Park Lake	416 S St. Louis St, Los Angeles, CA 90033	I	9/26/1994
7448	94-105	Glendale Adventist Med. Center	Physicians Medical Terrace	1509 Wilson Terrace, Glendale, CA 91205	I	10/31/1994
2439	94-107	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	I	10/31/1994
7467	94-117	Montgomery Ward and Co., Inc.	Auto Service Center	6601 Owensmouth Ave, Canoga Park, CA 91304	I	12/5/1994
642	94-121	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	12/5/1994
6854	94-122	Los Angeles Times	Parking Structure 213 S.Spring	213 S Spring St, Los Angeles, CA 90053	I	12/5/1994
6894	94-126	Smith & Hricik	550 N. Brand Office Building	550 N Brand Blvd, Glendale, CA 91203	I	12/5/1994
7480	95-001	Jet Propulsion Laboratory	Jet Propulsion Lab.	4800 Oak Grove Dr #M/S171-225, Pasadena, CA 91109	I	1/23/1995
7482	95-003	3M Company	3M Pharmaceuticals	19901 Nordhoff St, Northridge, CA 91328	I	1/23/1995
6903	95-004	Glendale Memorial Hospital	Health Center	1420 S Central Ave, Glendale, CA 91204	I	1/23/1995
6181	95-006	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E Artesia Blvd, Long Beach, CA 90805	I	1/23/1995
6761	95-007	Lubricating Specialties Co.	Lubricating Specialties Co.	3365 Slauson Ave, Vernon, CA 90058	I	1/23/1995
7512	95-032	Time Warner Entertainment Co.	Warner Brothers Studios Fac.	4000 Warner Blvd., Burbank, CA 91522	I	4/3/1995
6416	95-040	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	I	4/3/1995
6705	95-053	WRC Properties, Inc.	Office Building, LA	6500 Wilshire Blvd, Los Angeles, CA 90048	I	5/15/1995
6915	95-063	Chin Lee Group, Inc	Carbon Cannister Water Trt Sys	861 N Springs St, Los Angeles, CA 90012	I	6/12/1995
6713	95-064	Cornerstone Suburban Office,Lp	First Financial Plaza	16830 Ventura Blvd, Encino, CA 91436	I	6/12/1995
6722	95-065	Jamison Properties	Encino Executive Plaza	16501 Ventura Blvd, Encino, CA 91436	I	6/12/1995
6882	95-067	Los Angeles Teachers Credit Un	Taft Building	3330 Cahuenga Blvd, Los Angeles, CA 90068	I	6/12/1995
5675	95-075	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	6/12/1995

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6833	95-095	Trillium Property, LLC	Office Building	6320 Canoga Ave #1610, Woodland Hills, CA 91367	I	7/17/1995
6986	95-096	Mitsui Fudosan (U.S.A.) Inc.	Sanwa Bank Plaza/Mitsui Fudosa	601 S Figueroa St, Los Angeles, CA 90017	I	7/17/1995
7576	95-108	Pasadena, City of	Dept. of Water & Power	45 E Glenarm Ave, Pasadena, CA 91105	I	8/21/1995
6762	95-109	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	I	8/21/1995
6926	95-112	Douglas Emmett Warner CtrTower	Plaza 6, Warner Center	21700 Oxnard St, Woodland Hills, CA 91367	I	8/21/1995
7588	95-118	Metropolitan Water Dist. Of SC	Greg Avenue Power Plant	7554 Greg Ave, Sun Valley, CA 91352	I	9/18/1995
6994	95-137	Los Angeles Times	Parking Structure 205 W. 2nd.	205 W Second St, Los Angeles, CA 90053	I	10/30/1995
6878	95-138	Central Associates	Central Bank Office Building	411 N Central Ave, Glendale, CA 91203	I	10/30/1995
6856	95-139	Bethlehem Steel Corp.	Vernon Industry Plaza	3300 E Slauson, Vernon, CA 90058	I	10/30/1995
4671	95-140	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	10/30/1995
7637	96-002	Los Angeles City of DWP	Pollock Wells Treatment Plant	2660 Fletcher Dr, Los Angeles, CA 90039	I	1/22/1996
6453	96-003	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	I	1/22/1996
7655	96-017	Resolution Specialty Materials	Resolution Specialty Materials	2801 Lynwood Rd, Lynwood, CA 90262	I	4/1/1996
7670	96-028	C. C. Associates	C. C. Associates	22330 Sherman Way, Canoga Park, CA 91303	I	5/6/1996
4551	96-035	Los Angeles City of Rec&Parks	Los Angeles Zoo Griffith Park	4700 Western Heritage Dr, Los Angeles, CA 90027	I	6/10/1996
4424	96-050	Burbank, City of Public Works	Burbank WWRP	7040 N Lake St, Burbank, CA 91502	I	7/15/1996
6702	96-051	Quaker State Oil Refining Corp	Lubricating Oil Packaging	19501 Stanta Fe Avenue, Rancho Dominguez, CA 90221	I	7/15/1996
5841	96-052	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E Victoria St, Compton, CA 90220	I	7/15/1996
7709	96-065	Axel Johnson, Inc.	Industrial Tectonics Bearing	18301 S. Santa Fe Ave., Rancho Dominguez, CA 90221	I	9/30/1996
5988	96-083	MCA / Universal City Studios	Universal City Studios	100 Universal City Plaza, Universal City, CA 91608	I	11/4/1996
7742	96-089	Sta - Lube/CRC Industries Inc.	Sta - Lube/CRC Industries Inc.	3039 Ana St, Rancho Dominguez, CA 90221	I	12/9/1996
7752	97-002	Lincoln Avenue Water Co.	South Coulter Water Treatment	564 W Harriet St, Altadena, CA 91001	I	1/27/1997
7762	97-016	Mairoll, Inc.	Voi-Shan Chatsworth	9631 Desoto Ave, Chatsworth, CA 91311	I	3/3/1997
6079	97-017	Owens-Brockway Glass Container	Glass Container Div, Vernon	2901 Fruitland Ave, Vernon, CA 90058	I	3/3/1997
6710	97-019	BP West Coast Products LLC	East Hynes Facility	5905 Paramount Blvd, Long Beach, CA 90805	I	3/3/1997
6637	97-024	Consolidated Drum Recondition	Oil Drum Recycling, South Gate	9316 S Atlantic Ave, South Gate, CA 90280	I	3/3/1997
7794	97-043	21300 Victory Blvd. Ltd. Co.	Warner Corporate Center	21300 Victory Blvd, Woodland Hills, CA 91367	G	6/9/1997
7868	97-043	Chevron U.S.A. Inc.	Chevron Station # 9-0477	4005 Eagle Rock Blvd, Los Angeles, CA 90065	G	2/19/1998
6722	97-043	Jamison Properties	Encino Executive Plaza	16501 Ventura Blvd, Encino, CA 91436	G	3/23/1998
7881	97-043	ITT Industries	ITT Industries	1200 Flower St, Burbank, CA 91502	G	4/8/1998

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7922	97-043	Walt Disney Co., The	Riverside Bldg.	500 Buena Vista St, Burbank, CA 91521	G	8/6/1998
7940	97-043	Tishman Warner Center Venture	Tishman Warner Venture	6303 Owensmooth Ave, Woodland Hills, CA 91367	G	9/17/1998
7975	97-043	Metropolitan Water Dist. Of SC	Sepulveda Feeder Joseph Jensen	16251 Rinaldi Ave, Granada Hills, CA 91344	G	11/23/1998
8006	97-043	Kinder Morgan SFPP, L.P.	Carson to Norwalk Project-LA	14-mile long pipeline, Carson, CA	G	3/9/1999
8024	97-043	United Storm Water, Inc.	Storm Drain Cleaning I	105 Freeway @ 110 Freeway, Los Angeles, CA 90061	G	5/20/1999
8025	97-043	United Storm Water, Inc.	Storm Drain Cleaning II	2425 Enterprise St, Los Angeles, CA 90021	G	5/20/1999
8080	97-043	Tutor-Saliba Team	Mid-corridor Pipeline Relocati	Alameda St. & Geenleaf Blvd., Compton, CA 90221	G	10/27/1999
8140	97-043	Southern California Water Co.	Century Site	7128 Century Blvd, Paramount, CA 90723	G	4/17/2000
8134	97-043	Southern California Water Co.	Goodyear Site	1127 E 61st St, Los Angeles, CA 90011	G	4/20/2000
8147	97-043	Compton Municipal Water Dept.	Municipal Water Supply Wells	480 W Compton Blvd, Compton, CA 90221	G	4/27/2000
8145	97-043	Southern California Water Co.	Clara Site	6440 Clara St, Bell Gardens, CA 90201	G	6/12/2000
8141	97-043	Southern California Water Co.	Priory Site	5646 Priory St, Bell Gardens, CA 90201	G	6/12/2000
8162	97-043	LA Co Dept of Public Works	Project 9037 Unit 4	San Francisco St & 16th St, Long Beach, CA 90813	G	8/21/2000
8181	97-043	Crescenta Valley Water Distric	Water Well No. 15	3730 Glenwood Ave, Verdugo City, CA	G	8/21/2000
8248	97-043	Archdiocese of Los Angeles Cat	Calvary Cemetery	4201 Whittier Blvd, Los Angeles, CA 90023	G	4/10/2001
8260	97-043	Los Angeles City of DWP	Burbank Trunk Line	Magnolia & Burbank Blvd, Burbank, CA 91316	G	5/3/2001
8269	97-043	Los Angeles City of DWP	Sepulveda Trunk Line Project	Rinaldi St/Midwood Dr., Granada Hills, CA 91345	G	5/10/2001
8301	97-043	LA Co Dept of Public Works	Laurel Park Road Pumping Plant	Alameda & Santa Fe, Rancho Dominguez, CA 90221	G	8/17/2001
8338	97-043	Water Replenishment District of Southern California	Reg. GW monitor - LA River	LA River Watershed- multi loc, Los Angeles, CA	G	12/19/2001
8376	97-043	Arnold Palmer Golf Management	Whittier Narrows Golf Course	8640 E Rush St, Rosemead, CA 91770	G	2/25/2002
8385	97-043	Southern California Water Co.	Otis Well No. 3	6424 S Otis Ave, Bell, CA	G	3/22/2002
8483	97-043	USC University Hospital, Inc.	USC Univ. Hosp Norris Tower	1500 San Pablo St, Los Angeles, CA 90033	G	10/22/2002
8583	97-043	Pure Effect Incorporated	LAC/USC Replacement Project	1200 N State St, Los Angeles, CA 90033	G	5/9/2003
8601	97-043	Los Angeles City of DWP	Distributing Station 87	4926 Maplewood Ave, Los Angeles, CA 90004	G	7/7/2003
8184	97-043	Southern California Water Co.	Gage Site Water Wells	6112 E Gage Ave, Bell Gardens, CA 90201	G	12/23/2003
7837	97-044	Newlowe Properties c/o HMC	Newlowe Properties c/o HMC	3378 San Fernando Rd, Los Angeles, CA 90065	G	10/24/1997
7637	97-044	Los Angeles City of DWP	Pollock Wells Treatment Plant	2660 Fletcher Dr, Los Angeles, CA 90039	G	4/10/1998
7991	97-044	Los Angeles City of DWP	Headwork Pilot Well Test	950 Riverside Dr, Burbank, CA 91506	G	12/17/1998
7395	97-044	Aramark Uniform Services	Former Aratex Services	702 W Anaheim St, Long Beach, CA 90813	G	12/30/1998
8068	97-044	Caltrans	LA-105 Garfield/Ardis Ave	LA-105 Garfield/Ardis Ave., Downey, CA	G	7/30/1999

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				90242		
8152	97-044	DTSC/England & Assoc.	Former Southland Oil Site	5619 Randolph St, Commerce, CA 90040	G	6/26/2000
8307	97-044	EMIF IV, LP c/o Hazard Mgmt	Lynwood Town Center GW Treat	11341 Court St, Lynwood, CA	G	11/20/2000
8277	97-044	Monterey Park, City of	Well No. 12	Klingerman & Muscatel Rd, Rosemead, CA 91770	G	6/11/2001
8315	97-044	Univar USA Inc.	Former Vopak USA Inc.	1363 S Bonnie Beach Pl, Los Angeles, CA 90023	G	8/22/2001
8359	97-044	Georgia Pacific Corporation	Frmer Georgia-Pacific Facility	760 S Vail Ave, Montebello, CA 90640	G	1/15/2002
7441	97-045	California American Water Co.	Arlington Well # 2	5107 Arlington Ave, Los Angeles, CA 90043	G	5/12/1997
7099	97-045	Jones Lang la Salle	Bank of America Harbor Bldg	333 S Beaudry Ave, Los Angeles, CA 90017	G	5/12/1997
7132	97-045	Burbank, City of Public Service	Burbank Public Service Dept	164 W. Mangolia Blvd, Burbank, CA 91503	G	5/12/1997
7704	97-045	Caltrans	Caltrans-Route 105	West Bound Route 105, Paramount, CA 90723	G	5/12/1997
7647	97-045	Arcadia, City of	Chapman Well Redevelopment	48 Carol Pine Ln, Arcadia, CA 91007	G	5/12/1997
7299	97-045	Children's Hospital LosAngeles	Children's Hospital	4616 De Longpre Ave, Los Angeles, CA 90033	G	5/12/1997
7708	97-045	Bell Gardens, City of, DPW	Domestic Water Well	N.E. Corner Florence Pl., Bell Gardens, CA 90201	G	5/12/1997
7151	97-045	Pasadena, City of	Garfield Well	586 N Garfield Ave, Pasadena, CA 91101	G	5/12/1997
7611	97-045	G & K Management Co., Inc.	Grand Promenade	225 S Grand Ave, Los Angeles, CA 90012	G	5/12/1997
7731	97-045	Caltrans	Los Angeles River Watershed	2187 Riverside Dr, Los Angeles, CA 90039	G	5/12/1997
7302	97-045	Lucky Stores, Inc.	Lucky Supermarket #616	4211 Eagle Rock Blvd., Eagle Rock, CA 90065	G	5/12/1997
7117	97-045	Los Angeles Times	Office Bldg. 145 S. Spring	145 S Spring St, Los Angeles, CA 90053	G	5/12/1997
7560	97-045	Maguire Properties	One California Plaza	300 S Grand Ave, Los Angeles, CA 90071	G	5/12/1997
7761	97-045	Los Angeles, City of	Oro Vista Project	Oro Vista Ave., Los Angeles, CA 91040	G	5/12/1997
7127	97-045	Grand Central Square	Parking Structure	320 W 3rd St, Los Angeles, CA 90013	G	5/12/1997
7316	97-045	Burbank, City of Public Service	Reservoir Forebay	2030 N Hollywood Way, Burbank, CA 91503	G	5/12/1997
7587	97-045	California American Water Co.	San Marino Wells Projects	Canterbury Rd. & Lambardy Rd., San Marino, CA 91108	G	5/12/1997
7407	97-045	Washington Mutual	Sherman Oaks Branch	13949 Ventura Blvd, Sherman Oaks, CA 91423	G	5/12/1997
7295	97-045	South Gate, City Of	South Gate Park Reservoir	South Gate Park, South Gate, CA 90280	G	5/12/1997
7517	97-045	LA Co Dept of Public Works	Storm Drain Project 9037	500 20th St, Long Beach, CA 90806	G	5/12/1997
7098	97-045	Two Calif Plaza/Arden Realty	Two Calif Plaza/Equity Office	350 S. Grand Ave, Los Angeles, CA 90071	G	5/12/1997
7317	97-045	Pico Water District	Various wells	4852 Church St, Pico Rivera, CA 90660	G	5/12/1997
7273	97-045	Los Angeles County I.S.D.	W. San Fernando Courthouse	9425 Penfield Ave, Chatsworth, CA	G	5/12/1997
7227	97-045	LA Co Parking Authority	Walt Disney Hall Parking	111 S. Grand Ave, Los Angeles, CA 90012	G	5/12/1997
7668	97-045	Lynwood, City Of	Water Well #21	Wright Rd. & Josephine, Lynwood, CA 90262	G	5/12/1997
7304	97-045	South Gate, City Of	Well-Head Wts Const.	10242 Lee Ln, South Gate, CA 90280	G	5/12/1997

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7126	97-045	Glendale, City of	Wells A & B Verdugo Pick-Up	1720 Canada Blvd, Glendale, CA 91206	G	5/12/1997
7499	97-045	LA Co Dept of Public Works	Woodcliff Drain Project	4200 Woodcliff Rd, Sherman Oaks, CA 91403	G	5/12/1997
7399	97-045	APW Zero Cases	Zero Corp.- Zero West Division	777 Front St, Burbank, CA 91502	G	5/12/1997
7792	97-045	Douglas Emmett Warner CtrTower	Plaza 3, Warner Center	21650 Oxnard St, Woodland Hills, CA 91367	G	6/4/1997
6986	97-045	Figueroa at Wilshire LLC	Sanwa Bank Plaza	601 S Figueroa St, Los Angeles, CA 90017	G	7/28/1997
7811	97-045	Pacific Terminals LLC	Systems Wide Pipelines	LA River Watershed	G	8/20/1997
7782	97-045	California Water Service Co.	Wells 27201 & 29001	Santa Fe Ave & Victoria St, Long Beach, CA	G	9/9/1997
7827	97-045	Lakewood, City of	WELL # 11 & 11-A	5136 Sunfield Ave, Lakewood, CA 90812	G	9/22/1997
7833	97-045	Alameda Corridor Trans. Author	Alameda Corridor Transp. Proj.	Alameda Blvd, Los Angeles, CA	G	10/10/1997
7831	97-045	California Water Service Co.	Well 29401	4100 S Santa Fe Ave, Long Beach, CA 90810	G	10/21/1997
7830	97-045	California Water Service Co.	Wells 21501 & 21502	21718 S Alameda St, Long Beach, CA 90810	G	10/21/1997
6917	97-045	CarrAmerica Realty Corp.	CarrAmerica Office Building	5550 Topanga Canyon Blvd, Woodland Hills, CA 91367	G	12/24/1997
6926	97-045	Douglas Emmett Warner CtrTower	Plaza 6, Warner Center	21700 Oxnard St, Woodland Hills, CA 91367	G	1/23/1998
7870	97-045	Monrovia, City of	Well # 6	2655 S Myrtle Ave, Monrovia, CA 91016	G	2/18/1998
7480	97-045	Jet Propulsion Laboratory	Jet Propulsion Lab.	4800 Oak Grove Dr #M/S171-225, Pasadena, CA 91109	G	3/18/1998
6713	97-045	Cornerstone Suburban Office,L	First Financial plaza	16830 Ventura Blvd, Encino, CA 91436	G	3/23/1998
6833	97-045	Douglas Emmett & Company	Trillium - 6320 Canoga Ave.	6320 Canoga Ave #220, Woodland Hills, CA 91367	G	3/23/1998
7877	97-045	Long Beach, City of	North L.B. Water Well #s 5&11	1622 Jackson St, Long Beach, CA 90805	G	3/26/1998
7895	97-045	Water Replenishment District of Southern California	Dominguez Monitoring Wells	Dominguez Monitoring Wells, Wilmington, CA 90744	G	4/20/1998
6882	97-045	Cushman & Wakefield	California Credit Union	3330 Cahuenga Blvd #West, Los Angeles, CA 90068	G	6/5/1998
7907	97-045	LA Co Dept of Public Works	Le Sage Avenue Drain	5900 Manton Ave, Woodland Hills, CA 91367	G	6/11/1998
7909	97-045	Los Angeles City of DWP	Stone Inlet Line Flow Control	3641 Stone Canyon Ave, Sherman Oaks, CA 91403	G	7/13/1998
7948	97-045	California Water Service Co.	Well 29701	169 W Victoria St, Long Beach, CA 90810	G	9/23/1998
7942	97-045	Walnut Park Mutual Water Co.	Well # 11	2460 E Florence Ave, Huntington Park, CA 90255	G	9/28/1998
7961	97-045	University of Southern Calif.	MarlyneNorris Cancer Res Tower	1450 Biggy St, Los Angeles, CA 90033	G	10/16/1998
7962	97-045	Long Beach Water Dept.	North Long Beach #489	1330 Jackson St, Long Beach, CA 90805	G	10/27/1998
6973	97-045	The Pacific Condos	The Pacific Condos	850 E Ocean Blvd, Long Beach, CA 90802	G	11/4/1998
6972	97-045	Capital & Conuties U.S.A.,Inc.	Capital & Counties U.S.A.,Inc.	800 W 6th St #880, Los Angeles, CA 90017	G	12/14/1998
7995	97-045	Kinder Morgan SFPP, L.P.	Carson to Norwalk Project-LA	14-mile long pipeline, Carson, CA	G	2/24/1999
8015	97-045	Alameda Corridor Trans. Author	Alameda Mid-Corridor Trench Pj	10700 S Alameda St, Lynwood, CA 90262	G	4/7/1999

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8033	97-045	Brutoco Engr. & Const. Co. Inc	Compton Creek Bridge	17611 S Santa Fe Ave, Rancho Dominguez, CA 90221	G	6/4/1999
8067	97-045	Tutor-Saliba Team	Alameda Mid-Corridor Pipline R	Alameda St. & El Segundo Blvd, Compton, CA	G	8/6/1999
8112	97-045	Southern California Water Co.	Chanslor Well	6938 Chanslor Ave, Bell, CA 90201	G	12/29/1999
8172	97-045	Mammoth Apartments, LLC	Mammoth Apartments	4328 Mammoth Ave, Sherman Oaks, CA 91423	G	8/9/2000
8196	97-045	TABC, INC.	Toyota Auto Body Corp (TABC, I	6375 Paramount Blvd, Long Beach, CA 90801	G	11/2/2000
8203	97-045	Los Angeles City of DWP	Sepulveda Basin Reclaim Pipeli	Woodley Ave, Los Angeles, CA 90012	G	11/3/2000
8218	97-045	Arcadia, City of	Anokia Well	Anoakia Lane West of Baldwin, Arcadia, CA 91066	G	12/22/2000
8250	97-045	Darling International Inc.	Darling International Inc.	2626 E 25th St, Los Angeles, CA 90058	G	4/19/2001
8278	97-045	Pasadena, City of	Well #58	3000 E Alameda St, Pasadena, CA 91107	G	5/22/2001
8297	97-045	Jefferson Smurfit Corp.	Jefferson Smurfit Corp.1	2001 E 57th St, Los Angeles, CA 90058	G	7/9/2001
8298	97-045	Brutoco Engr. & Const. Co. Inc	Lankershim Bridge Widening	3973 Lankershim Blvd, Studio City, CA 91606	G	7/20/2001
8295	97-045	DDR Urban LP	Queens Way Bay Retail Entertai	25 Aquarium Way, Long Beach, CA 90802	G	8/7/2001
8341	97-045	Camden Development	The Park at Harbor View	55 S Chesnut Pl, Long Beach, CA 90802	G	11/14/2001
8344	97-045	Arcadia, City of	St. Joseph Well #2	230 N Second Ave, Arcadia, CA 91066	G	11/16/2001
8350	97-045	Arcadia, City of	Anoakia Water Supply Well	778 Anoakia Ln, Arcadia, CA 91066	G	12/18/2001
8353	97-045	Arcadia, City of	Longden Well #2	1257 E Longden Ave, Arcadia, CA 91006	G	1/17/2002
8397	97-045	Arcadia, City of	Chapman Well #7	57 Michillinda Ave, Arcadia, CA 91066	G	5/8/2002
8409	97-045	Vernon, City of	Well No.19 Rehabilitation Proj	3336 S 50th St, Vernon, CA 90058	G	6/12/2002
8422	97-045	Clark Construction Group Inc.	Caltrans Dist. 7 Headquarters	100 S Main St, Los Angeles, CA 90012	G	7/3/2002
8466	97-045	Valencia Water Company	Valencia Water Co. Well #N7&N8	Valencia & Cinema Dr, Valencia, CA 91355	G	10/7/2002
8605	97-045	South Gate, City Of	Water Well No. 28	3414 Adrmore Ave, South Gate, CA 90280	G	7/2/2003
7528	97-046	Chevron U.S.A. Inc.	44 Service Stations	10340 Rosecrans, Bellflower, CA 90706	G	5/12/1997
7342	97-046	Arco Petroleum Products Co.	Arco Station #5206	12525 Hadley St, Whittier, CA 90601	G	5/12/1997
7642	97-046	Lasmo Petroleum Inc.	Carson Tank Farm	21000 S Figueroa St, Carson, CA 90037	G	5/12/1997
6826	97-046	Exxon Co., U.S.A.	Exxon Ss#3733	6000 Canoga Ave, Woodland Hills, CA 91605	G	5/12/1997
7606	97-046	Gelb Enterprises	Former Marlin'S Shel	22021 Ventura Blvd, Woodland Hills, CA 91367	G	5/12/1997
7677	97-046	Refiners Marketing Co.	Former Refiners Mark	100 S Seaside Ave, Terminal Island, CA 90731	G	5/12/1997
7609	97-046	Former Shell SS/Equilon Enter.	Hanna's Arco (former Shell SS)	918 N SOTO ST, Los Angeles, CA 90033	G	5/12/1997
7248	97-046	J & M Oil Co., Inc.	J & M Oil Co., Inc.	11515 Atlantic Ave., Lynwood, CA 90262	G	5/12/1997
7721	97-046	Los Angeles City of DWP	Main St. & Garnada	630 N Main & 18144 Dovenshire, Los Angeles, CA 90051	G	5/12/1997

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7260	97-046	Mobil Oil Corp.	Mobil SS#11-164	12904 Ventura Blvd, North Hollywood, CA 91609	G	5/12/1997
7760	97-046	ExxonMobil Oil Corporation	Mobil SS#11-FRN	16461 Ventura Blvd, Encino, CA 91436	G	5/12/1997
7739	97-046	Spring St. Redevelopment LLC	Sprint St. Redevelop	1825 E Spring St, Long Beach, CA 90802	G	5/12/1997
7521	97-046	LA Unified School District	Tank Leak Site- Elem. School	309 Lucas Ave, Los Angeles, CA 90017	G	5/12/1997
7212	97-046	Interstate Brands Corp.	Interstate Brands	6841 San Fernando Rd, Glendale, CA 91201	G	5/28/1997
6817	97-046	General Motors Corp.	South Gate Facility	2700 Tweedy Blvd, South Gate, CA 90280	G	6/27/1997
7210	97-046	Southern California Edison Co.	Compton Service Cen.	700 N Bullis Rd, Compton, CA 90220	G	7/14/1997
6942	97-046	Thrifty Oil Co.	Thrifty Oil Co. # 132	18266 Ventura Blvd, Tarzana, CA 91356	G	5/14/1998
8062	97-046	Sherman Car Inc.	Sherman Car Inc	1965 E. Artesia Blvd, Long Beach, CA 90805	G	7/23/1999
8081	97-046	Fashion Square Car Wash	Fashion Square Car Wash	4625 Woodman Ave, Sherman Oaks, CA 91423	G	10/6/1999
8123	97-046	Long Beach Building Materials	Long Beach Building Materials	1851 E 19th St, Long Beach, CA 90806	G	3/19/2000
8169	97-046	Shell Oil Products US	Shell station	11151 Long Beach Blvd, Lynwood, CA 90262	G	7/14/2000
8258	97-046	Los Feliz Fuel Stop	Los Feliz Fuel Stop	3160 Riverside Dr, Los Angeles, CA 90027	G	4/23/2001
8265	97-046	Atlantic Richfield Company	Former Arco Service Stn. #1860	3817 W Third St, Los Angeles, CA 90020	G	5/10/2001
8290	97-046	ConocoPhillips Company	76 Products Station #1747	12863 Ventura Blvd, Studio City, CA 91604	G	7/17/2001
8402	97-046	J & M Oil Company	United Oil Station #33	11515 Atlantic Ave, Lynwood, CA 90262	G	5/1/2002
8405	97-046	Atlantic Richfield Company	Arco Station No. 6035	9824 Flair Dr, El Monte, CA 91731	G	5/15/2002
7501	97-047	Southern California Gas Co.	Line 765	Wardlow Rd. / Santa Fe Ave, Long Beach, CA 90802	G	5/12/1997
7663	97-047	Southern California Gas Co.	Southern California Gas Co.	NW Corner Spence St. & 74th St, Los Angeles, CA 90023	G	5/12/1997
7770	97-047	BP West Coast Products LLC	West Hynes Pump Station	5900 Cherry Ave, Long Beach, CA 90805	G	5/12/1997
7807	97-047	Los Angeles City of DWP	Rescoe Trunk Line	Roscoe Trunk Line, Los Angeles, CA 90012	G	7/18/1997
7810	97-047	Los Angeles City of DWP	East Valley Water Recycling	Woodley Ave, Van Nuys, CA 91401	G	7/29/1997
7823	97-047	Arco Petroleum Products Co.	Vinvale Terminal	8601 S Garfield Ave, South Gate, CA 90280	G	9/2/1997
7867	97-047	Chevron U.S.A. Inc.	Chevron Station # 9-0477	4005 Eagle Rock Blvd, Los Angeles, CA 90065	G	2/19/1998
7883	97-047	Pacific Pipeline System LLC	Pacific Pipeline Proj. Front	777 N Front St, Los Angeles, CA 91502	G	4/2/1998
7896	97-047	Kinder Morgan Energy Partners	Taylor Yard Station	2800 Kerr St, Los Angeles, CA 90034	G	4/20/1998
7888	97-047	Pacific Pipeline System LLC	Pacific Pipeline Proj. Alameda	2000 Alameda St, Los Angeles, CA 90221	G	5/4/1998
7887	97-047	Pacific Pipeline System LLC	Pacific Pipeline Proj. Hower	11550 S Hoover, Los Angeles, CA 90086	G	5/4/1998
7920	97-047	Pacific Pipeline System LLC	Segment #2B	Emidio Pump Station to El Segu, Los Angeles, CA	G	8/17/1998
7919	97-047	Pacific Pipeline System LLC	Segment #3	I-5 and MTA Railroad, Los Angeles, CA	G	8/17/1998
7943	97-047	Los Angeles City of DWP	East Valley Water Recycling Pj	San Fernando Valley, San Fernando, CA	G	9/16/1998
7941	97-047	Pacific Pipeline System LLC	Segment # 4	Emidio pump station, Los Angeles, CA	G	9/16/1998
7973	97-047	Arco Petroleum Products Co.	Vinvale Terminal	8601 S Garfield Ave, South Gate, CA 90280	G	11/17/1998

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7999	97-047	Los Angeles City of DWP	Roscoe Tank Line No. 2	Roscoe Blvd, Canoga Park, CA	G	2/1/1999
8037	97-047	Cargill Foods	Cargill Foods	2800 Lynwood Rd, Lynwood, CA 90262	G	6/4/1999
8096	97-047	Pacific Terminals LLC	Systems Wide Pipelines	Los Angeles River Wateshed	G	11/29/1999
8119	97-047	Chevron U.S.A. Inc.	Van Nuys Terminal	15359 Oxnard St, Van Nuys, CA 91411	G	2/8/2000
8122	97-047	Pacific Pipeline System LLC	West Hynes Station	5900 Cherry Ave, Long Beach, CA 90805	G	2/11/2000
8155	97-047	Southern California Gas Co.	Line120 Pipeline Relocation Pj	Victory Blvd. & Woodley Ave, Van Nuys, CA	G	5/31/2000
8160	97-047	Mobil Oil Corp.	Vernon Terminal	2709 E 37th St, Vernon, CA 90058	G	6/15/2000
8202	97-047	Los Angeles City of DWP	Sepulveda Basin Reclaim Pipeli	Woodley Ave, Los Angeles, CA 90012	G	11/3/2000
8262	97-047	Los Angeles City of DWP	Burbank Trunk Line	Magnolia & Burbank Blvd, Burbank, CA 91316	G	4/2/2001
8245	97-047	Los Angeles City of DWP	Sepulveda Trunk Line Project	Rinaldi St/Midwood Dr., Granada Hills, CA 91345	G	4/25/2001
8358	97-047	BP West Coast Products LLC	East Hynes Terminal	5905 Paramount Blvd, Long Beach, CA 90805	G	1/11/2002
8393	97-047	Chevron Products Co.	Chevron Montebello Terminal	601 S Vail Ave, Montebello, CA 90640	G	4/24/2002
8395	97-047	Chevron Products Co.	Chevron Van Nuys Terminal	15359 Oxnard St, Van Nuys, CA 91411	G	4/24/2002
8406	97-047	Southern California Gas Co.	So Cal Gas - Pico Rivera	Slauson & Rio Hondo Channel, Pico Rivera, CA	G	5/8/2002
8433	97-047	Pacific Pipeline System LLC	West Hynes Station	5900 Cherry Ave, Long Beach, CA 90805	G	7/18/2002
8454	97-047	Shell Oil Products US	Shell Van Nuys Terminal	8100 Haskell Avenue, Van Nuys, CA 91406	G	9/23/2002
8554	97-047	Los Angeles City of DWP	River Supply Conduit	Crystal Springs & Western Heri, Los Angeles, CA 90027	G	2/27/2003
8626	97-047	Los Angeles City of DWP	Encino Reser Water Qty Proj.	4500 Encino Ave, Los Angeles, CA 91316	G	8/20/2003
8721	97-047	Los Angeles City of DWP	City Trunk Line-South	Los Angeles, Los Angeles, CA	G	3/17/2004
7759	97-049	LA Co Metro Trans Authority	Segments 1,2A,2B,3 Operations	Greater Los Angeles, Los Angeles, CA 90017	I	5/12/1997
6742	97-051	Metropolitan Water Dist. Of SC	Rio Hondo Power Plant	9840 Miller Way, South Gate, CA 90280	I	5/12/1997
4135	97-054	Los Angeles City of DWP	General Office Building	111 N Hope St, Los Angeles, CA 90012	I	5/12/1997
6242	97-056	Filtrol Corp.	Filtrol Corp.	3305 E Bandini Blvd, Los Angeles, CA 90023	I	5/12/1997
7482	97-083	3M Company	3M Pharmaceuticals	19901 Nordhoff St, Northridge, CA 91328	I	6/16/1997
7467	97-109	Montgomery Ward and Co., Inc.	Auto Service Center	6601 Owensmouth Ave, Canoga Park, CA 91304	I	8/25/1997
7210	97-109	Southern California Edison Co.	Compton Service Center	700 N Bullis Rd, Compton, CA 90224	I	8/25/1997
6705	97-109	WRC Properties, Inc.	Office Building, LA	6500 Wilshire Blvd, Los Angeles, CA 90048	I	8/25/1997
6989	97-109	Unocal Corp.	Unocal SS #3459	12080 Ventura Blvd, Studio City, CA 91602	I	8/25/1997
7795	97-111	LA Co Metro Trans Authority	Metro Lines-Eastside Extension	Greater Los Angeles, Los Angeles, CA 90017	I	8/25/1997
6203	97-126	Bank of America	Nt & Sa L.A. Data Center	1000 W. Temple St, Los Angeles, CA 90012	I	9/29/1997
6289	97-127	J. C. Penney Company, Inc.	Glendale Facility	333 W Colorado St, Glendale, CA 91210	I	9/29/1997
7212	97-127	Interstate Brands Corp.	Interstate Brands	6841 San Fernando Rd, Glendale, CA 91201	I	9/29/1997

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
6986	97-127	Mitsui Fudosan (U.S.A.) Inc.	Sanwa Bank Plaza/Mitsui Fudosa	601 S Figueroa St, Los Angeles, CA 90017	I	9/29/1997
7050	97-132	Altadena Texaco Market	Altadena Texaco Mark	340 W Pacific Coast Hwy, Long Beach, CA 90806	I	11/3/1997
7120	97-132	Arco Petroleum Products Co.	Arco Station #1691	740 W Rosecrans Blvd, Compton, CA 90222	I	11/3/1997
7051	97-132	Arco Petroleum Products Co.	Arco Station #5028	124 W Pacific Coast Hwy, Long Beach, CA 90806	I	11/3/1997
6762	97-132	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	I	11/3/1997
7190	97-132	Mobil Oil Corp.	Mobil SS#11-Mxy	2601 Atlantic Ave, Long Beach, CA 90806	I	11/3/1997
7238	97-132	Walt Disney Co., The	Walt Disney Co.	500 S Buena Vista St, Burbank, CA 91521	I	11/3/1997
7842	97-133	LA Co Dept of Public Works	Debris Basins Maintenance	Los Angeles County, Los Angeles, CA	I	11/3/1997
6878	97-140	Central Associates	Central Bank Office Building	411 N Central Ave, Glendale, CA 91203	I	12/8/1997
7839	98-007	Los Angeles City of DWP	Tunnel # 105	Aqueduct, Newhall, CA 91321	I	1/26/1998
6894	98-009	Smith & Hricik	550 N. Brand Office Building	550 N Brand Blvd, Glendale, CA 91203	I	1/26/1998
5755	98-009	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	I	1/26/1998
6416	98-009	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	I	1/26/1998
7353	98-009	Hilton Glendale	Hilton Glendale	100 W Glenoaks Blvd, Glendale, CA 91202	I	1/26/1998
7448	98-009	Glendale Adventist Med. Center	Physicians Medical Terrace	1509 Wilson Terrace, Glendale, CA 91205	I	1/26/1998
6917	98-021	CarrAmerica Realty Corp.	CarrAmerica Office Building	5550 Topanga Canyon Blvd, Woodland Hills, CA 91367	I	3/2/1998
6903	98-021	Glendale Memorial Hospital	Health Center	1420 S Central Ave, Glendale, CA 91204	I	3/2/1998
2439	98-021	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	I	3/2/1998
6926	98-021	Douglas Emmett Warner CtrTower	Plaza 6, Warner Center	21700 Oxnard St, Woodland Hills, CA 91367	I	3/2/1998
7480	98-026	Jet Propulsion Laboratory	Jet Propulsion Lab.	4800 Oak Grove Dr #M/S171-225, Pasadena, CA 91109	I	4/13/1998
7512	98-026	Time Warner Entertainment Co.	Warner Brothers Studios Fac.	4000 Warner Blvd., Burbank, CA 91522	I	4/13/1998
7482	98-033	3M Company	3M Pharmaceuticals	19901 Nordhoff St, Northridge, CA 91328	I	5/18/1998
7167	98-034	Shell Oil Products US	4236 Eagle Rock Blvd	4236 Eagle Rock Blvd, Los Angeles, CA	I	5/18/1998
5139	98-034	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	I	5/18/1998
7014	98-034	Douglas Emmett Joint Venture	Douglas Emmett Joint Venture	800 N Brand Blvd, Glendale, CA 91203	I	5/18/1998
6722	98-034	Jamison Properties	Encino Executive Plaza	16501 Ventura Blvd, Encino, CA 91436	I	5/18/1998
6236	98-034	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	I	5/18/1998
6746	98-034	First American Title Co.of L.A	First American Title Co.of L.A	520 N Central Ave, Glendale, CA 91203	I	5/18/1998
6713	98-034	Cornerstone Suburban Office,Lp	First Financial Plaza	16830 Ventura Blvd, Encino, CA 91436	I	5/18/1998
6464	98-034	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	I	5/18/1998
7402	98-034	J. A. B. Holdings, Inc.	J. A. B. Holdings	9401 Whitmore St, El Monte, CA 91731	I	5/18/1998
7166	98-034	Mobil Oil Corp.	Mobil SS#11-F3b	19650 Sherman Way, Reseda, CA 91335	I	5/18/1998
6284	98-034	Foto-Kem Industries, Inc	Movie Film Lab, Burbank	2800 West Olive Ave, Burbank, CA 91505	I	5/18/1998
6833	98-034	Trillium Property, LLC	Office Building	6320 Canoga Ave #1610, Woodland Hills,	I	5/18/1998

CI No.	Order No.	Discharger	Facility	Facility Address	General / Individual	Effective Date
				CA 91367		
7637	98-034	Los Angeles City of DWP	Pollock Wells Treatment Plant	2660 Fletcher Dr, Los Angeles, CA 90039	I	5/18/1998
7046	98-034	Thrifty Oil Co.	Thrifty Oil #236	12500 Ventura Blvd, Studio City, CA 91604	I	5/18/1998
6942	98-034	Thrifty Oil Co.	Thrifty Oil Co. # 132	18266 Ventura Blvd, Tarzana, CA 91356	I	5/18/1998
6931	98-034	Unocal Corp.	Unocal SS #2058	13464 Ventura Blvd, Sherman Oaks, CA 91423	I	5/18/1998
7904	98-040	Golden West Refining Company	Santa Fe Springs Refinery	13539 E Foster Rd, Santa Fe Springs, CA 90670	I	5/18/1998
5695	98-046	LA City Bureau of Sanitation	Tillman WWRP	6100 Woodley Ave, Van Nuys, CA 91406	I	6/15/1998
5675	98-047	LA City Bureau of Sanitation	L.A.-Glendale WWRP	4600 Colorado Blvd, Los Angeles, CA 90039	I	6/15/1998
6224	98-049	Broadway-Glendale	Broadway-Glendale	650 W Broadway, Glendale, CA 91204	I	6/29/1998
7588	98-049	Metropolitan Water Dist. Of SC	Greg Avenue Power Plant	7554 Greg Ave, Sun Valley, CA 91352	I	6/29/1998
6882	98-049	Los Angeles Teachers Credit Un	Taft Building	3330 Cahuenga Blvd, Los Angeles, CA 90068	I	6/29/1998
6027	98-051	The Boeing Company	Santa Susana Field Lab	Santa Susana Field, Simi Hills, CA 93065	I	6/29/1998
4424	98-052	Burbank, City of Public Works	Burbank WWRP	7040 N. Lake St, Burbank, CA 91502	I	6/29/1998
4424	98-052	Burbank, City of Public Works	Burbank WWRP	7040 N. Lake St, Burbank, CA 91502	I	6/29/1998
1265	98-054	Kaiser Marquardt, Inc.	Ramjet Testing, Van Nuys	16555 Saticoy St, Van Nuys, CA 91406	I	6/29/1998
6894	98-055	Smith & Hricik	550 N. Brand Office Building	550 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
5139	98-055	California Federal Bank	California Federal Bank	401 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
6878	98-055	Central Associates	Central Bank Office Building	411 N Central Ave, Glendale, CA 91203	G	6/29/1998
6762	98-055	Glendale Docker Partnership	Central Stocker Ltd.	1140 N Central Ave, Glendale, CA 91202	G	6/29/1998
7584	98-055	NBB Associates, L.P.	Charles Dunn Co.	500 N. Brand Blvd., Glendale, CA 91203	G	6/29/1998
7778	98-055	Glendale Adventist Med. Center	Chevy Chase Facility	801 S Chevy Chase, Glendale, CA 91205	G	6/29/1998
7652	98-055	Coast Packing Co.	Coast Packing Co.	3275 E Vernon Ave, Vernon, CA 90058	G	6/29/1998
7014	98-055	Douglas Emmett Joint Venture	Douglas Emmett Joint Venture	800 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
6236	98-055	Citadel Realty, Inc.	Fidelity Federal Bank Bldg.	600 N Brand Ave, Glendale, CA 91209	G	6/29/1998
6746	98-055	First American Title Co.of L.A	First American Title Co.of L.A	520 N Central Ave, Glendale, CA 91203	G	6/29/1998
5755	98-055	Maguire Thomas Partners	Glendale Center	611 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
7720	98-055	J. C. Penney Company, Inc.	Glendale Facility	333 W Colorado St, Glendale, CA 91210	G	6/29/1998
6683	98-055	Glendale II Associates, Ltd.	Glendale Galleria Office	2148 Glendale Galleria, Glendale, CA 91210	G	6/29/1998
6416	98-055	C. B. Commercial Management	Glendale Office - 701 N. Brand	701 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
7588	98-055	Metropolitan Water Dist. Of SC	Greg Avenue Power Plant	7554 Greg Ave, Sun Valley, CA 91352	G	6/29/1998
6903	98-055	Glendale Memorial Hospital	Health Center	1420 S Central Ave, Glendale, CA 91204	G	6/29/1998
7353	98-055	Hilton Glendale	Hilton Glendale	100 W Glenoaks Blvd, Glendale, CA 91202	G	6/29/1998
6464	98-055	California Federal Bank	Hoeft Center	201 W Lexington Dr, Glendale, CA 91203	G	6/29/1998
2439	98-055	Lockheed Martin Librascope	Loral Librascope Div	833 Sonora Ave, Glendale, CA 91201	G	6/29/1998
7774	98-055	Los Angeles City Of Gen. Serv.	Los Angeles City Hall	200 N Spring St, Los Angeles, CA 90012	G	6/29/1998
6224	98-055	Macy's West	Macy's West Glendale	650 W Broadway, Glendale, CA 90031	G	6/29/1998

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7862	98-055	WRC Properties, Inc.	Office Bldg.- 330 N. Brand	330 N Brand Blvd, Glendale, CA 91203	G	6/29/1998
7448	98-055	Glendale Adventist Med. Center	Physicians Medical Terrace	1509 Wilson Terrace, Glendale, CA 91205	G	6/29/1998
6008	98-055	Sierracin/Sylmar Corp.	Sierracin.Sylmar Corp.	12780 San Fernando Rd, Sylmar, CA 91342	G	6/29/1998
7238	98-055	Walt Disney Co., The	Walt Disney Co.	500 S Buena Vista St, Burbank, CA 91521	G	6/29/1998
6761	98-055	Lubricating Specialties Co.	Lubricating Specialties Co.	3365 Slauson Ave, Vernon, CA 90058	G	4/20/1999
6885	98-055	Robert Chan	B.C. Plaza	711 N Broadway, Los Angeles, CA 90012	G	4/21/1999
6915	98-055	Chin Lee Group, Inc	Carbon Cannister Water Trt Sys	861 N Springs St, Los Angeles, CA 90012	G	4/21/1999
6994	98-055	Los Angeles Times	Parking Structure 205 W. 2nd.	205 W Second St, Los Angeles, CA 90053	G	4/21/1999
6854	98-055	Los Angeles Times	Parking Structure 213 S.Spring	213 S Spring St, Los Angeles, CA 90053	G	4/21/1999
7013	98-055	L & R Auto Parks, Inc.	Parking Structure 220 S.Spring	220 S Spring St, Los Angeles, CA 90053	G	4/21/1999
7005	98-055	Maguire Partners	The Gas Company Tower	555 W 5th St #5050, Los Angeles, CA 90013	G	4/21/1999
8060	98-055	Warner Brothers Inc.	Warner Brothers Studio Facilit	4000 Warner Blvd, Burbank, CA 91522	G	7/21/1999
8064	98-055	Southern California Water Co.	Hoffman Plant	5064 Cecelia St, Cudahy, CA	G	8/19/1999
8070	98-055	Tract 349 Mutual Water Company	Well 2 & 3 and 2 Tanks	4630 Santa Ana St, Cudahy, CA 90201	G	8/20/1999
8240	98-055	Southern California Water Co.	Century Site	7128 Century Blvd, Paramount, CA 90723	G	4/2/2001
8252	98-055	Southern California Water Co.	San Gabriel Plant	2630 S San Gabriel Blvd, Rosemead, CA 91770	G	4/16/2001
6453	98-055	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	G	7/27/2006
7576	98-057	Pasadena, City of	Dept. of Water & Power	45 E Glenarm Ave, Pasadena, CA 91105	I	6/29/1998
7865	98-060	Pacific Refining Co.	Former Western Fuel Oil	2100 N Gaffey St, San Pedro, CA 90731	I	8/3/1998
7264	98-061	Boeing Company	Rocketdyne Div.	6633 Canoga Ave, Canoga Park, CA 91309	I	8/3/1998
7795	98-067	LA Co Metro Trans Authority	Metro Lines-Eastside Extension	Greater Los Angeles, Los Angeles, CA 90017	I	9/14/1998
7944	98-068	Golden West Refining Company	Santa Fe Springs Refinery	13539 E Foster Rd, Santa Fe Springs, CA 90670	I	9/14/1998
7121	98-080	Grand Rent-A-Car Corp.	Grand Rent-A-Car	1207 W Third St, Los Angeles, CA 90017	I	11/2/1998
7709	98-080	Axel Johnson, Inc.	Industrial Tectonics Bearing	18301 S. Santa Fe Ave., Rancho Dominguez, CA 90221	I	11/2/1998
6972	98-093	Capital & Conuties U.S.A.,Inc.	Capital & Counties U.S.A.,Inc.	800 W 6th St #880, Los Angeles, CA 90017	I	12/14/1998
7267	98-093	Union Station Gateway, Inc.	Gateway Center Construction	S.E. of Macy St. & Vignes St., Los Angeles, CA 90012	I	12/14/1998
6973	98-093	LJR Partners LP	Pacific Condo Association	850 East Ocean Blvd., Long Beach, CA 90802	I	12/14/1998
6181	98-095	Edington Oil Co.	Long Beach Refinery - Rainfall	2400 E. Artesia Blvd, Long Beach, CA 90805	I	12/14/1998
642	98-097	Certainteed Corp.	Asphalt Roofing Mfg, LA	1632 N San Pablo St, Los Angeles, CA 90033	I	12/14/1998
4671	98-098	Pabco Paper Products	Paperboard & Carton Mfg,Vernon	4460 Pacific Blvd, Vernon, CA 90058	I	12/14/1998
7395	99-016	Aratex Services, Inc.	Aratex Services, Inc	702 W Anaheim St, Long Beach, CA 90813	I	4/22/1999
6885	99-016	Robert Chan	B.C. Plaza	711 N Broadway, Los Angeles, CA 90012	I	4/22/1999
6915	99-016	Chin Lee Group, Inc	Carbon Cannister Water Trt Sys	861 N Springs St, Los Angeles, CA 90012	I	4/22/1999

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6453	99-016	Grifols Biologicals Inc.	Grifols Biologicals Inc.	5555 Valley Blvd, Los Angeles, CA 90032	I	4/22/1999
6761	99-016	Lubricating Specialties Co.	Lubricating Specialties Co.	3365 Slauson Ave, Vernon, CA 90058	I	4/22/1999
6994	99-016	Los Angeles Times	Parking Structure 205 W. 2nd.	205 W Second St, Los Angeles, CA 90053	I	4/22/1999
6854	99-016	Los Angeles Times	Parking Structure 213 S.Spring	213 S Spring St, Los Angeles, CA 90053	I	4/22/1999
7013	99-016	L & R Auto Parks, Inc.	Parking Structure 220 S.Spring	220 S Spring St, Los Angeles, CA 90053	I	4/22/1999
7005	99-016	Maguire Partners	The Gas Company Tower	555 W 5th St #5050, Los Angeles, CA 90013	I	4/22/1999
6856	99-016	Bethlehem Steel Corp.	Vernon Industry Plaza	3300 E Slauson, Vernon, CA 90058	I	4/22/1999
7949	99-042	Water Replenishment District of Southern California	West Coast Basin Desalter	20500 Madrona, Torrance, CA 90509	I	5/27/1999
5841	99-043	Pacific Terminals LLC	Dominguez Hills Tank Farm	2500 E Victoria St, Compton, CA 90220	I	5/27/1999
6010	99-044	Kaiser Aluminum & Chemical	Kaiser Aluminum & Chemical	6250 E Bandini Blvd, Los Angeles, CA 90040	I	5/27/1999
6984	99-045	Dial Corp, The	Southwest Grease Business	5832 S Garfield Ave, Commerce, CA 90040	I	5/27/1999
6702	99-052	Quaker State Oil Refining Corp	Lubricating Oil Packaging	19501 Stanta Fe Avenue, Rancho Dominguez, CA 90221	I	6/30/1999
7655	99-053	Resolution Specialty Materials	Resolution Specialty Materials	2801 Lynwood Rd, Lynwood, CA 90262	I	6/30/1999
6947	99-054	Wakefield of California, Inc.	Figueroa Plaza	201 N. Figueroa St., Los Angeles, CA 90012	I	6/30/1999
7037	99-054	Los Angeles City of Rec&Parks	Hollenbeck Park Lake	416 S St. Louis St, Los Angeles, CA 90033	I	6/30/1999
6522	99-058	Exxon Co., U.S.A.	Exxon Company U.S.A.	19350 S Alameda St, Rancho Dominguez, CA 90221	I	6/30/1999
8059	99-066	Las Virgenes MWD	Tapia WRF	731 Malibu Canyon Rd, Calabasas, CA 91302	I	7/8/1999
8044	99-088	Coltec Industries Inc.	Former Menasco Aerosystem Faci	100 E Cedar Ave, Burbank, CA 91502	I	9/16/1999
6702	99-089	Quaker State Oil Refining Corp	Lubricating Oil Packaging	19501 Stanta Fe Avenue, Rancho Dominguez, CA 90221	I	9/16/1999
8102	99-109	Los Angeles Turf Club	Santa Anita Park	285 W. Huntington Dr, Arcadia, CA 91006	I	10/28/1999
8228	R01-003	Bodycote Thermal Processing	Huntington Park Facility	3370 Benedict Way, Huntington Park, CA 90255	I	1/11/2001
7395	R4-2002-0107	Aramark Uniform Services	Former Aratex Services	702 W Anaheim St, Long Beach, CA 90813	G	5/23/2002
8359	R4-2002-0107	Georgia Pacific Corporation	Frmer Georgia-Pacific Facility	760 S Vail Ave, Montebello, CA 90640	G	5/23/2002
8307	R4-2002-0107	EMIF IV, LP c/o Hazard Mgmt	Lynwood Town Center GW Treat	11341 Court St, Lynwood, CA	G	5/23/2002
8277	R4-2002-0107	Monterey Park, City of	Well No. 12	Klingerman & Muscatel Rd, Rosemead, CA 91770	G	5/23/2002
8564	R4-2002-0107	Calclean Inc.	Reseda Hand Car Wash	7601 Reseda Blvd, Los Angeles, CA 91335	G	4/9/2003
8747	R4-2002-0107	Pride Properties LLC	Corbin Village Cleaners	19812 Ventura Blvd, Woodland Hills, CA 91364	G	5/5/2004
8290	R4-2002-0125	ConocoPhillips Company	76 Products Station #1747	12863 Ventura Blvd, Studio City, CA 91604	G	7/11/2002
8405	R4-2002-0125	Atlantic Richfield Company	Arco Station No. 6035	9824 Flair Dr, El Monte, CA 91731	G	7/11/2002
7642	R4-2002-0125	Lasmo Petroleum Inc.	Carson Tank Farm	21000 S Figueroa St, Carson, CA 90037	G	7/11/2002
7210	R4-2002-0125	Southern California Edison Co.	Compton Service Cen.	700 N Bullis Rd, Compton, CA 90220	G	7/11/2002

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8081	R4-2002-0125	Fashion Square Car Wash	Fashion Square Car Wash	4625 Woodman Ave, Sherman Oaks, CA 91423	G	7/11/2002
8265	R4-2002-0125	Atlantic Richfield Company	Former Arco Service Stn. #1860	3817 W Third St, Los Angeles, CA 90020	G	7/11/2002
7609	R4-2002-0125	Former Shell SS/Equilon Enter.	Hanna's Arco (former Shell SS)	918 N. Soto St, Los Angeles, CA 90033	G	7/11/2002
7760	R4-2002-0125	ExxonMobil Oil Corporation	Mobil SS#11-FRN	16461 Ventura Blvd, Encino, CA 91436	G	7/11/2002
8169	R4-2002-0125	Shell Oil Products US	Shell station	11151 Long Beach Blvd, Lynwood, CA 90262	G	7/11/2002
6942	R4-2002-0125	Thrifty Oil Co.	Thrifty Oil Co. # 132	18266 Ventura Blvd, Tarzana, CA 91356	G	7/11/2002
8444	R4-2002-0125	EDF-Associates, LLC	Commerce Service Station	2445 Ralph Lieberman Ave, Commerce, CA 90040	G	7/31/2002
8486	R4-2002-0125	Arco Service Station	Arco Service Staion (Glen Smit	6580 Paramount Blvd, Long Beach, CA 90805	G	10/25/2002
8630	R4-2002-0125	Leatherman Property	Leatherman Property	11920 Balboa Blvd, Granada Hills, CA 91344	G	8/26/2003
8732	R4-2002-0125	Berglund Property	Triangle Gas Station	2900 Riverside Dr, Los Angeles, CA 90039	G	4/8/2004
8402	R4-2002-0125	J & M Oil Company	United Oil Station #33	11515 Atlantic Ave, Lynwood, CA 90262	G	7/9/2004
8867	R4-2002-0125	Tesoro Petroleum Co	Fmr. Fast Fuel Service Station	11051 Victory Blvd, North Hollywood, CA	G	2/18/2005
7576	R4-2002-0137	Pasadena, City of	Dept. of Water & Power	45 E Glenarm Ave, Pasadena, CA 91105	I	8/29/2002
6522	R4-2002-0137	Exxon Co., U.S.A.	Exxon Company U.S.A.	19350 S Alameda St, Rancho Dominguez, CA 90221	I	8/29/2002
6242	R4-2003-0024	Filtrol Corp.	Filtrol Corp.	3305 E Bandini Blvd, Los Angeles, CA 90023	I	1/30/2003
7904	R4-2003-0046	Golden West Refining Company	Santa Fe Springs Refinery	13539 E Foster Rd, Santa Fe Springs, CA 90670	I	3/13/2003
7944	R4-2003-0046	Golden West Refining Company	Santa Fe Springs Refinery	13539 E Foster Rd, Santa Fe Springs, CA 90670	I	3/13/2003
1265	R4-2003-0054	Kaiser Marquardt, Inc.	Ramjet Testing, Van Nuys	16555 Saticoy St, Van Nuys, CA 91406	I	4/3/2003
8655	R4-2003-0108	Rubio Canon Land & Water Assoc	Rubio-Well No. 7	246 W. Figueroa, Altadena, CA 91001	G	10/8/2003
8665	R4-2003-0108	Forest Lawn	Well No. 2A	1712 S. Glendale Ave, Glendale, CA 91205	G	10/28/2003
8827	R4-2003-0108	San Gabriel Valley Water Co.	Plant No. 2	4921 Kings Row, El Monte, CA 91731	G	11/9/2004
8850	R4-2003-0108	Smurfit-Stone Container	Smurfit-Stone Container Ent.	2001 E. 57th St, Los Angeles, CA 90058	G	1/11/2005
8265	R4-2003-0111	Atlantic Richfield Company	Former Arco Service Stn. #1860	3817 W. Third St, Los Angeles, CA 90020	G	8/28/2003
8307	R4-2003-0111	EMIF IV, LP c/o Hazard Mgmt	Lynwood Town Center GW Treat	11341 Court St, Lynwood, CA	G	10/14/2003
8583	R4-2003-0111	Pure Effect Incorporated	LAC/USC Replacement Project	1200 N. State St, Los Angeles, CA 90033	G	10/28/2003
7961	R4-2003-0111	University of Southern Calif.	MarlyneNorris Cancer Res Tower	1450 Biggy St, Los Angeles, CA 90033	G	11/18/2003
8714	R4-2003-0111	Jewish Home for the Aging	Jewish Home for the Aging	7150 Tampa Ave, Reseda, CA 91335	G	2/10/2004
7099	R4-2003-0111	Jones Lang la Salle	Bank of America Harbor Bldg	333 S Beaudry Ave, Los Angeles, CA 90017	G	3/17/2004
7127	R4-2003-0111	Grand Central Square	Parking Structure	320 W 3rd St, Los Angeles, CA 90013	G	8/13/2004
6986	R4-2003-0111	Figueroa at Wilshire LLC	Sanwa Bank Plaza	601 S. Figueroa St, Los Angeles, CA 90017	G	8/13/2004
7005	R4-2003-0111	Maguire Partners	The Gas Company Tower	555 W. 5th St #5050, Los Angeles, CA 90013	G	10/5/2004
6885	R4-2003-0111	Robert Chan	B.C. Plaza	711 N. Broadway, Los Angeles, CA 90012	G	1/13/2005
8977	R4-2003-0111	California State Univeristy, LA	CSU Parking Structure III	5151 State University Dr, Los Angeles, CA	G	11/18/2005

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7742	R4-2003-0119	Sta - Lube/CRC Industries Inc.	Sta - Lube/CRC Industries Inc.	3039 Ana St, Rancho Dominguez, CA 90221	I	9/11/2003
6637	R4-2004-0045	Consolidated Drum Recondition	Oil Drum Recycling, South Gate	9316 S Atlantic Ave, South Gate, CA 90280	I	3/4/2004
7762	R4-2004-0045	Mairoll, Inc.	Voi-Shan Chatsworth	9631 Desoto Ave, Chatsworth, CA 91311	I	3/4/2004
8228	R4-2004-0072	Bodycote Thermal Processing	Huntington Park Facility	3370 Benedict Way, Huntington Park, CA 90255	I	5/6/2004
8244	R4-2004-0109	Los Angeles City of DWP	Valley Generating Station	1801 Sheldon St, Sun Valley, CA 91352	G	7/1/2004
8626	R4-2004-0109	Los Angeles City of DWP	Encino Reser Water Qty Proj.	4500 Encino Ave, Los Angeles, CA 91316	G	9/22/2004
7949	R4-2004-0117	Water Replenishment District of Southern California	West Coast Basin Desalter	20500 Madrona, Torrance, CA 90509	I	8/5/2004
4135	R4-2004-0143	Los Angeles City of DWP	General Office Building	111 N Hope St, Los Angeles, CA 90012	I	9/2/2004
8044	R4-2004-0175	Coltec Industries Inc.	Former Menasco Aerosystem Faci	100 E Cedar Ave, Burbank, CA 91502	I	12/13/2004
4135	R4-2005-0009	Los Angeles City of DWP	General Office Building	111 N Hope St, Los Angeles, CA 90012	I	1/27/2005
7394	R4-2005-0009	ExxonMobil Refining Supply Co.	RAS#7-8712	18201 S Crenshaw Blvd, Torrance, CA	I	1/27/2005
6203	R4-2005-0048	Bank of America	Nt & Sa L.A. Data Center	1000 W. Temple St, Los Angeles, CA 90012	I	7/7/2005
7759	R4-2005-0060	LA Co Metro Trans Authority	Segments 1,2A,2B,3 Operations	Greater Los Angeles, Los Angeles, CA 90017	I	9/1/2005
6203	R4-2006-0031	Bank of America	Nt & Sa L.A. Data Center	1000 W. Temple St, Los Angeles, CA 90012	I	3/9/2006
7742	R4-2006-0041	Sta - Lube/CRC Industries Inc.	Sta - Lube/CRC Industries Inc.	3039 Ana St, Rancho Dominguez, CA 90221	I	4/6/2006
5988	R4-2007-0017	MCA / Universal City Studios	Universal City Studios	100 Universal City Plaza, Universal City, CA 91608	I	3/1/2007

POLA Summary Report
Review of Chemical and Biological Data on Sediments for the Channel Deepening Project

Summary Report

REVIEW OF CHEMICAL AND BIOLOGICAL DATA ON SEDIMENTS FOR THE CHANNEL DEEPENING PROJECT PORT OF LOS ANGELES

Prepared for:

Port of Los Angeles
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Kinnetic Laboratories/ToxScan, Inc.
January 2002

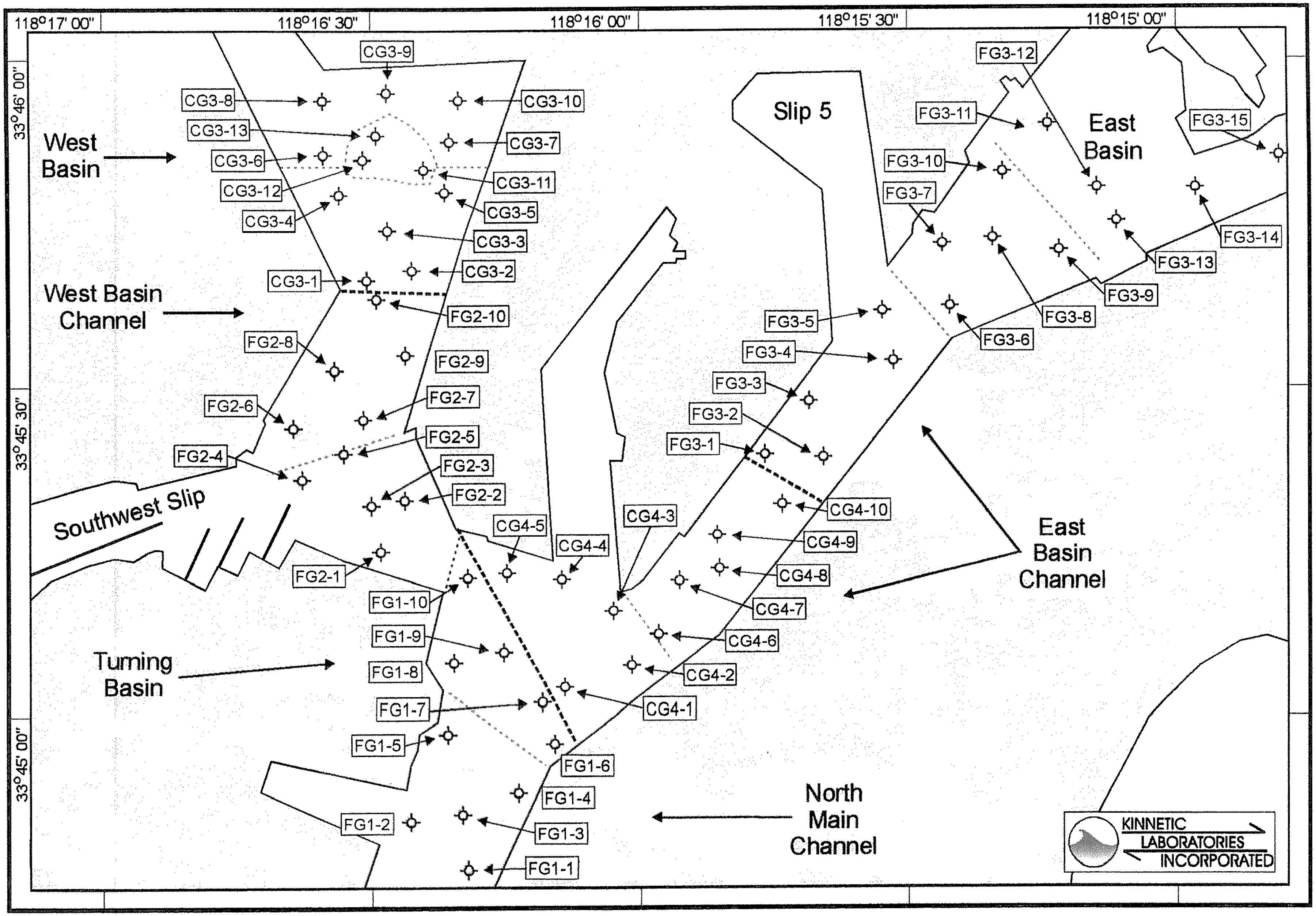


Figure 2. Vibracore Sampling Locations for the Port of Los Angeles Channel Deepening Program (Northern Extent of the Inner Harbor), April 1997.

Table 2. Bulk Sediment Chemistry Results: Borrow - 1996 / Channel Deepening - 1997 (Kinnetic Laboratories/ToxScan 1996; 1997). (page 1 of 2)

Analytical Parameter	BORROW 1996 CG-1A TOP	CG-1A BOT	CB-1B TOP	CG-1B BOT	CHANNEL DEEPENING PROJECT 1997* CG-2A TOP	CG-2A BOT	CG-2B TOP	CG-2B BOT	CG-2C BOT	CG-3A TOP	CG-3A BOT	CG-3B TOP	CG-3B BOT	CG-3C BOT
GRAIN SIZE (% dry)														
Sand/Gravel (>0.063 mm)	78.7	92.9	90.1	82.7	80.3	95.4	82.4	88.3	90.4	56.3	79.8	76.8	90.6	90.8
Silt (0.004 mm - 0.063 mm)	13.9	5.0	7.5	13.2	11.2	3.3	10.5	5.9	5.4	24.6	11.3	12.7	5.9	5.1
Clay (<0.004 mm)	7.4	2.1	2.6	4.1	8.5	1.3	7.1	5.8	4.2	19.1	8.8	10.5	3.5	4.1
SEDIMENT CONVENTIONALS														
Ammonia (mg/Kg)	10U	10U	10U	10U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfides (mg/Kg, dry)	13	0.1U	1.3	0.1U	37	0.10U	13	0.30	9.4	12	0.13	9.7	0.10	1.7
Total Volatile Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water soluble sulfides (mg/Kg, dry)	0.2	0.1U	0.1U	0.1U	0.39	0.10U	0.17	0.10U	0.60	0.18	0.10U	0.10U	0.10U	0.11
Oil and Grease (mg/Kg, dry)	100U	100U	100U	100U	250	100U	120	100U	100U	150	100U	270	100U	100
TRPH (mg/Kg, dry)	100U	100U	100U	100U	100U	100U	100U	100U	100U	100U	100U	100U	100U	100U
% Solids (%)	75	80	79	81	73	79	76	79	81	70	82	74	81	77
TOC (%)	0.3	0.1U	0.2	0.1U	0.37	0.10U	0.36	0.20	0.21	0.6	0.14	0.47	0.10U	0.21
METALS (mg/Kg, dry wt)														
Arsenic	2.3	1.6	0.7	0.4	4.1	1.3	6.4	3.5	3.9	4.1	4.0	0.87	2.0	0.71
Cadmium	0.2	0.1	0.1	0.1	0.26	0.10U	0.21	0.22	0.11	0.28	0.10U	0.27	0.10U	0.10U
Chromium	28	17	23	25	33	16	28	24	21	46	26	37	17	22
Copper	19	7.9	14	14	**36**	10	25	17	18	35	13	31	6.6	16
Lead	8.2	3.9	6.3	4.2	22	3.5	16	6.1	7.6	20	5.7	31	3.4	9.4
Mercury	0.07	0.04	0.09	0.06	**0.17**	0.10U	0.14	0.043	0.063	**0.15**	0.048	**0.16**	0.020U	0.050
Nickel	13	10	12	15	19	11	16	16	13	**27**	16	19	10	12
Selenium	0.1	0.1U	0.1U	0.1U	0.31	0.10U	0.19	0.10U	0.11	0.27	0.15	0.31	0.10	0.21
Silver	0.1U	0.1U	0.1U	0.1U	0.15	0.10U	0.12	0.10U	0.10U	0.13	0.10U	0.10U	0.10U	0.10U
Zinc	54	28	50	53	90	42	68	52	51	100	55	86	31	52
ORGANOTINS (ppb, dry weight)														
Dibutyltin	7	1.0U	4	1.0U	16	1.0U	5.6	1.5	6.7	9.4	1.0U	28	1.0U	11
Monobutyltin	3.0	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Tetrabutyltin	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Tributyltin	37	1.0U	6.0	1.0U	70	1.0U	19	2.1	28	20.0	1.9	64	1.0U	42
CHLORINATED PESTICIDES (ppb, dry weight)														
Aldrin	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U
alpha-BHC	0.33U	1.8	0.32U	0.91	4.0	0.31U	3.1	0.82	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U
beta-BHC	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U
delta-BHC	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	1.4	0.33U
gamma-BHC (lindane)	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U
alpha-Chlordane	3.3U	3.1U	3.2U	3.1U	3.4U	3.1U	3.3U	3.2U	3.1U	3.6U	3.0U	3.4U	3.1U	3.3U
gamma-Chlordane	3.3U	3.1U	3.2U	3.1U	3.4U	3.1U	3.3U	3.2U	3.1U	3.6U	3.0U	3.4U	3.1U	3.3U
4,4'-DDD	0.72	0.31U	0.67	0.31U	4.7	0.31U	1.4	0.32U	0.58	1.8	0.30U	0.34U	0.31U	0.72
4,4'-DDE	**24**	0.31	**15**	0.46	**36**	0.31U	**16**	**2.7**	**9.2**	**9.8**	0.52	**34**	0.31U	**6.9**
4,4'-DDT	0.33U	0.31U	0.32U	0.31U	5.9	0.31U	2.2	0.32U	0.69	0.81	0.30U	0.34U	0.31U	4.4
Total DDTs	**24.72**	0.31	**15.67**	0.46	**46.6**	0.31U	**19.6**	**2.7**	**10.5**	**12.4**	0.52	**34**	0.31U	**12.0**

Analytical Parameter	CG-4A TOP	CG-4A BOT	CG-4B TOP	CG-4B BOT	FG1A	FG1B	FG2A	FG2B	FG3A	FG3B	FG3C	FM1A	FM1B	FM1-2	FM1-8
GRAIN SIZE (% dry)															
Sand/Gravel (>0.063 mm)	78.3	81.3	90.6	77.8	36.9	48.6	55.5	40.7	30.5	38.0	33.7	23.1	50.1	36.8	46.4
Silt (0.004 mm - 0.063 mm)	13.2	11.8	6.4	15.0	35.3	30.2	28.3	36.8	48.1	41.7	47.3	47.1	29.7	38.0	27.6
Clay (<0.004 mm)	8.5	6.9	3.0	7.2	27.8	21.1	16.1	22.5	21.4	20.3	19.0	29.8	20.1	25.2	26.0
SEDIMENT CONVENTIONALS															
Ammonia (mg/Kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfides (mg/Kg, dry)	23	2.9	0.10U	1.1	27	10	2.5	0.52	33	7.7	20	11	130	0.10U	0.38
Total Volatile Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water soluble sulfides (mg/Kg, dry)	0.18	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.28	0.12	0.11	0.10U	0.10U	0.10U
Oil and Grease (mg/Kg, dry)	190	260	100U	100U	170	230	100U	310	750	760	560	140	350	110	100U
TRPH (mg/Kg, dry)	100U	100U	100U	100U	110	100U	100U	150	380	420	300	100U	170	100U	100U
% Solids (%)	78	79	77	81	70	72	77	70	70	71	69	55	54	62	47
TOC (%)	0.36	0.26	0.10U	0.10U	0.94	0.45	0.34	0.45	0.70	0.56	0.52	1.7	1.3	1.2	1.4
METALS (mg/Kg, dry wt)															
Arsenic	0.80	0.79	0.78	1.3	0.79	0.52	1.6	0.55	0.57	0.95	1.8	4.7	**8.7**	3.1	4.8
Cadmium	0.19	0.21	0.10U	0.31	0.46	0.64	0.26	0.27	0.50	0.64	0.17	**1.9**	**1.7**	**1.9**	**13**
Chromium	33	32	27	35	39	42	26	35	46	44	51	**86**	78	**110**	**140**
Copper	29	27	13	25	**35**	31	21	28	**45**	**43**	**48**	**71**	**73**	75	78
Lead	17	20	4.5	8.6	19	21	11	19	41	40	24	21	40	8.0	6.2
Mercury	0.11	**0.17**	0.035	0.052	**0.19**	**0.20**	0.12	**0.20**	**0.37**	**0.35**	**0.25**	**0.23**	**0.36**	0.11	0.099
Nickel	18	17	16	**23**	**24**	**25**	16	**21**	**25**	**26**	**39**	**55**	**41**	**95**	**110**
Selenium	0.13	0.18	0.19	0.19	1.7	1.2	0.22	0.93	0.39	1.1	1.3	7.0	2.8	11	17
Silver	0.10U	0.10U	0.10U	0.10U	0.10	0.11	0.10U	0.10U	0.18	0.21	0.10	0.70	0.64	0.80	**1.5**
Zinc	78	78	54	77	87	79	55	75	110	110	94	140	**150**	**200**	**180**
ORGANOTINS (ppb, dry weight)															
Dibutyltin	19	12	1.0U	1.0U	13	18	8.5	9.7	35	14	23	8.7	29	1.0U	1.0U
Monobutyltin	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Tetrabutyltin	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
Tributyltin	55	31	1.0U	1.0U	27	40	19	15	75	17	26	38	120	1.0U	1.0U
CHLORINATED PESTICIDES (ppb, dry weight)															
Aldrin	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
alpha-BHC	0.32U	0.32U	0.32U	0.31U	4.7	3.7	1.4	5.1	11	2.2	3.2	1.4	2.0	0.40U	0.53U
beta-BHC	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
delta-BHC	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
gamma-BHC (lindane)	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
alpha-Chlordane	3.2U	3.2U	3.2U	3.1U	3.6U	3.5U	3.3U	3.6U	3.6U	3.5U	3.6U	4.5U	4.6U	4.0U	5.3U
gamma-Chlordane	3.2U	3.2U	3.2U	3.1U	3.6U	3.5U	3.3U	3.6U	3.6U	3.5U	3.6U	4.5U	4.6U	4.0U	5.3U
4,4'-DDD	**5.9**	3.5	1.1	0.31U	3.0	3.9	1.3	1.3	12	5.1	5.6	5.8	6.6	0.40U	0.53U
4,4'-DDE	**27**	**14**	**23**	0.48	**30**	**29**	**6.9**	**21**	**34**	**14**	**20**	**130**	**170**	0.40U	0.53U
4,4'-DDT	4.7	1.4	0.40	0.31U	2.6	3.2	0.54	0.36U	10	2.1	1.0	0.98	0.98	0.40U	1.0
Total DDTs	**37.6**	**18.9**	**24.5**	0.48	**35.6**	**36.1**	**8.7**	**22.3**	**56**	**21.2**	**26.6**	**137**	**178**	0.40U	1.0

Bold values equal or exceed the ERL

Bold and underlined values equal or exceed the ERM

"U" Qualifier denotes analyte not detected at method detection limit

" U* " Qualifier denotes reporting limit raised due to matrix interference

* Individual core results are available in September 1997 report " Environmental Evaluation of Sediments for the Channel Deepening Program Port of Los Angeles - Vol 1"

Table 2. Bulk Sediment Chemistry Results: Borrow - 1996 / Channel Deepening - 1997 (Kinnetic Laboratories/ToxScan 1996; 1997). (page 2 of 2)

	BORROW 1996				CHANNEL DEEPENING PROJECT 1997*																								
Analytical Parameter	CG-1A TOP	CG-1A BOT	CG-1B TOP	CG-1B BOT	CG-2A TOP	CG-2A BOT	CG-2B TOP	CG-2B BOT	CG-2C BOT	CG-3A TOP	CG-3A BOT	CG-3B TOP	CG-3B BOT	CG-3C BOT	CG-4A TOP	CG-4A BOT	CG-4B TOP	CG-4B BOT	FG1A	FG1B	FG2A	FG2B	FG3A	FG3B	FG3C	FM1A	FM1B	FM1-2	FM1-8
CHLORINATED PESTICIDES (Continued)																													
Dieldrin	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.37	0.37	0.33U	0.36U	1.7	0.45	0.36U	0.45U	0.46U	0.40U	0.53U
Endosulfan I	1.3U	1.3U	1.3U	1.2U	1.4U	1.3U	1.3U	1.3U	1.2U	1.4U	1.2U	1.4U	1.2U	1.3U	1.3U	1.3U	1.3U	1.2U	1.4U	1.4U	1.3U	1.4U	1.4U	1.4U	1.4U	1.8U	1.8U	1.6U	2.1U
Endosulfan II	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Endosulfan sulfate	6.7U	6.3U	6.3U	6.2U	6.9U	6.3U	6.6U	6.4U	6.2U	7.1U	6.1U	6.8U	6.2U	6.5U	6.4U	6.3U	6.5U	6.2U	7.1U	6.9U	6.5U	7.1U	7.1U	7.0U	7.2U	9.1U	9.2U	8.1U	11U
Endrin	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.59	2.1	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Endrin Aldehyde	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Endrin Ketone	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	2.2	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Heptachlor	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Heptachlor epoxide	0.33U	0.31U	0.32U	0.31U	0.34U	0.31U	0.33U	0.32U	0.31U	0.36U	0.30U	0.34U	0.31U	0.33U	0.32U	0.32U	0.32U	0.31U	0.36U	0.35U	0.33U	0.36U	0.36U	0.35U	0.36U	0.45U	0.46U	0.40U	0.53U
Toxaphene	20U	19U	19U	18U	21U	19U	20U	19U	19U	21U	18U	20U	18U	20U	19U	19U	19U	19U	21U	21U	20U	21U	21U	21U	22U	27U	28U	24U	32U
Methoxychor	6.7U	6.3U	6.3U	6.2U	6.9U	6.3U	6.6U	6.4U	6.2U	7.1U	6.1U	6.8U	6.2U	6.5U	6.4U	6.3U	6.5U	6.2U	7.1U	6.9U	6.5U	7.1U	7.1U	7.0U	7.2U	9.1U	9.2U	8.1U	11U
PCBs (ppb, dry weight)																													
PCB 1242	13U	13U	13U	12U	14U	13U	13U	13U	12U	14U	12U	14U	12U	13U	13U	13U	13U	12U	14U	14U	13U	14U	14U	14U	14U	18U	18U	16U	21U
PCB 1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 1254	13U	13U	13U	12U	64	13U	24	13U	12U	65	12U	180	12U	33	60	47	79	12U	50	53	26	130	100	42	46	65	130	16U	21U
PCB 1260	13U	13U	13U	12U	14U	13U	13U	13U	12U	14U	12U	14U	12U	13U	13U	13U	13U	12U	14U	14U	13U	14U	14U	14U	14U	18U	18U	16U	21U
Total PCBs	13U	13U	13U	12U	**64**	13U	**24**	13U	12U	**65**	12U	**<u>180</u>**	12U	**33**	**60**	**47**	**79**	12U	**50**	**53**	**26**	**130**	**100**	**42**	**46**	**65**	**130**	16U	21U
SEMI-VOLATILES (ppb, dry wt)																													
Naphthalene	10U	9.4U	9.5U	9.2U	10U	9.4U	9.8U	9.6U	9.3U	11U	9.1U	10	9.2U	9.8U	9.6U	9.5U	9.7U	9.3U	11U	10U	9.8U	11U	11U	11U	11U	14U	14U	12U	16U
Acenaphthylene	10U	9.4U	9.5U	9.2U	10U	9.4U	9.8U	9.6U	9.3U	11U	9.1U	18	9.2U	9.8U	11	9.5U	9.7U	9.3U	11U	17	9.8U	11U	26	14	12	14U	22	12U	16U
Acenaphthene	10U	9.4U	9.5U	9.2U	10U	9.4U	9.8U	9.6U	9.3U	11U	9.1U	13	9.2U	9.8U	9.6U	9.5U	9.7U	9.3U	11U	10U	9.8U	11U	11U	11U	11U	14U	14U	12U	16U
Fluorene	10U	9.4U	9.5U	9.2U	10U	9.4U	9.8U	9.6U	9.3U	11U	9.1U	18	9.2U	9.8U	9.6U	9.5U	9.7U	9.3U	11U	10U	9.8U	11U	11U	11U	11U	14U	14U	12U	16U
Phenanthrene	12	9.4U	9.5U	9.2U	25	9.4U	24	9.6U	9.3U	11	9.1U	37	9.2U	9.8U	18	15	9.7U	9.3U	16	25	26	11U	54	25	67	24	46	12U	16U
Anthracene	10U	9.4U	9.5U	9.2U	32	9.4U	11	9.6U	9.3U	20	9.1U	65	9.2U	12	29	15	9.7U	9.3U	20	36	26	21	53	53	38	20	46	12U	16U
Fluoranthene	21	9.4U	19	9.2U	80	9.4U	41	9.6U	12	14	9.1U	470	9.2U	17	35	19	9.7U	9.3U	30	43	29	21	76	53	81	45	85	12U	16U
Pyrene	39	9.4U	21	17	130	9.4U	58	9.6U	22	43	9.1U	**1500**	9.2U	38	56	29	11	9.3U	58	97	41	69	190	410	110	73	110	12U	34
Benzo(a)anthracene	19	9.4U	12	9.2U	47	9.4U	18	9.6U	12	13	9.1U	220	9.2U	13	28	18	9.7U	9.3U	27	37	24	17	67	170	58	38	68	12U	16U
Chrysene	32	9.4U	30	9.2U	84	9.4U	34	9.6U	26	24	9.1U	240	9.2U	27	64	33	12	9.3U	47	72	47	39	120	310	80	51	96	12U	16U
Benzo(b)fluoranthene	45	9.4U	44	9.2U	190	9.4U	71	12	51	120	9.1U	450	9.2U	94	220	96	36	9.3U	130	210	160	110	260	170	230	110	200	12U	16U
Benzo(k)fluoranthene	44	9.4U	42	9.2U	180	9.4U	63	9.7	45	100	9.1U	350	9.2U	74	200	81	30	9.3U	100	180	120	84	240	140	190	85	180	12U	16U
Benzo(a)pyrene	40	9.4U	34	9.2U	140	9.4U	56	11	35	92	9.1U	320	9.2U	74	140	80	34	9.3U	87	150	82	90	230	200	170	96	150	12U	16U
Indeno[1,2,3-CD]pyrene	19	13U	19U*	12U	88	13U	34	13U	20	45	12U	200	12U	47	130	58	25	12U	51	90	60	44	130	86	110	18U	90	16U	21U
Dibenzo(a,h)anthracene	13U	13U	13U	12U	23	13U	13U	13U	12U	16	12U	64	12U	13U	38	13U	13U	12U	14U	14U	18	16	44	45	36	18U	28	16U	21U
Benzo[ghi]perylene	20U*	13U	19U*	12U	75	13U	33	13U	17	38	12U	120	12U	44	110	57	13U	12U	50	80	55	47	130	110	120	51	28	16U	21U
Benzo(e)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total detectable PAHs	270	9.4-13U	9.5-19U	9.2-12U	1100	9.4-13U	440	33	240	540	9.1-12U	**4100**	9.2-12U	440	1100	500	150	9.3-12U	620	1000	690	560	1600	1800	1300	590	1100	12-16U	34
Total Phthalates	10U	9.4U	9.5U	9.2U	390	52	410	80	200	250	130	470	220	310	560	470	230	130	250	840	280	250	1000	640	690	620	710	300	470
Total Phenols	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Bold values equal or exceed the ERL.

Bold and underlined values equal or exceed the ERM.

"U" Qualifier denotes analyte not detected at method detection limit

" U* " Qualifier denotes reporting limit raised due to matrix interference

* Individual core results are available in September 1997 report " Environmental Evaluation of Sediments for the Channel Deepening Program Port of Los Angeles - Vol. 1"

Table 3. Elutriate Chemistry Results: Port of Los Angeles 2001 Deepening Project (Kinnetic Laboratories/ToxScan 1996; 1997). (Page 1 of 2)

Analytical Parameter	BORROW 1996					CHANNEL DEEPENING PROJECT 1997*																
	CG-1A TOP	CG-1A BOT	CG-1B TOP	CG-1B BOT	Harbor Water	CG-2A TOP	CG-2A BOT	CG-2B TOP	CG-2B BOT	CG-2C BOT	CG-3A TOP	CG-3A BOT	CG-3B TOP	CG-3B BOT	CG-3C BOT	CG-4A TOP	CG-4A BOT	CG-4B TOP	CG-4B BOT	Harbor Water	WQS Salt Water Max EPA 2000	WQS Salt Water Cont EPA 2000
CONVENTIONALS																						
Ammonia (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Water soluble sulfides (mg/L)	0.5U	0.5U	0.5U	0.5U	0.5U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U		
Oil and Grease (mg/L)	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U		
METALS (µg/L, wet wt)																						
Arsenic	3.0	1.5	4.2	1.6	2.3	9.4	1.2	5.6	3.7	2.1	10	3.6	6.8	1.8	3.1	6.0	2.1	8.5	4.0	6.8	69	36
Cadmium	0.07	0.17	0.07	0.15	0.07	0.29	0.18	0.24	0.40	0.22	0.35	0.31	0.38	0.31	0.16	0.22	0.21	0.26	0.33	0.19	42	9.3
Chromium	0.5U	0.5U	0.5U	0.5U	0.5U	20	21	57	20	20	20	20	28	18	18	18	21	23	21	21	1100	50
Copper	1.2	3.8	14	7.9	9.9	2.1	3.4	1.8	1.9	1.7	1.5	2.1	1.6	2.6	1.5	1.1	2.2	1.1	1.7	5.2	4.8	3.1
Lead	0.7	0.1	0.4	0.5	0.4	0.67	0.43	0.67	0.51	0.71	0.57	0.32	0.70	0.52	0.58	0.42	0.28	0.49	0.39	0.53	210	8.1
Mercury	0.1U	0.1U	0.1U	0.1U	0.1	0.10U	0.10U	0.14	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.16(a)	0.04 (b)
Nickel	1.7	4.5	60	5.8	5.2	3.4	2.5	2.0	2.7	2.0	1.5	3.3	1.7	2.9	1.2	1.3	5.0	1.3	4.5	2.0	74.0	8.2
Selenium	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	290	71
Silver	0.19	0.06	0.08	0.13	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.06	0.05U	1.90	
Zinc	4.2	12	9.6	5.6	9.7	6.8	26	11	9.2	9.3	13	6.8	5.0	3.6	4.2	3.0	10	3.5	8.0	10	90	81
ORGANOTINS (ppt (ng/L) wet weight)																						
Dibutyltin	2.0U	17	2	8	21	2.0U	44	2.0U	2.0U	2.3	2.0U	3.8	2.0U	2.0U	2.0U	2.0U	6.2	2.0U	14	30		
Monobutyltin	2.0U	2.0U	2.0U	5	3	2.0U	2.3	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.8	2.0U	2.3	3.7		
Tetrabutyltin	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U		
Tributyltin	2.0U	2.0U	2.0U	2.0U	4	4.0	4.6	7.4	4.2	4.2	2.0U	2.0U	3.6	2.0U	2.0U	2.4	2.0U	2.0U	2.0U	7.5		
CHLORINATED PESTICIDES (ppb, wet weight)																						
Aldrin	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	1.3	
alpha-BHC	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
beta-BHC	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
delta-BHC	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
gamma-BHC (lindane)	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.16	
alpha-Chlordane	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.09	0.004
gamma-Chlordane	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.09	0.004
4,4'-DDD	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
4,4'-DDE	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
4,4'-DDT	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.13	0.001
Total DDTs	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		

a. Mercury values not established under the California Toxics Rule. Value is the daily maximum from the 1997 Ocean Plan.

"U" Qualifier denotes analyte not detected at method detection limit

b. Mercury values not established under the California Toxics Rule. Value is the 6-month median from the 1997 Ocean Plan.

Bolded values equal or exceed the maximun 4 day average Water Quality Standard

Bolded and underlined values exceed the maximum 1 hour average Water Quality Standard

* Individual core results are available in September 1997 report " Environmental Evaluation of Sediments for the Channel Deepening Program Port of Los Angeles - Vol. 1"

Table 3. Elutriate Chemistry Results: Port of Los Angeles 2001 Deepening Project (Kinnetic Laboratories/ToxScan 1996;1997). (Page 2 of 2)

Analytical Parameter	BORROW 1996					CHANNEL DEEPENING PROJECT 1997*																
	CG-1A TOP	CG-1A BOT	CG-1B TOP	CG-1B BOT	Harbor Water	CG-2A TOP	CG-2A BOT	CG-2B TOP	CG-2B BOT	CG-2C BOT	CG-3A TOP	CG-3A BOT	CG-3B TOP	CG-3B BOT	CG-3C BOT	CG-4A TOP	CG-4A BOT	CG-4B TOP	CG-4B BOT	Harbor Water	WQS Salt Water Max EPA 2000	WQS Salt Water Cont EPA 2000
CHLORINATED PESTICIDES (Continued)																						
Dieldrin	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.71	0.0019
Endosulfan I	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.034	0.0087
Endosulfan II	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.034	0.0087
Endosulfan sulfate	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U		
Endrin	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.037	0.0023
Endrin Aldehyde	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
Endrin Ketone	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
Heptachlor	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
Heptachlor epoxide	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U		
Toxaphene	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U	0.15U		
Methoxychor	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U		
PCBs (ppb, wet weight)																						
PCB 1242	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U		
PCB 1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
PCB 1254	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U		
PCB 1260	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U		
Total PCBs	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U	0.10U		0.03
SEMI-VOLATILES (ppb, wet wt)																						
Naphthalene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Acenaphthylene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Acenaphthene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Fluorene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Phenanthrene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Anthracene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Fluoranthene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Pyrene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Benzo(a)anthracene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Chrysene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Benzo(b)fluoranthene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Benzo(k)fluoranthene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Benzo(a)pyrene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Indeno[1,2,3-CD]pyrene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Dibenzo(a,h)anthracene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Benzo[ghi]perylene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		
Total detectable PAHs	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U		15
Total Phenols	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		

Bolded values equal or exceed the maximun 4 day average Water Quality Standard

Bolded and underlined values exceed the maximum 1 hour average Water Quality Standard

* Individual core results are available in September 1997 report " Environmental Evaluation of Sediments for the Channel Deepening Program Port of Los Angeles - Vol. 1"

"U" Qualifier denotes analyte not detected at method detection limit

" U* " Qualifier denotes reporting limit raised due to matrix interference

POLA Channel Deepening Project Water Quality Monitoring Results

Dredge Monitoring Data
Location: West Basin
Dredge: *H.R. Morris*
Date: 18 June 2003
Time: 1050
Station: A (30 yards upcurrent)
Maximum Water Depth (m): 14

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	1	46	7.4	17.8	7.6
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	2	35	7.4	17.4	7.5
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	3	21	7.4	17.3	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	4	15	7.4	17.3	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	5	10	7.4	17.2	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	6	9	7.4	17.1	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	7	10	7.4	17.1	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	8	10	7.4	17.1	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	9	13	7.4	17.0	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	10	13	7.4	17.0	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	11	11	7.4	17.0	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	12	11	7.4	16.9	7.4
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	13	11	7.3	16.9	7.7
18-Jun-03	1050	1,737,201	6,477,625	Dredge	West Basin	*H.R. Morris*	A (30 yards upcurrent)	14	14	11	7.3	16.8	7.9

Dredge Monitoring Data
Location: West Basin
Dredge: *H.R. Morris*
Date: 18 June 2003
Time: 1052
Station: B (30 yards downcurrent)
Maximum Water Depth (m): 16

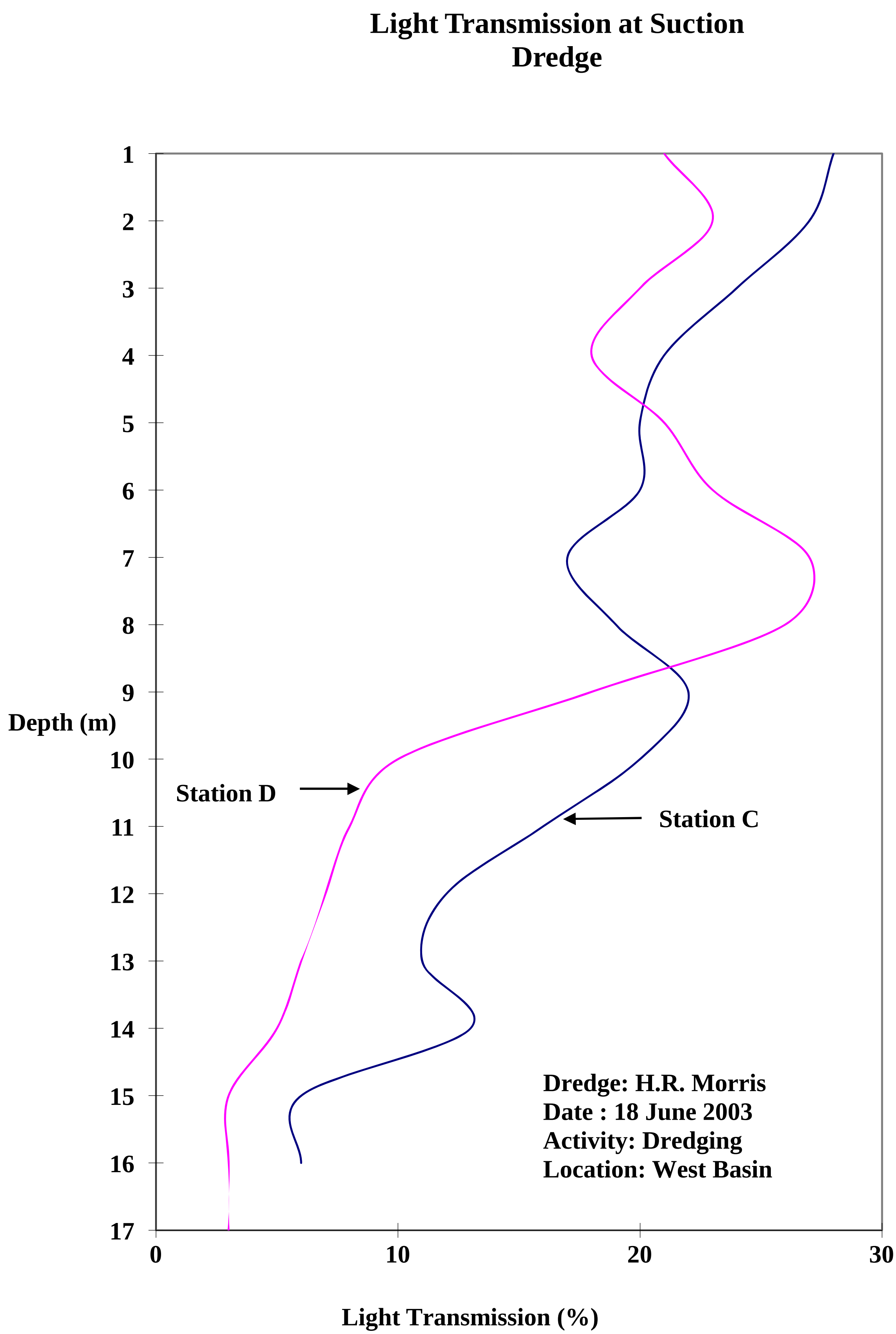
Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	1	29	7.7	17.5	7.8
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	2	22	7.7	17.3	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	3	21	7.7	17.2	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	4	22	7.7	17.2	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	5	20	7.7	17.1	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	6	19	7.7	17.1	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	7	19	7.7	17.1	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	8	17	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	9	17	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	10	15	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	11	12	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	12	12	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	13	11	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	14	5	7.7	17.0	7.9
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	15	3	7.7	17.0	7.8
18-Jun-03	1052	1,736,732	6,477,753	Dredge	West Basin	*H.R. Morris*	B (30 yards down current)	16	16	3	7.6	16.9	8.4

Dredge Monitoring Data
Location: West Basin
Dredge: *H.R. Morris*
Date: 18 June 2003
Time: 1056
Station: C (100 yards down current)
Maximum Water Depth (m): 16

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	1	28	7.9	17.3	7.8
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	2	27	7.9	17.2	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	3	24	7.9	17.2	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	4	21	7.9	17.2	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	5	20	7.9	17.1	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	6	20	7.9	17.1	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	7	17	7.9	17.0	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	8	19	7.9	17.0	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	9	22	7.9	16.9	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	10	20	7.9	16.9	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	11	16	7.9	16.9	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	12	12	7.9	16.8	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	13	11	7.9	16.8	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	14	13	7.9	16.8	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	15	6	7.9	16.8	7.9
18-Jun-03	1056	1,736,354	6,477,839	Dredge	West Basin	*H.R. Morris*	C (100 yards down current)	16	16	6	7.9	16.8	7.9

Dredge Monitoring Data
Location: West Basin
Dredge: *H.R. Morris*
Date: 18 June 2003
Time: 1100
Station: D (control)
Maximum Water Depth (m): 17

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	1	21	8.0	17.3	7.8
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	2	23	8.0	17.2	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	3	20	8.0	17.1	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	4	18	8.0	17.1	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	5	21	8.0	17.0	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	6	23	8.0	17.0	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	7	27	8.0	16.9	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	8	26	8.0	16.9	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	9	18	8.0	16.8	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	10	10	8.0	16.8	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	11	8	8.0	16.8	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	12	7	8.0	16.8	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	13	6	8.0	16.8	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	14	5	8.0	16.7	7.9
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	15	3	8.0	16.6	8.0
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	16	3	8.0	16.5	8.0
18-Jun-03	1100	1,735,559	6,477,994	Dredge	West Basin	*H.R. Morris*	D (control)	17	17	3	8.0	16.5	8.0



Light Transmission at Suction
Dredge
Depth (m)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
0
10
20
30
Light Transmission (%)
Station D
Station C
Dredge: H.R. Morris
Date : 18 June 2003
Activity: Dredging
Location: West Basin

Dredge Monitoring Data
Location: Southwest Slip
Dredge: *H.R. Norris*
Date: 18 June 2003
Time: 1132
Station: B (30 yards downcurrent)
Maximum Water Depth (m): 7

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	1	10	7.8	17.5	7.8
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	2	8	7.8	17.5	7.7
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	3	10	7.8	17.5	7.7
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	4	9	7.7	17.4	7.7
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	5	6	7.7	17.4	7.7
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	6	5	7.7	17.4	7.7
18-Jun-03	1132	1,733,230	6,476,274	Fill	Southwest Slip	*H.R Norris*	B (30 yards down current)	7	7	3	7.7	17.4	7.7

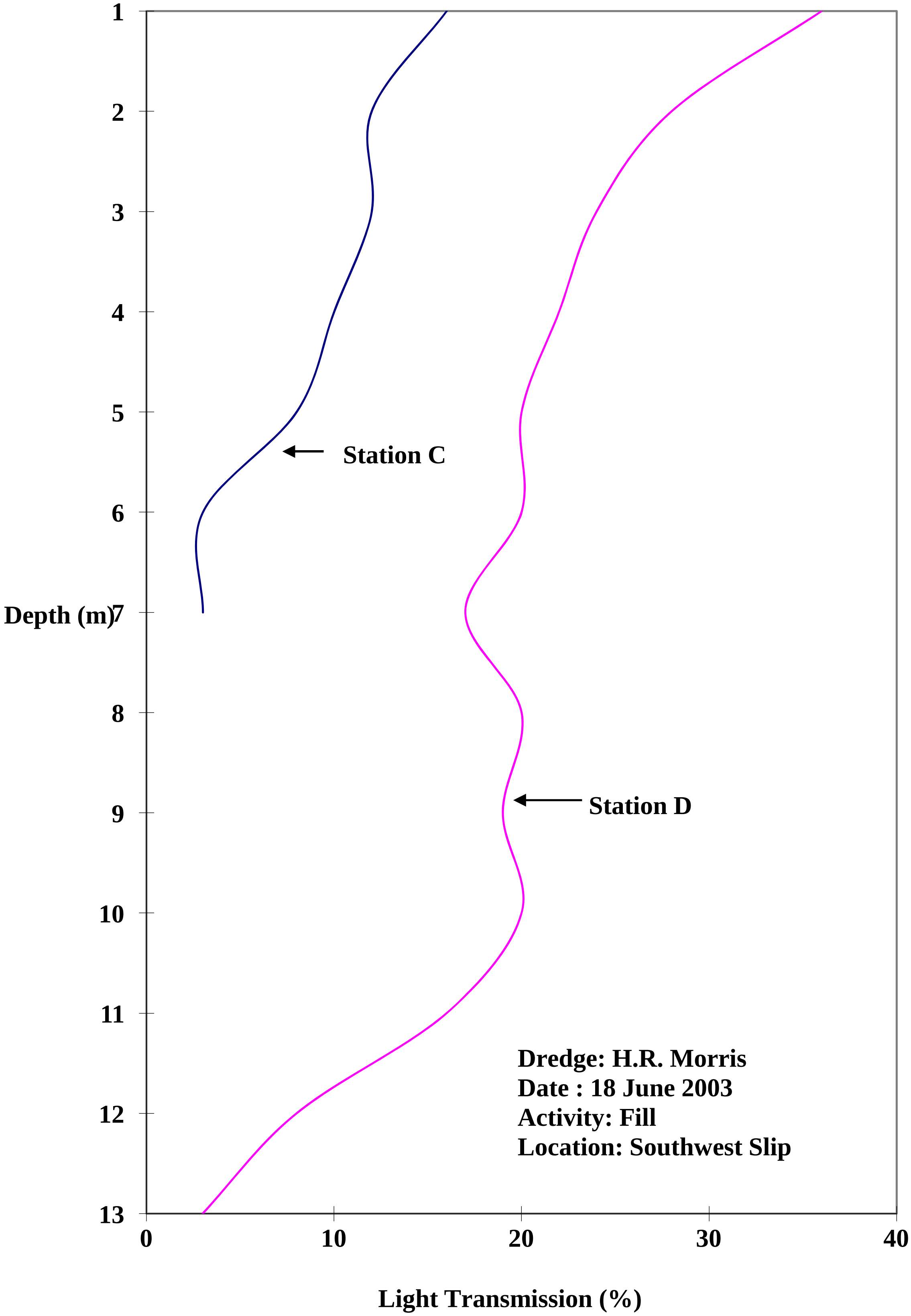
Dredge Monitoring Data
Location: Southwest Slip
Dredge: *H.R. Norris*
Date: 18 June 2003
Time: 1134
Station: C (100 yards down current)
Maximum Water Depth (m): 7

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	1	16	7.8	17.5	7.9
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	2	12	7.8	17.5	7.9
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	3	12	7.8	17.5	7.9
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	4	10	7.8	17.5	7.9
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	5	8	7.8	17.4	7.9
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	6	3	7.8	17.4	7.8
18-Jun-03	1134	1,733,373	6,476,492	Fill	Southwest Slip	*H.R. Norris*	C (100 yards down current)	7	7	3	7.8	17.4	7.8

Dredge Monitoring Data
Location: Southwest Slip
Dredge: *H.R. Morris*
Date: 18 June 2003
Time: 1140
Station: D (control)
Maximum Water Depth (m): 13

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	1	36	7.9	17.3	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	2	28	7.9	17.2	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	3	24	7.9	17.2	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	4	22	7.9	17.2	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	5	20	7.9	17.1	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	6	20	7.9	17.1	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	7	17	7.9	17.0	7.8
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	8	20	7.9	17.0	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	9	19	7.9	16.9	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	10	20	7.9	16.9	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	11	16	7.9	16.9	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	12	8	7.9	16.8	7.9
18-Jun-03	1140	1,733,706	6,476,829	Fill	Southwest Slip	*H.R. Morris*	D (control)	13	13	3	7.9	16.8	7.9

Light Transmission at Fill Location

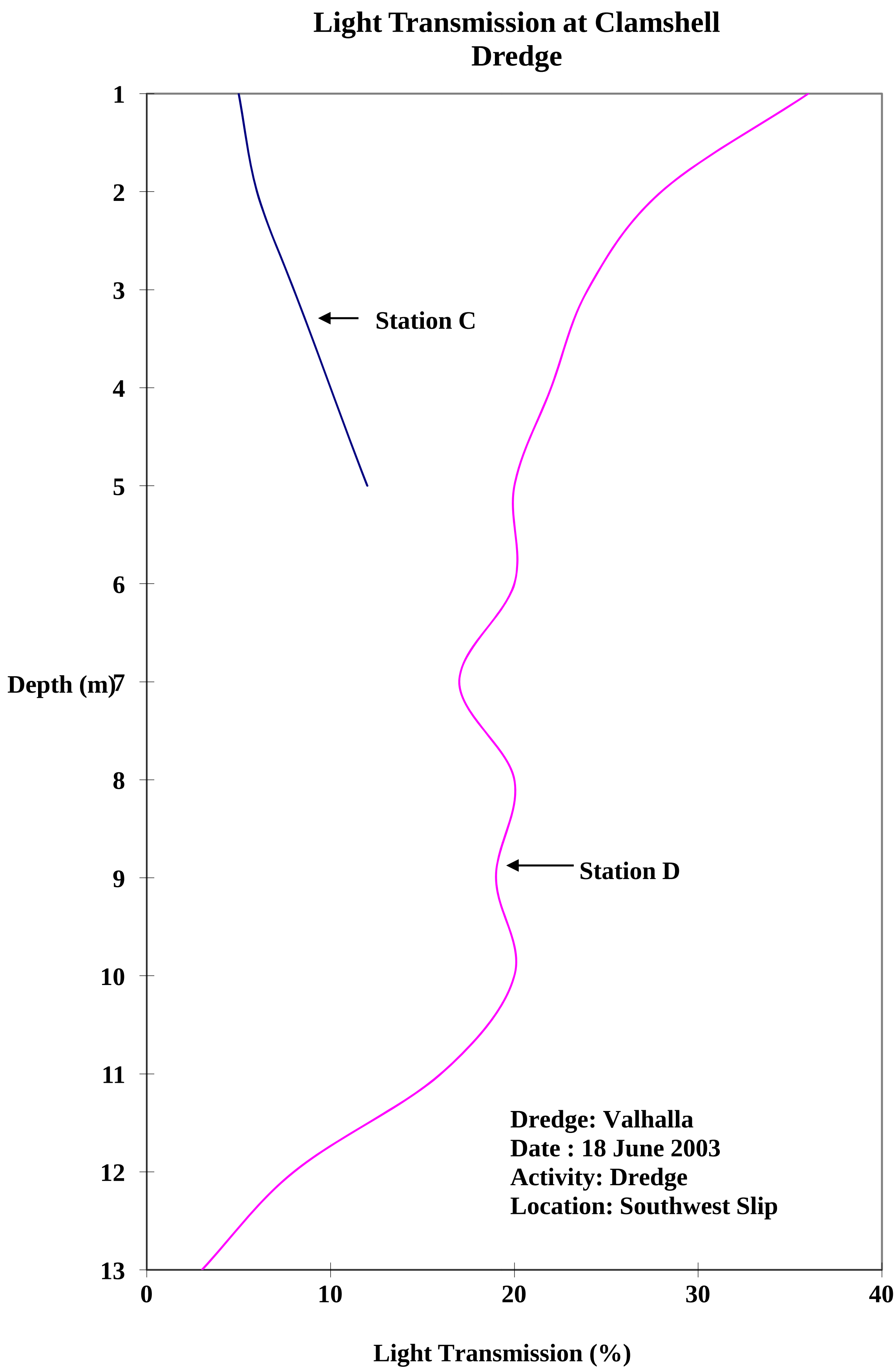


Dredge Monitoring Data
Location: Southwest Slip
Dredge: *Valhalla*
Date: 18 June 2003
Time: 1120
Station: B (30 yards downcurrent)
Maximum Water Depth (m): 6

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	1	3	8.1	17.9	7.8
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	2	5	8.0	17.5	7.8
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	3	3	8.0	17.6	7.8
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	4	3	8.0	17.6	7.8
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	5	3	8.0	17.7	7.8
18-Jun-03	1120	1,733,071	6,475,118	Dredge	Southwest Slip	*Valhalla*	B (30 yards down current)	6	6	16	8.0	17.8	7.9

Dredge Monitoring Data
Location: Southwest Slip
Dredge: *Valhalla*
Date: 18 June 2003
Time: 1110
Station: C (100 yards down current)
Maximum Water Depth (m): 5

Date	Time	Position Northing	Position Easting	Dredge or Fill	Dredge/Fill Location	Dredge	Monitoring Station	Maximum Water Depth (m)	Depth (m)	Light Transmission (%)	pH	Temperature (deg C)	Oxygen (mg/L)
18-Jun-03	1110	1,733,076	6,475,342	Dredge	Southwest Slip	*Valhalla*	C (100 yards down current)	5	1	5	8.1	17.9	7.8
18-Jun-03	1110	1,733,076	6,475,342	Dredge	Southwest Slip	*Valhalla*	C (100 yards down current)	5	2	6	8.0	17.5	7.8
18-Jun-03	1110	1,733,076	6,475,342	Dredge	Southwest Slip	*Valhalla*	C (100 yards down current)	5	3	8	8.0	17.6	7.8
18-Jun-03	1110	1,733,076	6,475,342	Dredge	Southwest Slip	*Valhalla*	C (100 yards down current)	5	4	10	8.0	17.6	7.8
18-Jun-03	1110	1,733,076	6,475,342	Dredge	Southwest Slip	*Valhalla*	C (100 yards down current)	5	5	12	8.0	17.7	7.8


Light Transmission at Clamshell Dredge
1
2
3
4
5
6
Depth (m)
7
8
9
10
11
12
13
Station C
Station D
Dredge: Valhalla
Date : 18 June 2003
Activity: Dredge
Location: Southwest Slip
0
10
20
30
40
Light Transmission (%)

Los Angeles Channel Deepening Project

Weekly Water Quality Monitoring Progress Report

Los Angeles Channel Deepening Project
Weekly Water Quality Monitoring Progress Report
18 June 2003

CONSTRUCTION WATER QUALITY MONITORING

Mr. Geoff Daly of AMEC Earth & Environmental undertook construction monitoring conducted according to the monitoring work plan in the Los Angeles Harbor on Wednesday, 18 June 2003. Monitoring efforts included the dredging operations the West Basin and Southwest Slip and fill operation at the Southwest Slip area. Monitoring was undertaken from the Manson survey vessel *Renegade* from approximately 1000 to 1430 hours. The tide was flooding from a low tide of -0.7 feet at 0735 hours to a high of +3.9 feet at 1439 hours during the time of sampling. The current was headed in the southeasterly direction because of the northwest winds during the dredge and fill monitoring. The headwaters of the basin were turbid.

A Seabird SBE-19 equipped with a YSI oxygen sensor, Wetstar light transmittance sensor, and pH, temperature and pressure sensors was used to characterize the water column. Maximum depth was recorded using a weighted measuring tape. The Manson surveyor aboard the *Renegade* recorded station location data.

Midwater grab samples were collected preemptively at Station C for both dredge and fill construction activities using a van Dorn bottle for TSS analysis to meet the sampling requirements outlined in the Water Quality Monitoring Plan. Samples were submitted to Calscience Laboratory for analysis.

Dredge Monitoring
The clamshell dredge *Valhalla* was actively dredging in the Southwest Slip area during monitoring activities. The *Valhalla* was 'stacking' material from within the fill area onto the interior face of the existing dike. A turbidity plume trailed downcurrent of the dredge. Dredge monitoring at Station A was not conducted due to shallow waters. Station B data was collected approximately 30 yards downcurrent of the *Valhalla* and in the turbidity plume. Monitoring at Station C was conducted 100 yards downcurrent of the operating dredge. Due to commingling of turbidity plumes from Valhalla operations and the weir pipe discharge, a single Station D was designated south of Berth 119.

The suction dredge *H.R. Morris* was actively dredging south of Berth 136 in the West Basin during monitoring activities. A surface turbidity plume was not visible downcurrent of the dredge. Dredge monitoring at Station A was conducted 30 yards upcurrent of the *H.R. Morris* to the north of the operation. Station B data was collected approximately 30 yards downcurrent of the *H.R. Morris*. Monitoring at Station C was conducted 100 yards downcurrent of the operating dredge. Station D was collected to the southwest of the *H.R. Morris* near Berth 126.

Fill Monitoring
Dredged material from the suction dredge *H.R. Morris* was continuously being disposed of via pipeline at the Southwest Slip area inside of the dike. Two weir pipes were discharging outside of the dike. Monitoring at Station A was not conducted. Station B

data was collected approximately 30 yards northeast of the weir pipes and close to the turbidity plume. Monitoring at Station C was conducted 100 yards northeast of the spill pipes. Station D was collected near Berth 119 as described above.

Monitoring data is included in nine attached tables. Figures comparing respective Station C and D transmissivity data for the dredging and disposal operations are also included. Light transmittance at the dredging (*Valhalla* and *H.R. Morris*) and disposal (spill pipes) sites were assessed for the degree of reduction at Station C relative to Station D; results are included in Tables 1, 2, and 3.

Table 1.
Light Transmittance Reduction at the *Valhalla* on 18 June 2003.

Depth	*Valhalla* Station D (transmittance, percent)	*Valhalla* Station C (transmittance, percent)	Reduction (percent)
Top	36	5	31
Mid-depth	19	8	11
Bottom	3	12	-

The light transmittance reduction at the *Valhalla* dredge area did not exceed the 40 percent reduction criteria listed in the monitoring work plan for uncontaminated sediments. Dissolved oxygen values were consistently above 5.0 mg/L at all stations

Table 2.
Light Transmittance Reduction at the *H.R. Morris* on 18 June 2003.

Depth	*H.R. Morris* Station D (transmittance, percent)	*H.R. Morris* Station C (transmittance, percent)	Reduction (percent)
Top	21	28	-
Mid-depth	15	18	-
Bottom	3	6	-

The light transmittance reduction at the *H.R. Morris* dredge area did not exceed the 40 percent reduction criteria listed in the monitoring work plan for uncontaminated sediments. Dissolved oxygen values were consistently above 5.0 mg/L at all stations.

Table 3.
Light Transmittance Reduction at the Southwest Slip Fill Site on 18 June 2003.

Depth	Fill Station D (transmittance, percent)	Fill Station C (transmittance, percent)	Reduction (percent)
Top	36	16	20
Mid-depth	19	9	10
Bottom	3	3	-

The light transmittance reduction at the fill area did not exceed the 40 percent reduction criteria listed in the monitoring work plan for uncontaminated sediments. Dissolved oxygen values were consistently above 5.0 mg/L at all stations.

TSS Analysis Results

Table 4 includes TSS data for June 2003 monitoring events, which were sampled preemptively in the case that plan transmittance thresholds were not met. Values of respective mid-column light transmittance values for each station are included in the table.

Table 4.
TSS Results and Mid-depth Light Transmittance in May 2003

Date	Dredge	Activity	Station	TSS (mg/L)	Light Transmittance (percent)
5/15/03	*H.R. Morris*	Dredging	C	11.9	28
5/15/03	*H.R. Morris*	Fill	C	38.2	4
5/19/03	*H.R. Morris*	Fill	B	51.6	4
5/19/03	*H.R. Morris*	Fill	C	69.5	3
5/19/03	*H.R. Morris*	Dredging	A	37.1	17
5/19/03	*H.R. Morris*	Dredging	B	46.8	5
5/19/03	*H.R. Morris*	Dredging	C	25.5	5
5/19/03	*H.R Morris/ Valhalla*	Dredging /Fill	D	7.4	40
5/19/03	*Valhalla*	Fill	A	172	3
5/19/03	*Valhalla*	Fill	B	150	3
5/19/03	*Valhalla*	Fill	C	93	3
5/19/03	*Valhalla*	Dredging	A	77	31
5/19/03	*Valhalla*	Dredging	B	46.9	24
5/19/03	*Valhalla*	Dredging	C	23	51
5/19/03	*Valhalla*	Dredging	D	5.0	44
5/28/03	*H.R. Morris*	Dredging	C	31	34
5/28/03	*H.R. Morris*	Fill	C	22	10

Final Report

Sediment Characterization for Ocean or Harbor Disposal
Berths 145 through 147
Port of Los Angeles

Final Report
Sediment Characterization for Ocean or Harbor Disposal Berths 145 through 147 Port of Los Angeles

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LIST OF ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Earth & Environmental, Inc.
ASTM	American Society for Testing and Materials
BP	bioaccumulation phase
comp	composite
COPC	chemical of potential concern
CTR	California Toxics Rule
CTV	critical tissue values
DGPS	differential global positioning system
Dry wt.	dry weight
EC_{50}	median effects concentration
EPA	U.S. Environmental Protection Agency
ERL	effects range-low
ERV	ecotoxicity reference value
ERM	effects range-median
ft	feet
g	gram
ITM	*Inland Testing Manual*
kg	kilogram
L	liter
LOEC	lowest observable effects concentration
LPC	limiting permissible concentration
µg	microgram
mg	milligram
MLLW	mean lower low water
ND	not detected
NOEC	no observed effects concentration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Los Angeles
PSDDA	Puget Sound Dredge Disposal Analysis Program
SAP	sampling and analysis plan
SP	solid phase
SPP	suspended particulate phase
St. Dev.	standard deviation
TBT	tributyltin
TRPH	total recoverable petroleum hydrocarbons
TS	total solids
USACE	U.S. Army Corps of Engineers
Wet wt.	wet weight

1.0 INTRODUCTION

The Port of Los Angeles (Port) is proposing improvements to the existing wharf and backlands of Berths 145 through 147 to accommodate berthing of deeper draft ships. Berths 145 through 147 are located in the West Basin of the Port of Los Angeles, Los Angeles County, California (Figure 1). The project includes dredging approximately 266,500 cubic yards of sediment. AMEC Earth & Environmental, Inc. (AMEC), has been contracted by the Port to conduct a sediment characterization study of the area to determine whether ocean or harbor disposal are appropriate options for the sediments. Disposal is proposed at either the U.S. Environmental Protection Agency (EPA)-approved LA-2 Ocean Dredged Material Disposal Site (LA-2) or at an undetermined in-harbor aquatic disposal location (Figure 2).

This study is based on the protocols described in the document *Evaluation of Dredged Material Proposed for Ocean Disposal* (*Green Book*) (EPA/U.S. Army Corps of Engineers [USACE] 1991), the *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.* (*Inland Testing Manual* [*ITM*]) (EPA/USACE 1998), and regional guidance of the EPA Region 9 (EPA 1991). The aforementioned guidance documents present an outline for three-tiered effects-based testing to determine disposal option acceptability for dredged materials. A Tier III evaluation has been selected based on potential sources of contamination near the project site as indicated in previous sediment characterization reports for areas offshore Berths 144 and 147 (Ogden 1996a, Ogden 1996b).

2.0 METHODS AND MATERIALS

Sediment collection, handling, and preservation activities followed the procedures outlined in the site-specific Sampling and Analysis Plan (SAP) (AMEC 2002).

2.1 Marine Sediment Collection

A differential global positioning system (DGPS) was used to locate predetermined station locations (Figures 3 and 4) and mark them with a weighted buoy. After positioning Seaventure Inc.'s vessel, *Early Bird*, on station, the boat was double-tied to docks and/or anchors to maintain its position. Once secured, the position was recorded in the field log and the water depth was measured with a weighted fiberglass tape. The depth was corrected to mean lower low water (MLLW) using National Oceanic and Atmospheric Administration tide tables and the sampling depth confirmed.

TEG Oceanographic Services, Inc.'s vibracore was used to sample sediments aboard the *Early Bird*. The vibracore used a 4-inch-diameter aluminum tube connected to a stainless steel cutter. The aluminum-encased vibrating unit used electricity (240-volt, 3-phase, 26-amp) to drive two outer-rotating vibrators. The vibracore's head and tube were lowered by a hydraulic winch and vibrated until penetration to project depth was achieved. Core penetration depth was calculated with a tape measure attached to the vibracore's head. The vibracore was then turned off and the tube extracted from the sediment and returned to the vessel.

INSERT FIGURE 1

INSERT FIGURE 2

INSERT FIGURE 3

INSERT FIGURE 4

After collection, samples were extruded on the vessel into clean, polyethylene-lined trays. Each core was photographed and the unique strata were identified and noted. Samples were logged, and sediments for chemical analysis were placed into a clean stainless steel stockpot for compositing. Thorough compositing was achieved with the use of a stainless steel impeller.

Descriptions of sediment samples, field conditions, and meteorological conditions were recorded in the field log as described in the SAP (AMEC 2002). Table 1 summarizes the field log data. A copy of the core log is provided in Appendix A.

Table 1
Summary of Field Log Data

Site	Coring Location	Number of Cores	Position (Latitude, Longitude)	Target Recovery (ft)	Average Core Recovery (ft)[1]	Comments
1	1	1	33°45.655 118°16.389	8	7	From top of core – 0.5' dk gray silt – 0.5' green/blue fine/medium sand – 2' compact blue fine sand (more compact and finer w/depth) – bottom 3.5' very compact blue gray clay.
1	2	2	33°45.634 118°16.403	12.5	4.5	Top 2' drk gray/blk bottom 3' fine gray sand. At transition between dark gray silt & gray sand is some black sand.
1	3		33°45.691 118°16.385	8	4.5	Top of core – 0.5' gr silt, 0.5' blk silt w/oil staining, 1' gr silt/clay. Bottom 2' dk gr fine sand w/ some clay layers, 0.5' gr/blue fine sand/clay – compact.
1	4	3	33°45.708 118°16.368	10	4.25	Top 1.5' drk gray/blk silt, middle drk gray silty clay. Bottom 1.5' fine gray sand.
1	5	2	33°45.739 118°16.372	7	5	Top of core – 0.5/ gr/blk med sand, 0.5' gr fine sand w/ some clay. Then 2' dk gr fine sand. Bottom 3.5' gr fine sand. Black mass, 2" long @ 2' w/petroleum odor. Core 2 dark gray fine sand, slightly coarser in middle 1', loose top 6".
2	1	1	33°45.497 118°16.456	18	10	Top of core 1.5' dk gr silt w/some clay, 0.5' gr/blk fine sand, 1' gr clay w/shell hash. Bottom, 7' gr clay.

Table 1 (continued)
Summary of Field Log Data

Site	Coring Location	Number of Cores	Position (Latitude, Longitude)	Target Recovery (ft)	Average Core Recovery (ft)[1]	Comments
2	2	1	33°45.531 118°16.450	13	13	Top 1.5 ft dark gray w/shell hash at top, next 3 ft dark gray/light gray silt, next 0.5 ft dark gray clay w/black silt w/oil odor, next 1 ft dark gray clay; bottom 7 ft gray consolidated clay.
2	3	1	33°45.559 118°16.426	18	9	Top 4 ft dark gray silt w/some clay. Middle 1 ft dark gray clay w/silt. Bottom 4 ft firm dark gray clay silt.
2	4	1	33°45.583 118°16.427	10.5	11	Top 6.5 ft dark gray clay w/silt. Bottom 5 ft dark gray clay w/silt w/some shell.
2	5		33°45.609 118°16.412	14.5	6.5	Top 2.5 ft gray silt, next 1 ft mixed black fine sand & green clay, next 0.5 ft green gray clay; bottom 2.5 ft clay/silt. Very compact 1 ft above bottom w/shell hash.
2	6		33°45.484 118°16.452	15	14	Top 4.5 ft dark gray/black silt w/mussel hash top 2 ft. Middle 3 ft dark gray mixed w/fine sand/silt - some shell hash and oil odor. Bottom 5.5 ft dark gray, loose clay.

[1] length of cores varied between cores taken at a single station.

2.2 Sediment Handling and Analyses

Each core was homogenized independently and subsampled for physical and chemical testing. All sediment from within each site were then composited and subsampled for the same suite of physical and chemical analyses. Subsamples were collected in Teflon®-lined, labeled jars and were subsequently stored at 4°C. Five (Site 1) or six (Site 2) core-composite samples were sent in iced coolers along with the site-composite samples to Calscience Environmental Laboratories (Calscience) and CRG Laboratories (CRG) for physical and chemical analyses. The remainder of the site-composite material was retained and stored at 4°C until bioassay and bioaccumulation testing commenced. A complete set of archived samples was retained and frozen for possible additional testing. The sediment samples submitted to Calscience were analyzed for the physical and chemical constituents listed in Table 2.

Table 2
Recommended Methods for Sample Preparation, Analysis, Detection Limits and Reporting Limits for Sediments, Tissues, and Elutriates

Analyte	Preparation Method	Analysis Method	Sediment Target Detection Limit[a]	Tissue Target Detection Limit[a]	Elutriate Reporting Limits[b] (mg/L)
Total Solids (%)	-	160.3	0.1	0.1	-
Total Organic Carbon (%)	Acidify to release carbonates	9060	0.01	-	-
Total Ammonia (mg/kg)	-	350.2M[c]	0.2	-	-
Total & Soluble Sulfides (mg/kg)	Zinc acetate preserve	376.2M[c]	0.1	-	-
Grain Size (%)	-	ASTM D422-63[d] Plumb[e]	0.1	-	-
Arsenic (mg/kg)	3051[f]	6020[f]	0.1	0.25	0.001
Cadmium (mg/kg)	3051[f]	6020[f]	0.1	0.1	0.001
Chromium (mg/kg)	3051[f]	6020[f]	0.1	0.02	0.001
Copper (mg/kg)	3051[f]	6020[f]	0.1	0.1	0.001
Lead (mg/kg)	3051[f]	6020[f]	5.0	1.0	0.001
Mercury (mg/kg)	Total Digestion	7471A[f]	0.02	0.02	0.0005
Nickel (mg/kg)	3051[f]	6020[f]	0.1	1.0	0.001
Selenium (mg/kg)	3051[f]	6020[f]	0.1	0.5	0.001
Silver (mg/kg)	3051[f]	6020[f]	0.2	1.0	0.001
Zinc (mg/kg)	3051[f]	6020[f]	2.0	1.0	0.005
TRPH (mg/kg)	-	418.1M[f]	5.0	5.0	-
PAHs[g] µg/kg)	3550A[f]	8270C[f]	20	20	1.0 - 13
Organochlorine Pesticides[h] (µg/kg)	3550A[f]	8081A/8082[f]	0.5 - 30	0.5 - 25	0.1
PCBs[i](µg/kg)	3550A[f]	8082[f]	20	20	1.0
Phenols (mg/kg)	3545[f]	8270C	20 - 100	-	5.0 - 25
Phthalates (mg/kg)	3545[f]	8270C	10	-	5.0
Organotins (µg/kg)	Rice et al.[j]	Rice et al.[j]	1	-	-

[a] Sediment minimum detection limits are on a dry-weight basis. Tissue minimum detection limits are on a wet-weight basis. To achieve the recommended minimum detection limit for some compounds in sediment, it may be necessary to use a larger sample size than the method describes, a smaller extract volume for gas chromatography/mass spectrometry analyses, and one of the recommended sample cleanup methods, as necessary, to reduce interference.

[b] Reporting Limits provided by Calscience Environmental Laboratories, Inc.

[c] Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995.

[d] ASTM D1234.

[e] Procedures for Handling and Chemical Analysis of Sediment and Water Samples, Russell H. Plumb, Jr., EPA/CE-81-1, May, 1981, Particle Size, Method 2, apparent particle-size distribution.

[f] SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Revision 3 (Nov. 1986), as amended by Updates I (Jul 1992), II (Sep 1994), IIA (Aug 1993), IIB (Jan 95), and III (Dec 96).

[g] Includes 14 PAH compounds (LPAHs: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene) and (HPAHs: fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene).

[h] Includes Aldrin, α-BHC, β-BHC, γ-BHC (Lindane), δ-BHC, Chlordane, 4,4-DDD, 4,4-DDE, 4,4-DDT, Dieldrin, Endosulfan I and II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, and Toxaphene.

[i] Includes Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1262.

[j] Rice, C.D., F.A. Espourteille, and R.J. Huggett. 1987. Analysis of tributyltin in estuarine sediments and oyster tissue, *Crassostrea virginica*. Applied Organometallic Chemistry, 1:541-544.

ASTM = American Society for Testing and Materials
HPAH = high-molecular-weight polycyclic aromatic hydrocarbon
LPAH = low-molecular-weight polycyclic aromatic hydrocarbon
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TRPH = total recoverable petroleum hydrocarbons

2.2.1 Elutriate Testing

The elutriate test solution was prepared by mixing seawater and test sediment to yield a volumetric sediment:water ratio of 1:4. Seawater used in tests was collected at Scripps Institution of Oceanography and transported to AMEC's Bioassay Laboratory in San Diego, California. Mechanical mixing, using a stainless steel impeller, was applied to vigorously agitate the mixture for 30 minutes. After a 1-hour settling period, the supernatant was drained from the top of the mixing chamber. The mixture was filtered through a 0.45-micrometer Millipore filter prior to testing.

2.3 Bioassay Testing

Bioassays were conducted on composite sediment samples from both test sites and the two reference sites. The test series included three types of bioassays: (1) solid phase, (2) suspended-particulate phase, and (3) bioaccumulation phase. Each of these tests was performed in accordance with the *Green Book*, the *ITM*, and EPA Region 9's General Requirements for Sediment Testing of Dredged Material Proposed for Ocean Dumping (EPA 1991). Seawater used for all bioassay analyses was also collected at Scripps.

2.3.1 Test Organisms

Table 3 provides a list of the organisms tested in the three-phase bioassay series. Test organisms underwent a holding period under laboratory and test conditions prior to test initiation. During the initial 48-hour acclimation period, test animals were slowly exposed to laboratory water, test temperature, and other test and laboratory conditions. Test organism health and acceptability were determined to be within normal limits and testing proceeded as planned.

Table 3
Test Species

Test Organism	Taxon	SPP	SP	BP
Bivalve Larvae	*Mytilus edulis*	X		
Silverside	*Menidia beryllina*	X		
Mysid shrimp	*Americamysis bahia**	X	X	
Amphipod	*Ampelisca abdita*		X	
Polychaete	*Nereis virens*			X
Mollusk	*Macoma nasuta*			X

SPP – suspended particulate phase
SP – solid phase
BP – bioaccumulation phase
*formerly *Mysidopsis bahia*

2.3.2 Solid Phase Toxicity Tests

Ten-day amphipod and mysid shrimp tests were conducted under static renewal conditions in 1-liter glass beakers according to the protocol described in American Society for Testing and Materials (ASTM) (1990). Tests were prepared with the addition of a 2-centimeter layer of control, reference, or test sediment and 950 milliliters of clean seawater into each test beaker. Gentle aeration was added to each chamber through a 1-milliliter, cotton-plugged pipette.

Twenty amphipods were distributed randomly to each beaker, with 5 replicates exposed to each sediment treatment. After 10 days, test animals were removed by gently sieving the contents of each beaker through a nitex mesh screen. Animals were collected on the screen and final counts were made.

The mysid test was conducted with 10 individuals distributed randomly per replicate container. After 10 days, test animals were removed by gently sieving the contents of each beaker through a nitex mesh screen. Animals were collected on the screen and final counts were made.

2.3.3 Suspended Particulate Phase Toxicity Tests

The test solution used in the suspended-particulate phase bioassays was prepared by mixing seawater and test sediment to yield a volumetric sediment:water ratio of 1:4. Mechanical mixing, using a stainless steel impeller, was applied to vigorously agitate the mixture for 30 minutes. After a 1-hour settling period, the supernatant was drained from the top of the mixing chamber. This material was considered to be 100 percent elutriate and was used to mix the concentrations used for all suspended-particulate phase testing.

The 100 percent elutriate was diluted with clean seawater to prepare the four test concentrations, which were 0 percent (control, no supernatant), 10, 50, and 100 percent supernatant solutions. The test material was distributed to individual test chambers, and initial water quality readings were taken. Readings included dissolved oxygen, pH, temperature, ammonia, and salinity. If dissolved oxygen was found to be below 60 percent of saturation, all test chambers were aerated. Testing was initiated by randomly adding test organisms to individual test chambers. Water quality was monitored daily thereafter to ensure proper and constant test conditions and was found to be acceptable.

2.3.4 Bioaccumulation Phase

Bioaccumulation testing was performed using the polychaete worm (*Nereis virens*) and the bent-nose clam (*Macoma nasuta*) over a 28-day test period under flow-through conditions. Testing was initiated using reference and test sediments in the same manner as described for the 10-day solid phase tests. For this test, however, 10-gallon glass aquariums were stocked with 10 polychaete worms and 35 clams per replicate. This number of organisms is necessary to generate the amount of biomass necessary to conduct all the required chemical analyses. The chambers were maintained under flow-through conditions and daily water quality measurements were taken on each chamber as specified in the 28-day test.

Upon test termination, the reference and test sediments were sieved to remove the worms and clams. Surviving animals were placed, by replicate, in clean sand in an aquarium and held under flow-through conditions to depurate for 24 hours. Sediments eliminated by the animals during depuration were removed periodically. Following depuration, animals were carefully removed from the holding chambers, placed into labeled, zipper-sealed plastic storage bags, and frozen. Each bag was assigned a random number. Frozen test tissue was transported to CRG for chemical analyses.

A suite of chemical analyses similar to that used to test sediments was applied to the bioaccumulation tissue samples. The constituents analyzed, along with their respective target detection limits, are included in Table 2.

2.4 Statistical Analyses

Statistical analyses were used to evaluate all test results following the guidelines in the *Green Book* and *ITM*. In cases where average survival in the test medium equals or exceeds that of the reference, no statistical analysis was performed. Dunnett's test using the statistical software TOXCALC (Tidepool 1992) was conducted on suspended-particulate phase results to assess significant reductions in fish and mysid shrimp survival or normality in bivalve larvae test. A one-tailed *t*-test using the Microsoft Excel data management tool was used for solid phase test results comparing the test exposure mean survival values to the mean reference values.

Statistical analysis of the bioaccumulation test data compared tissue concentrations from animals held in reference sediments to concentrations from tissues exposed to test sediments. Significance was determined with a one-tailed *t*-test using the Microsoft Excel data management tool. For treatment units with analytes measured below the detection limit, statistical tests were carried out using an average of the concentrations from replicates in which the analyte was detected. In this case, a minimum of three replicates with concentrations above the detection limit was required for statistical testing, and an assumption of unequal variance was adopted as an assumption for the test. In cases where reference tissue levels exceeded treatment levels, no statistical analyses were performed.

3.0 RESULTS

3.1 Field Collection

Field sampling was undertaken on 4 and 5 December 2002. Field logs are included in Appendix A and photographic documentation of the core samples is included in Appendix B.

3.2 Physical Results

The results of the grain size analyses are presented in Table 4. The majority of Site 1 and the Harbor Reference material was found to be primarily fine-fraction sediments whereas the majority of the Site 2 and Ocean Reference sediments were mostly sand. The laboratory grain size data sheets are contained in Appendix C. Additional general chemistry data is presented in Table 5.

Table 4
Grain Size

Particle Size	Units	Site 1 Composite	Site 2 Composite	Ocean Reference Site	Harbor Reference Site
Sand (>74µm)	%	18	65	55	22
Fines (<74µm)	%	82	35	45	78

Table 5
General Chemistry Summary

Parameter	Site 1						Reference Sites	
	1-1	1-2	1-3	1-4	1-5	1-Comp	Ocean	Harbor
Total Solids (TS), %	66.9	74.9	68.6	69.8	76.8	74.4	75.6	60.8
Total Organic Carbon, % dry wt.	1.69	0.18	1.17	1.6	0.16	1.86	0.56	1.12
Total Sulfides, mg/kg	ND	4.0	20	2.9	0.39	4.3	ND	0.49
Soluble Sulfides, mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Ammonia-N, mg/kg	6.3	ND	4.9	2.0	0.73	2.6	5.0	2.3

Parameter	Site 2							Reference Sites	
	2-1	2-2	2-3	2-4	2-5	2-6	2-Comp	Ocean	Harbor
Total Solids (TS), %	64.9	63.7	63.5	64.9	69.4	61.8	65.1	75.6	60.8
Total Organic Carbon, % dry wt.	0.68	0.87	1.91	2.06	1.75	1.84	0.97	0.56	1.12
Total Sulfides, mg/kg	3.6	12	11	7.1	3.5	2.9	15	ND	0.49
Soluble Sulfides, mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ammonia-N, mg/kg	38	29	25	21	5.5	37	21	5.0	2.3

ND = Not Detected within reporting limits
Comp = composite

3.3 Bulk Sediment Chemistry Results

The chemical levels obtained in this study have been compared to the effects range-low (ERL) and the effects range-median (ERM) values. ERLs and ERMs were developed by comparing toxicity effects and chemistry results for numerous studies (Long et al. 1995) and are used as rough benchmarks indicating possible toxicity. The ERL is calculated as the lower 10th percentile concentration of the available sediment data identified as toxic by the original studies investigators (Buchman 1999). The ERM is the median concentration of the compiled data. Original laboratory sediment chemistry reports are included in Appendix D.

Metal and General Chemistry

The variety of metals detected in individual core samples was generally reflected in the composite sample values. A summary of the results is found in Table 6. Site 1 sediments did not exceed any metal ERM values, though some individual core samples exceeded ERL values for copper, nickel, and mercury. Mercury was the only metal to exceed the ERL in the Site 1 composite sample. Site 2 sediments generally exceeded ERL values for arsenic, copper, nickel, and mercury. Sporadic ERL exceedances for lead were also observed in Site 2 individual core sediments. Although the ERM for mercury (0.71 mg/kg) was exceeded only in Core 2 of Site 2 (0.895 mg/kg), exceedance was also observed in the Site 2 composite (0.746 mg/kg).

Organic Chemistry

A summary of the organic chemistry results can also be found in Table 6. Of the chlorinated pesticides, only DDT and its derivatives were detected in the sediment samples. DDT and its derivatives were detected in all of the Site 1 core samples, the Site 1 composite sample, five of the six Site 2 core samples, and the Site 2 composite sample. Of those samples, the ERL for total DDTs was exceeded in four of the five Site 1 core samples, the Site 1 composite sample, four of the six Site 2 core samples, and the Site 2 composite sample. Total DDTs were detected in both reference sites between the ERL and ERM values. The total DDTs' ERM value was not exceeded in any of the samples.

Polychlorinated biphenyls (PCBs) and phenols were not detected in any of the samples. Total phthalates were detected in all but one of the Site 1 core samples and one of the Site 2 core samples; all values were below ERL values.

Total polycyclic aromatic hydrocarbons (PAHs) were found in all core samples and composite samples. None of the samples exceeded the total PAHs' ERL values. However, acenaphthene, fluorene, anthracene, and pyrene were detected above their respective ERL values (see Table 6). Reference sediments did not exhibit PAH concentrations above their respective reporting limits.

Table 6
Bulk Sediment Chemistry Results

Analytes	Units (dry wt.)	ERL	ERM	Site 1						Reference Sites	
				1-1	1-2	1-3	1-4	1-5	1-Comp	Ocean	Harbor
Arsenic	mg/kg	8.2	70	5.78	4.18	7.50	4.07	2.56	3.83	ND	7.47
Cadmium	mg/kg	1.2	9.6	0.656	0.187	0.532	0.232	0.227	0.259	ND	0.719
Chromium (total)	mg/kg	81	370	43.7	21.0	46.4	30.2	17.2	28.0	13.5	45.4
Copper	mg/kg	34	270	***52.7***	22.4	***44.2***	31.9	17.4	27.4	6.88	***48.4***
Lead	mg/kg	46	218	23.5	14.3	***50.7***	23.9	23.2	19.7	3.97	26.8
Nickel	mg/kg	20.9	51.6	***29.7***	11.1	19.7	14.8	10.3	15.4	6.74	***27.2***
Selenium	mg/kg	-	-	ND	ND	ND	0.748	ND	ND	ND	ND
Silver	mg/kg	1	3.7	0.301	ND	0.270	0.208	0.201	ND	ND	0.879
Zinc	mg/kg	150	410	99.6	51.4	92.3	65.5	43.8	60.6	34.5	111
Mercury	mg/kg	0.15	0.71	***0.200***	***0.164***	***0.452***	***0.259***	0.119	***0.211***	0.032	***0.191***
TRPH	mg/kg	-	-	54	50	150	91	46	66	43	54
Total PCBs	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND
Total Phenols	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND
Total Phthalates	µg/kg	-	-	24	88	39	51	ND	44	51	83
Total DDTs *	µg/kg	1.58	46.1	***7.3***	***7.8***	***30***	***13.9***	1.4	***7.8***	***38***	***10***
Total PAHs	µg/kg	4022	44792	265	364	1130	782	166	488	ND	ND
Dibutyltin	µg/kg	-	-	ND	ND	ND	ND	ND	7.5	ND	ND
Monobutyltin	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND
Tributyltin	µg/kg	-	-	ND	ND	3.1	44.5	ND	40.8	ND	ND

Table 6 (continued)
Bulk Sediment Chemistry Results

Analytes	Units (dry wt.)	ERL	ERM	Site 2							Reference Sites	
				2-1	2-2	2-3	2-4	2-5	2-6	2-Comp	Ocean	Harbor
Arsenic	mg/kg	8.2	70	***8.70***	***12.2***	***11.1***	***10.9***	***9.18***	***8.26***	***10.9***	ND	7.47
Cadmium	mg/kg	1.2	9.6	0.339	0.561	0.503	0.325	0.342	0.585	0.612	ND	0.719
Chromium (total)	mg/kg	81	370	40.6	53.3	54.4	47.9	51.5	64.7	65.2	13.5	45.4
Copper	mg/kg	34	270	***40.7***	***85.3***	***73.0***	***50.0***	***58.4***	***65.1***	***83.2***	6.88	***48.4***
Lead	mg/kg	46	218	43.8	***47.9***	45.6	28.7	33.9	***52.6***	***57.7***	3.97	26.8
Nickel	mg/kg	20.9	51.6	***28.5***	***33.9***	***33.0***	***31.9***	***33.8***	***28.1***	***34.9***	6.74	***27.2***
Selenium	mg/kg	-	-	0.781	1.11	ND	ND	1.04	ND	ND	ND	ND
Silver	mg/kg	1	3.7	0.192	0.310	0.256	0.169	0.169	0.245	0.239	ND	0.879
Zinc	mg/kg	150	410	94.6	130	124	93.9	103	117	146	34.5	111
Mercury	mg/kg	0.15	0.71	***0.395***	***0.895***	***0.503***	***0.246***	***0.329***	***0.582***	***0.746***	0.032	***0.191***
TRPH	mg/kg	-	-	180	220	170	44	140	150	41	43	54
Total PCBs	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Phenols	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Phthalates	µg/kg	-	-	ND	21	140	170	65	120	170	51	83
Total DDTs *	µg/kg	1.58	46.1	ND	***12.3***	***4.7***	ND	***4.5***	***16***	***14.3***	**38**	**10**
Total PAHs	µg/kg	4022	44792	38	622	724	330	935	2570	1100	ND	ND
Dibutyltin	µg/kg	-	-	ND	ND	13.3	ND	ND	ND	ND	ND	ND
Monobutyltin	µg/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tributyltin	µg/kg	-	-	ND	3.5	156	11.8	7.5	ND	ND	ND	ND

* = DDT and its derivatives were the only chlorinated pesticides detected
bold = exceeds the ERL
[***bold***] = exceeds the ERM
dry wt. = dry weight
ERL = effects range low
ERM = effects range median

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ND = not detected within reporting limits
PAH = polycyclic aromatic hydrocarbon
PCB = polycyclic aromatic hydrocarbon
TRPH = total recoverable petroleum hydrocarbons

Organotins were detected in two of the five core samples and in the composite sample at Site 1 and four of the six Site 2 core samples. The Puget Sound Dredge Disposal Analysis program (PSDDA) screening level for organotins (73 µg/kg) was exceeded in one of the Site 2 core samples.

3.4 Elutriate Chemistry Results

The results of the elutriate chemistry analyses are presented in Table 7. The results are for the two test sites and one seawater sample that was used to prepare the filtered elutriates. Results are compared to the California Toxics Rule (CTR) ambient water quality criteria or the California Ocean Plan in the case of mercury. Laboratory data results are contained in Appendix E.

Table 7
Elutriate Chemistry Data

Parameter	Units	Site 1	Site 2	Seawater	CTR Criteria (mg/L)
Sulfides		ND	ND	ND	--
Arsenic	mg/L	ND	0.003	ND	0.069
Cadmium	mg/L	ND	ND	ND	0.042
Chromium (total)	mg/L	ND	ND	ND	--
Copper	mg/L	ND	ND	ND	0.0048
Lead	mg/L	ND	ND	ND	0.210
Nickel	mg/L	ND	ND	ND	0.074
Selenium	mg/L	ND	ND	ND	0.290
Silver	mg/L	ND	ND	ND	0.0019
Zinc	mg/L	ND	0.009	0.014	0.009
Mercury	mg/L	ND	ND	ND	0.0005*
Total Aroclor PCBs	µg/L	ND	ND	ND	--
Total Phenols	µg/L	ND	ND	ND	--
Total Phthalates	µg/L	ND	ND	ND	--
Total Pesticides	µg/L	ND	ND	ND	--
Total PAHs	µg/L	ND	ND	ND	--

* = minimum level from the California Ocean Plan
CTR = California Toxics Rule
ND = not detected within reporting limits
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyls

3.5 Bioassay and Bioaccumulation Results

Raw toxicity data is included in Appendix F and bioaccumulation data is included in Appendix G.

3.5.1 Solid Phase Bioassay Results

Solid phase toxicity tests included amphipod (*Ampelisca abdita*) and mysid shrimp (*Americamysis bahia*) protocols. As shown in Table 8, neither the amphipod nor the mysid test demonstrated any statistically significant mortality. The initial amphipod test was repeated because the controls did not meet the 90 percent survival standard set by the *Green Book*.

Table 8
Solid Phase Toxicity Results

Site	Amphipod Mean Survival (%)	Mysid Mean Survival (%)
Control	90	96
Ocean Reference	90	94
Harbor Reference	89	100
Site 1	91	94
Site 2	88	94

3.5.2 Suspended Phase Bioassay Results

The results of the suspended-particulate phase tests performed using silversides (*Menidia beryllina*), mysid shrimp (*Americamysis bahia*), and bivalve larvae (*Mytilus edulis*) are shown in Table 9. No toxicity was observed in either the silverside or mysid tests. The bivalve larvae test for Site 1 indicates that the 100 percent and 10 percent concentrations were statistically significant, but the reduction in normal development was minor. The Site 2 test, however, resulted in a 100 percent reduction in normal larvae in both the 50 and 100 percent elutriate concentrations. The EC_{50} for this test was calculated to be 22.3 percent elutriate.

Suspended particulate phase analyses are not typically conducted on the reference sediment samples (because the control is used for statistical comparisons). For this study, however, a test was conducted on the Harbor Reference sediment. Since this is the first study to be conducted using a reference sediment collected in Los Angeles Harbor, it was determined that conducting suspended particulate tests on this sediment would provide useful information on baseline conditions at this site.

Table 9
Suspended-Phase Toxicity Results

Site	Concentration (%)	Silverside Average Survival (%)	Mysid Average Survival (%)	Bivalve Average Normal Development (%)
Control	0	100	96	99
Harbor Reference	10	100	100	97
	50	100	100	91*
	100	100	98	89*
Site 1	10	100	94	97*
	50	100	98	98
	100	100	96	96*
Site 2	10	100	98	98
	50	100	96	0*
	100	100	92	0*

*indicates statistically significant toxicity

3.5.3 Bioaccumulation Test Results

Bioaccumulation results are summarized in Table 10 through 13. Table 10 is a comparison of the metal levels in organisms exposed to the ocean reference sediment to those in organisms exposed to test sediment. A comparison of the metal levels in tissue exposed to Harbor Reference sediment is summarized in Table 11. Tissue levels of organic chemicals in Ocean Reference (Table 12) and Harbor Reference (Table 13) exposures are also presented. In general, the levels of metals in test tissue were low. No pesticides or PCB were detected in any of the samples tested. PAH bioaccumulation was observed in many of the samples. The results are discussed in more detail in the Section 4.4.

3.6 Quality Assurance and Quality Control

Routine *Green Book* and *ITM* standard operating procedures were employed during all phases of this study. This included proper sediment collection and handling procedures; analyzing samples within holding times; method blank and laboratory control analyses at required frequencies; and using EPA-approved testing methods with state-of-the-art instrumentation. For bulk sediment chemistry test, all matrix spike analyses were within acceptable limits. Surrogate analyses were also within acceptable control limits. Due to matrix interferences, the target detection limits were not met for several samples.

Table 10
Metals Bioaccumulation Results
Ocean Reference Tissue Compared to Test Tissue

Analyte (mg/kg dry wt.)	Clam Ocean Reference		Clam Site 1		Clam Site 2		Worm Ocean Reference		Worm Site 1		Worm Site 2	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
% Solids	11.3	1.44	10.0	0.88	11.2	0.50	13.9	1.08	14.5	1.38	14.2	0.75
Arsenic (As)	12.7	0.95	13.7	2.21	13.0	1.40	11.0	0.97	9.9	0.72	9.8	0.90
Cadmium (Cd)	0.16	0.041	0.16	0.015	0.14	0.022	0.15	0.027	0.14	0.019	0.14	0.019
Chromium (Cr)	6.6	0.97	6.8	1.77	6.8	1.34	4.9	3.71	3.2	0.49	3.5	0.39
Copper (Cu)	15.4	2.19	**21.0***	4.22	17.0	2.98	7.8	1.19	8.2	0.47	8.5	0.85
Lead (Pb)	2.0	0.35	**3.8***	0.89	**3.3***	0.88	0.7	0.18	0.6	0.10	0.8	0.09
Mercury (Hg)	0.15	0.034	0.16	0.032	0.14	0.034	0.15	0.057	0.18	0.025	0.17	0.037
Nickel (Ni)	3.3	0.56	3.4	0.54	3.6	0.77	1.2	0.18	1.0	0.22	1.2	0.11
Selenium (Se)	1.8	0.20	1.8	0.17	1.8	0.15	1.8	0.33	1.7	0.25	1.6	0.25
Silver (Ag)	0.23	0.046	0.19	0.067	0.19	0.036	0.07	0.045	0.04	0.012	0.05	0.009
Zinc (Zn)	67.6	10.28	76.4	12.6	61.3	9.77	95.0	37.87	41.4	23.1	66.1	47.4

***indicates statistically elevated compared to reference tissue ($p \leq 0.05$)**
dry wt. = dry weight
mg/kg = milligram per kilogram
Std. Dev. = standard deviation

Table 11
Metals Bioaccumulation Results
Harbor Reference Tissue Compared to Test Tissue

Analyte (mg/kg dry wt.)	Clam Harbor Reference		Clam Site 1		Clam Site 2		Worm Harbor Reference		Worm Site 1		Worm Site 2	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
% Solids	11.0	0.67	10.0	0.88	11.2	0.50	13.1	2.15	14.5	1.38	14.2	0.75
Arsenic (As)	13.1	1.45	13.7	2.21	13.0	1.40	10.0	1.53	9.9	0.72	9.8	0.90
Cadmium (Cd)	0.16	0.029	0.16	0.015	0.14	0.022	0.14	0.023	0.14	0.019	0.14	0.019
Chromium (Cr)	7.3	1.14	6.8	1.77	6.8	1.34	4.2	2.06	3.2	0.49	3.5	0.39
Copper (Cu)	18.0	3.24	21.0	4.22	17.0	2.98	7.6	0.32	**8.2***	0.47	**8.5***	0.85
Lead (Pb)	2.8	0.52	**3.8***	0.89	3.3	0.88	0.6	0.14	0.6	0.10	0.8	0.09
Mercury (Hg)	0.15	0.03	0.16	0.032	0.14	0.034	0.15	0.04	0.18	0.025	0.17	0.037
Nickel (Ni)	4.2	0.51	3.4	0.54	3.6	0.77	1.0	0.08	1.0	0.22	**1.2***	0.11
Selenium (Se)	1.8	0.16	1.8	0.17	1.8	0.15	1.8	0.31	1.7	0.25	1.6	0.25
Silver (Ag)	0.19	0.034	0.19	0.067	0.19	0.036	0.06	0.011	0.04	0.012	0.05	0.009
Zinc (Zn)	68.2	12.80	76.4	12.6	61.3	9.77	78.3	79.29	41.4	23.1	66.1	47.4

***indicates statistically elevated compared to reference tissue ($p \leq 0.05$)**
dry wt. = dry weight
mg/kg = milligram per kilogram
Std. Dev. = standard deviation

Table 12
Organics Bioaccumulation Results
Ocean Reference Tissue Compared to Test Tissue

Analyte (µg/kg dry wt.)	Clam Ocean Reference		Clam Site 1		Clam Site 2		Worm Ocean Reference		Worm Site 1		Worm Site 2	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
% Solids	11.3	1.44	10.0	0.88	11.2	0.50	13.9	1.08	14.5	1.38	14.2	0.75
Pesticides	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
PCBs	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Acenaphthene	ND	-	ND	-	23	11.4	ND	-	ND	-	68	42.5
Acenaphthylene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Anthracene	ND	-	ND	-	110	16.5	ND	-	45	17.0	147	40.4
Benz[a]anthracene	ND	-	89	59.1	260	18.0	ND	-	ND	-	79	29.0
Benzo[a]pyrene	ND	-	591	179.9	464	86.0	ND	-	61	16.3	56	53.3
Benzo[b]fluoranthene	ND	-	639	177.0	579	61.7	ND	-	83	33.5	88	45.3
Benzo[g,h,i]perylene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Benzo[k]fluoranthene	ND	-	403	113.1	330	38.8	ND	-	86	32.2	80	31.4
Chrysene	ND	-	147	38.0	400	14.4	ND	-	ND	-	183	121.5
Dibenzo[a,h]anthracene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Fluoranthene	ND	-	ND	-	721	99.3	ND	-	23	4.7	341	148.9
Fluorene	ND	-	ND	-	19	5.5	ND	-	ND	-	29	-
Indeno[1,2,3-c,d]pyrene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Naphthalene	ND	-	45	-	ND	-	66	8.3	73	21.1	109	113.6
Phenanthrene	ND	-	ND	-	147	50.3	ND	-	37	-	359	92.4
Pyrene	ND	-	615	107.1	1259	463.0	ND	-	107	60.0	363	226.0
Average Total PAHs	ND	-	1854	1062.5	3690	1796.4	22	34.4	301	223.2	1717	822.5

dry wt. = dry weight
µg/kg = microgram per kilogram
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls
Std. Dev. = standard deviation

Table 13
Organics Bioaccumulation Results
Harbor Reference Tissue Compared to Test Tissue

Analyte (µg/kg dry wt.)	Clam Harbor Reference		Clam Site 1		Clam Site 2		Worm Harbor Reference		Worm Site 1		Worm Site 2	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
% Solids	11.0	0.67	10.0	0.88	11.2	0.50	13.1	2.15	14.5	13.8	14.2	0.75
Pesticides	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
PCBs	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Acenaphthene	ND	-	ND	-	23	11.4	ND	-	ND	-	68	42.5
Acenaphthylene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Anthracene	ND	-	ND	-	110	16.5	20	6.4	45	17.0	147	40.4
Benz[a]anthracene	ND	-	89	59.1	260	18.0	ND	-	ND	-	79	29.0
Benzo[a]pyrene	ND	-	591	179.9	464	86.0	ND	-	61	16.3	56	53.3
Benzo[b]fluoranthene	ND	-	639	177.0	579	61.7	ND	-	83	33.5	88	45.3
Benzo[g,h,i]perylene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Benzo[k]fluoranthene	ND	-	403	113.1	330	38.8	ND	-	86	32.2	80	31.4
Chrysene	ND	-	147	38.0	400	14.4	ND	-	ND	-	183	121.5
Dibenzo[a,h]anthracene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Fluoranthene	ND	-	ND	-	721	99.3	ND	-	23	4.7	341	148.9
Fluorene	ND	-	ND	-	19	5.5	ND	-	ND	-	29	-
Indeno[1,2,3-c,d]pyrene	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-
Naphthalene	ND	-	45	-	ND	-	61.7	-	73	21.1	109	113.6
Phenanthrene	ND	-	ND	-	147	50.3	ND	-	37	-	359	92.4
Pyrene	ND	-	615	107.1	1259	463.0	ND	-	107	60.0	363	226.0
Average Total PAHs	ND	-	1854	1062.5	3690	1796.4	20	25.4	301	223.2	1717	822.5

dry wt. = dry weight
µg/kg = microgram per kilogram
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls
Std. Dev. = standard deviation

4.0 DISCUSSION

4.1 Sediment Chemistry

The chemistry results indicate elevated metal levels in most samples. Mercury was the most prevalent metal contaminant: it exceeded the ERL value in almost all samples and only exceeded the ERM value in two samples (Core 2 in Site 2 and the Site 2 composite). Overall, metals concentrations in the test samples were generally lower than the Harbor Reference site but higher than the Ocean Reference site. DDT and its derivatives (the only pesticide detected) were also detected and exceeded the ERL value in 12 of the 13 samples, but not the ERM value. Generally, the test site total DDTs values were lower than the ocean reference site. PAHs did not exceed the ERL values for either site and were not detected in the reference site samples. Organotins were detected in the test samples; only 1 core in Site 2 had levels of tributyltin above the PSDDA screening level of 73 μg/kg TBT.

4.2 Elutriate Chemistry

All chemicals were found to be "nondetect" in Site 1 elutriate. Only arsenic (0.003 mg/L) and zinc (0.009 mg/L) were detected in the Site 2 elutriate. The arsenic level is well below the CTR criteria level of 0.069 mg/L. The zinc level is equal to the CTR criteria level of 0.009 mg/L, but it should be noted that the seawater used to prepare the elutriate sample had a zinc level of 0.014 mg/L. The results indicate that dissolved contaminants are not a problem in the test sediment.

4.3 Bioassay Tests

4.3.1 Solid Phase Tests

Survival of amphipods and mysid shrimp was high for all treatments ranging from 88 percent to 100 percent. These results indicate that the Berths 145-147 test sediments are not toxic to benthic test organisms. Therefore, the proposed dredged material is not predicted to cause adverse benthic effects at either the ocean or harbor disposal sites and is in compliance with Clean Water Act and Ocean Dumping Law criteria.

4.3.2 Suspended Particulate Phase Tests

No mortality was observed in any of the *Menidia* exposures. Survival was high in all the mysid shrimp exposures ranging from 92 percent to 100 percent. Normality of bivalve larvae for Site 1 and the Harbor Reference sediment were high; values ranged from 89 percent to 99 percent. There was significant abnormality observed in the Site 2 exposure. The filtered elutriate chemistry analyses did not indicate that a particular chemical was present in elevated levels. No normal larvae were observed in the 50 percent and 100 percent elutriate concentrations; the EC_{50} for the Site 2 test was 22.3 percent elutriate.

The bivalve water quality data (Appendix Table F-22) strongly indicates that the toxicity observed in the Site 2 bivalve larvae test was due to the elevated ammonia levels in the elutriate water. At test initiation (time = 0 hr), the total ammonia level in the 100 percent elutriate concentration was 15.7 mg/L. This can be converted to unionized ammonia (the toxic form of ammonia) using the initial test temperature of 14.8°C and the pH level of 8.13.

The resulting unionized ammonia concentration is 0.55 mg/L. Studies by Tang (1997) and Nicely (2000) found unionized ammonia EC_{50} levels for mussel larvae development of 0.19 and 0.12 mg/L, respectively. They also both reported a no observed effects concentration (NOEC) of 0.08 mg/L and lowest observable effects concentrations (LOEC) of 0.15 mg/L unionized ammonia. Based on the unionized ammonia level in the Site 2 suspended particulate elutriate (0.55 mg/l), it is clear that unionized ammonia is the likely cause of the observed toxicity. Since ammonia is a naturally occurring toxicant that would be rapidly dispersed at either disposal site, no effects on water column organisms would be expected.

These results indicate that the proposed dredged material meets the criterion for no water column impacts at the ocean or harbor disposal sites.

4.4 Bioaccumulation Tests

Metals

The metal levels in clams and worms exposed to test sediment were compared statistically to the level in reference sediment using a one-tailed *t*-test ($p \leq 0.05$). These analyses were done using the Ocean Reference site tissues and the Harbor Reference site tissues.

For the Ocean Reference site comparisons, only copper in Site 1 and lead in Sites 1 and 2 clam tissue was found to be statistically elevated (Table 10). No metals were found to be at statistically significant levels in worm tissue for the ocean reference site test. The significant copper level in clam tissue (21.0 mg/kg) was only 1.4 times the average concentration in the Ocean Reference tissue level (15.4 mg/kg). The significant lead level in Site 1 clam tissue (3.8 mg/kg) and Site 2 test tissue were only 1.7 and 1.9 times the Ocean Reference tissue level (2.0 mg/kg), respectively.

For the Harbor Reference comparisons, lead was statistically significant in Site 1 clam tissue, while copper was statistically significant in Sites 1 and 2 worm tissue and nickel in Site 2 worm tissue (Table 11). Again, the level of elevated bioaccumulation in the test tissues compared to the harbor reference was relatively low. The lead level in the Site 1 test tissue (3.8 mg/kg) was 1.4 times that of the Harbor Reference level (2.8 mg/kg). The worm levels of copper were Site 1 and 2 test tissue was 1.1 times the Harbor Reference level (7.6 mg/kg) for both sites. The Site 2 nickel level (1.2 mg/kg) was only 1.2 times the Harbor Reference tissue level (1.0 mg/kg).

The fact that several tissue samples exposed to test sediments had statistically elevated levels for certain metals does not indicate that ecological impacts would occur at the disposal site. This decision is based upon factors such as toxicological importance of the contaminants, the degree and severity of bioaccumulation, and the potential for biomagnification of contaminants. The metal results indicate that the degree of bioaccumulation in organisms exposed to test sediment was minor (no test tissue was more than 2 times its corresponding reference tissue level). These results would not preclude disposal at either the ocean or harbor site.

Organics

The three types of organic contaminants measured in reference and test tissue were organochlorine pesticides, PCBs, and PAHs. No pesticides or PCBs were detected in any of the reference or test tissues (Tables 12 and 13). PAHs were detected in both clams and worms for both sites. The reference site clam tissues were not at detectable concentrations for PAHs, while both reference site worm tissues had low levels of the PAH naphthalene.

To determine if there are potential ecological impacts at the ocean or harbor disposal sites that could be associated the presence of PAHs at the concentrations presented in Tables 12 and 13, a comparison to regulatory standards can be made.

The Food and Drugs Administration (FDA) has Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food. There are Action Levels for six chemicals measured in this study (mercury, chlordane, DDT + DDE, dieldrin + aldrin, heptachlor + heptachlor epoxide, and PCBs); none of these chemical exceeded the Action Levels. There are no Action Levels for PAHs. The EPA does, however, have fish tissue screening level guidelines for cancer and non-cancer risk for several of the PAHs analyzed in this study (USEPA 1997). These guidelines are presented in Table 14.

Table 14 first compares the dry weight ERL and ERM benchmark values to the test sediment results. This comparison indicates that Site 2 sediment was slightly above the ERLs for acenaphthene and fluorine and that there is a low likelihood of toxicity due to exposure to the sediment. This was confirmed by the lack of toxicity observed in the solid phase tests.

Table 14 also compares the EPA's wet weight guideline values for screening level hazard comparisons for humans were compared to the wet weight PAH levels in clam and worm tissue. This comparison indicates that benzo(a)pyrene in clam tissue for both test sites (59.1 and 52.0 μg/kg), respectively exceeded the cancer risk concentration of 15 μg/kg for humans. No other PAHs exceeded cancer or non-cancer guideline levels.

Benzo(a)pyrene bioaccumulation in clams is a potential concern because (1) benzo(a)pyrene is a known carcinogen, and (2) clams are not able to metabolize PAHs and are, therefore, able to pass them to higher trophic levels. The EPA guidelines presented in Table 14 are for fish and not clam tissue. Applying a trophic transfer rate from clams to fish of 0.1 to the benzo(a)pyrene concentration in the clam tissue would result in fish tissue levels of 5.9 and 5.2 for Sites 1 and 2, respectively (USEPA 2000). These levels are below the EPA cancer guidelines for humans benzo(a)pyrene. Therefore, disposal of the proposed dredged material at either the ocean or harbor sites would not likely cause significant bioaccumulation impacts for humans.

Table 14
PAH Concentrations Compared to NOAA ERLs and ERMs and EPA Screening Level Hazard Guidelines

Analyte	Sediment ERL (µg/kg dry wt.)	Sediment ERM (µg/kg dry wt.)	Site 1 Sediment Composite (µg/kg dry wt.)	Site 2 Sediment Composite (µg/kg dry wt.)	Fish Tissue Conc. = EPA 10^{-5} Risk (µg/kg wet wt.)	Fish Tissue EPA Noncancer Hazard Quotient = 1 (µg/kg wet wt.)	Site 1 Clam (µg/kg wet wt.)	Site 1 Worm (µg/kg wet wt.)	Site 2 Clam (µg/kg wet wt.)	Site 2 Worm (µg/kg wet wt.)
Acenaphthene	16	500	ND	***21***		650000	ND	ND	2.6	9.7
Acenaphthylene	44	640	ND	ND			ND	ND	ND	ND
Anthracene	85.3	1100	16	44		3200000	ND	6.5	12.3	20.9
Benzo[a]anthracene	261	1600	20	54	150		8.9	ND	29.1	11.2
Benzo[a]pyrene	430	1600	69	100	15		***59.1***	8.8	***52.0***	8.0
Benzo[b]fluoranthene			89	140	150		63.9	12.0	64.8	12.5
Benzo[g,h,i]perylene			28	30			ND	ND	ND	ND
Benzo[k]fluoranthene			69	100	1500		40.3	12.5	37.0	11.4
Chrysene	384	2800	50	100	15000		14.7	ND	44.8	26.0
Dibenzo[a,h]anthracene	63.4	260	ND	ND	15		ND	ND	ND	ND
Fluoranthene	600	5100	16	92		430000	ND	3.3	80.8	48.4
Fluorene	19	540	ND	***21***		430000	ND	ND	2.1	4.1
Indeno[1,2,3-c,d]pyrene			21	24	150		ND	ND	ND	ND
Naphthalene	160	2100	ND	32		430000	4.5	10.6	ND	15.5
Phenanthrene	240	1500	ND	57		3200000	ND	5.4	16.5	51.0
Pyrene	665	2600	110	290		320000	61.5	15.5	141	51.5
AverageTotal PAHs	4022	44792	448	1100			185	43.6	413	244

bold = concentrations that exceed guideline levels
dry wt. = dry weight
µg/kg = microgram per kilogram
PAHs = polycyclic aromatic hydrocarbons
wet wt. = wet weight

For assessing potential bioaccumulation risk to ecological receptors, measures of exposure for a chemical of potential concern (COPC) can be compared to ecotoxicity reference values (ERVs) for that COPC and receptor group type (Table 15). For developing appropriate ERVs, receptor group types include aquatic mollusks (relevant for clam tissues) and aquatic annelids (relevant for worm tissues). Briefly, ERVs are applied as critical tissue values (CTVs) for effects-based whole-body concentrations of COPCs in the appropriate aquatic receptor groups.

Measures of bioaccumulation exposure for COPCs in the aquatic receptor groups can be assessed as whole-body concentrations for a COPC in a particular receptor. This “critical body residue” approach is a method for assessing exposure estimates for COPCs in aquatic receptors in complex and/or multistep food web systems (e.g., McCarty and Mackay 1993; Jarvinen and Ankley 1999; Jarvinen et al. 1998; Field 1998). It is noted that: “Biomarkers and tissue residues are particularly useful when exposures across many pathways must be integrated and when site-specific factors influence bioavailability.” (USEPA 1998; p. 69).

Effects-based critical body residues are referred to as CTVs. COPC concentrations in whole-body samples of clams and worms can be compared to effects-based whole-body residue levels for a COPC in mollusks and annelids, respectively (Table 15). The analysis presented on Table 15 indicates that the PAHs levels in calm and worm tissue observed in this study are well below the level where adverse effects would be expected.

5.0 RESULTS SUMMARY

The following is a summary of the study results.

- No solid phase toxicity was observed, therefore the proposed dredged material meets the limiting permissible concentration (LPC) for benthic impacts.
- No suspended particulate phase toxicity in Site 1 sediment test, therefore the Site 1 LPC for water column impacts is met.
- No silverside or mysid shrimp suspended particulate toxicity in Site 2. Toxicity was observed in the Site 2 bivalve larvae test, but evidence indicates it was caused by elevated unionized ammonia levels. The LPC for water column impacts is, therefore, met by Site 2 sediment.
- Low levels of metal bioaccumulation, no pesticide or PCB bioaccumulation, and acceptable levels of PAH bioaccumulation were observed, therefore the dredged material meets the LPC for bioaccumulation impacts.

Table 15
PAH Concentrations in Test Tissue Samples Compared to Available Effects-Based Critical Tissue Values

Analyte (all values wet wt.)	Site 1 Clam (µg/kg)	Site 2 Clam (µg/kg)	Clams/molluscs (whole body) (USACE)[a]		Site 1 Worm (µg/kg)	Site 2 Worm (µg/kg)	Worms/annelids (whole body) (USEPA/Duluth)[b]		Worms/annelids (whole body) (USACE)[a]	
			No Effect[c] (µg/kg)	Adverse Effect[c] (µg/kg)			No Effect[c] (µg/kg)	Adverse Effect[c] (µg/kg)	No Effect (µg/kg)	Adverse Effect[c] (µg/kg)
Acenaphthene	ND	2.6		29400	ND	9.7				
Acenaphthylene	ND	ND			ND	ND				
Anthracene	ND	12.3			6.5	20.9	3400-52400	6300-52400		
Benzo[a]anthracene	8.9	29.1	600		ND	11.2				
Benzo[a]pyrene	59.1	52.0	2.21-1250	300	8.8	8.0				
Benzo[b]fluoranthene	63.9	64.8			12.0	12.5				
Benzo[g,h,i]perylene	ND	ND			ND	ND				
Benzo[k]fluoranthene	40.3	37.0			12.5	11.4				
Chrysene	14.7	44.8	930		ND	26.0				
Dibenzo[a,h]anthracene	ND	ND			ND	ND				
Fluoranthene	ND	80.8	1290	220	3.3	48.4	12500-250000	25000-250000		
Fluorene	ND	2.1			ND	4.1	189000			
Indeno[1,2,3-c,d]pyrene	ND	ND			ND	ND				
Naphthalene	4.5	ND			10.6	15.5				
Phenanthrene	ND	16.5		30700	5.4	51.0	780	780	780	780
Pyrene	61.5	141	1080		15.5	51.5	0.8-380000	10000-465000	0.8-380000	380000-465000
Average Total PAHs	185	413			43.6	244				

µg/kg = micrograms per kilogram
USACE = US Army Corps of Engineers
USEPA = US Environmental Protection Agency
wet wt. = wet weight
[a]USACE. 2002. Environmental Residue-Effects Database (ERED).
[b]Jarvinen, A.W. and G.T. Ankley. 1999.
[c]effect levels focused on ecologically relevant endpoints of reductions in growth/development, reproduction, or survival.

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Final Report

DREDGE MATERIAL EVALUATION MAINTENANCE DREDGING OF VARIOUS BERTHS, 2003 PORT OF LOS ANGELES

Final Report

DREDGE MATERIAL EVALUATION
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1.0 EXECUTIVE SUMMARY

This report presents the results of an environmental characterization of sediments from twelve different berth areas located throughout the Port of Los Angeles (Figure 1, Table 1) where the Los Angeles Harbor Department (Port) plans to conduct maintenance dredging. The planned dredging will involve removing approximately 87,650 cubic yards of sediment to various dredge depths. In addition to maintenance dredging, this report also presents the results of an environmental characterization of sediments to be dredged as part of a future deepening project at Berths 122 through 131. The total volume of material tested for this future deepening is approximately 84,000 cubic yards, and it encompasses the sediments from the maintenance dredging elevations down to an elevation of –55 ft mean lower low water (MLLW). Samples for future deepening were taken separately from those for the maintenance-dredging program.

Disposal options for sediments to be removed from the berths associated with this program are being studied. Options for clean dredge materials include offshore disposal at LA2; however, reuse of this material would be preferred. For dredge materials meeting criteria for open-water disposal, options include landfill reuse, upland storage, or storage at the Pier 400 submerged storage site being constructed as part of the Channel Deepening Project. For dredge materials not meeting criteria for open-water disposal, reuse in a confined disposal facility or upland disposal site are options.

Of the 12 berth areas proposed for maintenance dredging, recent data (within the last three years) exists for four of the areas. Further testing was not conducted on these sediments. However, for the sake of convenience, the results of the previous testing conducted on the sediments from these four areas are summarized in this report, and the original test reports are referenced. Sampling and testing was carried out as defined in the project Sampling and Analysis Plan (Kinnetic Laboratories/ToxScan, 2003) previously reviewed by the Port and regulatory agencies.

Vibracore samples were taken in each berth area not previously characterized and combined into appropriate composite samples to be representative of the sediment to be dredged. A composite sample consisting of five or six sampling locations was formed for every 10,000 cy or so of material to be removed for maintenance dredging purposes. For future deepening purposes, a composite sample was formed for every 30,000 cy or so of material because of the likelihood that deepening sediments consist of virgin material with less anthropogenic influence.

A phased approach was used for testing each of the sediment composites. For all composite samples, composite testing consisted of bulk sediment physical and chemical analyses and biological and chemical testing of the sediment elutriates. Sediment data were then evaluated using State of California Title 22 criteria and effects range-low (ERL) and effects range-median (ERM) values derived by Long et al. (1995) to see if testing for open water disposal was warranted. Elutriate data were compared to background water and evaluated using chronic and acute criteria promulgated in the California Toxics Rule (40 CFR Part 131, EPA 2000). For those composite samples representing sediments that looked like possible candidates for open water reuse/disposal, additional toxicity testing and bioaccumulation assessments were also conducted. Additional chemical analyses were also performed on individual cores in order to allow for more than one or two disposal options for problematic composite areas.

As specified in the Inland testing Manual (USEPA/USACE 1998), toxicity and bioaccumulation results were statistically evaluated against reference sites that are nearby planned unconfined aquatic disposal areas and have similar characteristics to those areas. For this study, reference sediments were collected, using a bucket dredge, at the LA2 Reference Site to represent the LA2 Deep Ocean Disposal Area and in the Outer Harbor near Pier 400 to represent in-harbor disposal areas.

The results of this study were used to evaluate the potential suitabilities of reuse/disposal options. Contaminants of concern were found in all composites at concentrations in excess of ERL and/or ERM sediment guidance values. Decisions were made not to further test sediments for open water disposal from Berths 36, 153-155, 165-167, 177-179, and 180-181 because of generally high concentrations of multiple contaminants of concern.

Sediments from most of the other berth areas that were further tested showed fairly substantial bioaccumulation of PCBs and PAHs that would seem to preclude open water disposal as an option, though toxicity of tested sediments generally did not exceed Limiting Permissible Concentrations (LPCs). The bioaccumulation results were evaluated using the USACE Biota/Sediment Accumulation Factors (BSAFs) database to see if the tissue concentrations measured were within expected ranges and with the USACE/USEPA Environmental Residue Effects Database to assess if toxicity results were consistent with the tissue burdens measured. With few exceptions, mostly minor, and within the expected limitations of these generalized databases, the results of these bioaccumulation tests fall within the range of predicted BSAFs values and the toxicity results are generally as expected from the Residue Effects Database.

The lack of toxicity exceeding LPCs and minimal contamination found in elutriate samples should allow the sediments from all berth areas to be suitable for placement at an in-harbor confined aquatic disposal facility. Because all analytes from all samples were below California Code of Regulations Title 22 criteria and very little contaminant leaching occurred, the sediment from all berth areas should also be acceptable for upland disposal.

An initial evaluation of the suitability of each composite sample tested is summarized in the table that follows. Final determinations of suitabilities of these sediments for given categories of reuse/disposal will be made by regulatory agencies and matched to options available to the Port.

Initial Suitability Categories of Tested Sediments for POLA 2003 Maintenance Dredging

Composite Area	Dredge Volume (cy)	Open Water	Confined Aquatic	Upland
36	750	Not Tested	Suitable	Suitable
90-92 & 93A-93B	10,100	Not Suitable	Suitable	Suitable
122-124 Maintenance Dredging	6,500	Suitable	Suitable	Suitable
122-124 Future Deepening	24,000	Not Suitable	Suitable	Suitable
125-126 Future Deepening	29,000	Not Suitable	Suitable	Suitable
127-131 Maintenance Dredging	6,700	Not Suitable	Suitable	Suitable
127-131 Future Deepening	31,000	Not Suitable	Suitable	Suitable
153-155	13,300	Not Tested	Suitable	Suitable
165-166	4,300	Not Tested	Suitable	Suitable
177-179	10,400	Not Tested	Suitable	Suitable
180-181	8,200	Not Tested	Suitable	Suitable
226-231A	25,200	Not Suitable	Suitable	Suitable
226-231B		Not Suitable	Suitable	Suitable
226-231C		Not Suitable	Suitable	Suitable
240B	6,500	Not Suitable	Suitable	Suitable

2.0 INTRODUCTION AND PURPOSE

The Los Angeles Harbor Department (Port) is planning to carry out maintenance dredging at various berths throughout the Port of Los Angeles. The plan involves dredging approximately 87,650 cubic yards of sediment from several berths within the Port to various dredge depths.

Dredging is planned at the twelve berth areas illustrated in Figure 1 and listed in Table 1. Table 1 also presents the proposed dredge depths, estimated dredge material volumes, and sampling requirements for each berth included in this program. The proposed dredge depths and estimated dredge material volumes include a two-foot overdredge allowance.

In addition to maintenance dredging, this report evaluates sediments from Berths 122 through 131 that are proposed for future deepening. Deepening involves dredging sediments from the currently proposed maintenance dredge depth to an elevation of –55 ft MLLW. Samples for testing were taken in this lower layer separately from those for the maintenance-dredging program. The total volume of material tested for this future deepening is approximately 84,000 cubic yards.

Previous dredge material testing data exists for some of the berth areas to be dredged, and current data (within the past three years) exists for Berth 36, Berths 165-166, Berths 240B, and for the upper layer (maintenance dredging) of Berths 122-124. For convenience, the available data for these berths are summarized in this report and the original test reports are referenced. New sampling and testing was only conducted for the berths and layers of sediment for which current data was not available.

Disposal options for sediments removed from the berths associated with this program are being studied. Options for clean dredge materials include offshore disposal at LA2; however, reuse of this material would be preferred. For dredge materials meeting criteria for open-water disposal, options include landfill reuse, upland storage, or storage at the Pier 400 submerged storage site being constructed as part of the Channel Deepening Project. For dredge materials not meeting criteria for open-water disposal, reuse in a confined disposal facility or upland disposal site are options.

The purpose of this present program was to sample and test sediments from within the proposed maintenance dredging areas to provide sediment quality data for evaluation of dredging and disposal options. This report details sampling methods, analytical and biological testing procedures, and presents and discusses the data gathered.

At the request of the Port, an interim report (Kinnetic Laboratories/ToxScan, 2003) presenting sediment and elutriate chemistry results and elutriate bioassay results was prepared for the Berths 226-231 sediments so that the Port could obtain permits for possible placement of the Berths 226-231 sediments into the Southwest Slip Confined Disposal Facility. Subsequent to the report, additional bioassay and bioaccumulation testing was conducted on the sediments to keep open the option for possible unconfined aquatic disposal. The results presented in the interim report are reported and discussed again in this report along with the results from the bioassay and bioaccumulation testing.

2.1 Previous Studies

Previous environmental sampling programs associated with dredging projects within the Port of Los Angeles provide analytical and toxicity data pertinent to several of the berthing areas listed in Table 1. These data are discussed for each berthing area separately below. Bulk sediment chemistry data are discussed in terms of effects range-low (ERL) and effects range-median (ERM) values. These values were derived by Long et al. (1995) as estimates of low (ERL) and median (ERM) concentrations of certain chemical constituents that are expected to cause toxicity to aquatic organisms. Table 2 lists available ERL and ERM values for selected analytes.

2.1.1 Berth 36

AMEC Earth and Environmental, Inc. (2001a) sampled the Berth 36 sediments in October of 2001. Two locations were sampled with a vibracore to a project depth of –15 ft MLLW. Bulk sediment and elutriate samples were prepared from the sediments at each location. The results of this study are summarized in Appendix A. Sediment analyses revealed nickel at a concentration that exceeded the ERM value in one of the samples. Chlordane was found in concentrations greater than the ERM in both of the samples, and some individual PAHs exceeded the ERM in one of the samples. ERLs for several metals and PAHs were exceeded in one sample. Analyte concentrations in elutriates prepared from the sediments were the same as the analyte concentrations found in the background water. AMEC concluded the Berth 36 sediments were suitable for upland disposal. No further sampling and testing were conducted at this berth.

2.1.2 Berths 90-92 and 93A and 93B

There are no known previous studies conducted in the vicinity of Berths 90-92 and 93A and 93B.

2.1.3 Berths 122-124

There are two recent pertinent studies conducted on the sediments from Berths 122-124. Most recently, AMEC (2001b) sampled Berths 121-124 in February of 2001. Twelve locations were sampled with either a vibracore or pipe dredge. Five of these locations were in front of Berths 122-124. These five locations were combined into a single composite sample and subjected to bulk sediment analyses and bioassay and bioaccumulation assessments. The project depth for this study was –48 ft MLLW. The results of this study are provided in Appendix A. Copper, lead and nickel were found in concentrations between the ERL and ERM. There was no toxicity observed in the test organisms, and only slight bioaccumulation of metals and PAHs were observed in the tissues of clams. There was also no bioaccumulation or toxicity observed from the sediments sampled in front of Berth 121. AMEC concluded that the sediments were suitable for ocean disposal at LA2.

A few years prior to the AMEC (2001b) study, Ogden (1997) sampled the sediments in front of Berths 121-126. Using a vibracore they sampled ten locations; five were in front of Berths 121-124 and five were in front of Berths 125-126. A single composite was made of the five cores in front of Berths 121-124. The project depth was to –47 ft MLLW. Copper and nickel were found in concentrations between the ERL and ERM. Significant bivalve larvae toxicity was observed in the 100% elutriate of the sample. Significant copper bioaccumulation was found in the tissues of clams and significant zinc and arsenic bioaccumulation were found in the tissues of worms. Despite the observed toxicity to bivalve larvae, disposal of the sediments would not exceed the Limiting Permissible Concentration (LPC) at the LA2 ocean disposal site after the 4-hour initial mixing period. The metals bioaccumulation never exceeded 1.4 times the average reference levels. Ogden concluded that the Berths 121-124 sediments were suitable for disposal at the LA2 disposal site.

In 1999, the sediments from Berths 121-124 were dredged and disposed of at LA2. This should have removed the sediments that had the potential to cause adverse biological effects. Based on the AMEC (2001b) study, no further sampling was conducted in 2003 on the sediments slated for maintenance dredging. Additional testing was only conducted on sediments slated for future deepening to –55 ft MLLW.

2.1.4 Berths 125-126

The sediments from Berths 125-126 were sampled and tested in April of 1997 by Ogden (1997) and subsequently dredged in 1999. The dredged sediments were disposed of at LA2.

Ogden (1997) analyzed a single composite from Berths 125-126 comprising five cores. This composite sample was subjected to bulk sediment chemical analysis along with bioassay and bioaccumulation assessments. The results from the composite sample are summarized in Appendix A. The only analytes to exceed the ERL in the composite sample were copper, mercury, and nickel. No analytes exceeded the ERM. Significant chronic and acute toxicity were observed by bivalve larvae exposed to the 100% elutriate made from the composite sediments. Despite the observed water column toxicity, it was determined that Berths 125-126 sediments would not exceed the LPC upon disposal at the LA2 site after initial mixing. Statistically significant bioaccumulation of copper and zinc was found in the tissues of worms exposed to the test sediments. However these concentrations were at levels below 1.4 times the reference tissue concentrations.

Except in one area, significant shoaling has not taken place since the Berths 125-126 sediments were dredged in 1999. Therefore, for most of the area, additional testing was only conducted on sediments slated for future deepening to –55 ft MLLW. In the one shoaled area, a separate sample was collected from one core of the sediments from the mudline elevation to the maintenance dredging depth of –47 ft MLLW.

2.1.5 Berths 127-131

The sediments from Berths 127-131 were most recently sampled in June of 1995 (Ogden, 1995). Using a vibracore, the sediments were sampled to a project depth of –46 ft MLLW. Ten locations were sampled and formed into a single composite sample that was subjected to bulk sediment analyses and bioassay and bioaccumulation assessments. Sediment copper and nickel were the only constituents that exceeded the ERL, and no constituents exceeded the ERM. Significant low-level solid phase toxicity was observed in worms but worm survival was high (84%) in the test sediment, and statistical significance was due to high reference survival (97%) and very low intra-replicate variability in both reference and test sediment exposures. Significant toxicity was also observed for mysid shrimp and bivalve larvae in the 100% sediment elutriate. Despite the observed water column toxicity, it was determined that sediments from Berths 127-131 would not exceed the LPC upon disposal at the LA2 site after initial mixing. Statistically significant bioaccumulation of cadmium and lead was found in the tissues of clams exposed to test sediments, and significant bioaccumulation of selenium was found in the tissues of worms exposed to test sediments. DDE was found in the tissues of both clams and worms after exposure to test sediments, but a higher concentration of DDE was found in tissues from worms exposed to the LA2 reference site. DDE bioaccumulation was statistically significant in clams, primarily because no DDE was detected in Reference clams. The statistical significance of the cadmium, lead and selenium accumulation was probably related to low intra-replicate variability. Ogden concluded that the Berths 127-131 were acceptable for disposal at LA2.

The sediments from Berths 127-131 were dredged in 1996 and disposed of at the LA2 disposal site. Seven years of sediments have accumulated in front of Berths 127-131 since the last dredge operation, therefore additional sampling and testing was conducted on the sediments to be dredged in 2003.

2.1.6 Berths 153-155

There are no known previous studies conducted in the vicinity of Berths 153-155. Therefore these sediments were sampled as part of the 2003 maintenance dredging effort.

2.1.7 Berths 165-166

The sediments from Berths 165-166 were sampled and tested in June of 2002 by Kinnetic Laboratories/ToxScan Inc. (2002). Four cores were collected to a project depth of –40 ft MLLW (-38 ft MLLW plus two feet overdredge allowance). A single composite sample was generated and subjected to bulk sediment and elutriate analyses. Results of this testing program are summarized in Appendix A. These data showed that concentrations of contaminants relative to ERL guidelines were elevated for a series of metals, PAHs, and PCBs. In addition, mercury, DDT compounds, and pyrene were at concentrations that exceeded ERM guidelines. Contaminant concentrations in the elutriate extract were all below applicable water quality criteria. Thus impacts to harbor waters from solubilizing contaminants into the water column during dredging or from return of decant water should not be a problem.

The Kinnetic Laboratories Inc. (2002) study concluded that the approximately 4300 cubic yards of sediments to be dredged from Berths 165-166 are probably not suitable for open water disposal. However, all sediment contaminant concentrations were below Title 22 criteria (CCR Title 22 §66261.24). Therefore, disposal of these sediments should be possible at a landfill or upland site where contact with aquatic organisms is not a factor. Further toxicity and bioaccumulation testing would be required if the possibility of open water disposal was to be considered. No further sampling and testing was conducted for this effort.

2.1.8 Berths 177-179

The last time sediments from Berths 177-179 were dredged was in 1992. ToxScan (1991) performed the dredge and disposal suitability study on one composite sample and found high levels of DDT and PCBs (greater than the ERM) and elevated levels of PAHs. They also observed amphipod and worm toxicity as well as significant bioaccumulation of metals in clams and worms, and DDD in worms. The sediments were placed in the Pier 300 landfill. Because it has been more than three years since the last dredging, additional sampling and testing was conducted on the sediments to be dredged in 2003.

2.1.9 Berths 180-181

There are no known previous studies conducted in the vicinity of Berths 180-181. Therefore these sediments were sampled as part of the 2003 maintenance dredging effort.

2.1.10 Berths 226-231

The last time sediments from Berths 226-231 were dredged was in 1993. ToxScan (1990) performed the dredge and disposal suitability study on one composite sample from Berths 229-232 and found elevated levels of DDE (just short of the ERM). There was no observed toxicity in any of the particulate phase or suspended particulate phase bioassays. There was significant bioaccumulation of several metals and DDE in the tissues of clams and worms exposed to the test sediments. The sediments were disposed of at LA. Because of the 10 years since the last dredging, additional sampling and testing was conducted on the sediments to be dredged in 2003.

Another study that may be relevant was conducted in 1997 on the sediments adjacent to Berths 226-231 at Berths 233-236 (ToxScan, 1997). Two composites were analyzed. There were elevated levels of total DDT, PCBs, and PAHs in both composites. One composite showed significant toxicity to amphipods when compared to the reference site. This composite also showed significant bioaccumulation of DDTs and pyrene in the tissue of clams exposed to the test sediments and of DDTs, PCBs, and copper in the tissue of worms exposed to the test sediments. Sediments from Berths 233-236 have not been dredged since the 1997 testing.

2.1.11 Berth 240B

AMEC (2001c) sampled the Berth 240B sediments in December of 2000. They sampled the sediment of two thin shoaled areas using a vibracore. Three sampling locations were located within one shoaled area and two sampling locations were located within the second shoaled area. Samples were collected to a project depth of –37 ft MLLW in the first shoaled area and –39 ft MLLW in the second shoaled area. Sediments from all five sampling locations were combined into a single composite sample and subjected to bulk sediment analyses and bioassay/bioaccumulation assessments. The results of this study are summarized in Appendix A. Cadmium, copper, lead, and total PAHs were detected in concentrations between the ERL and ERM. Mercury was found at a concentration twice the ERM. No significant toxicity was observed in animals exposed to the sediments or elutriates prepared from the sediments. There was significant bioaccumulation of metals and PAHs in the tissues of clams exposed to the sediments. However, none of the analytes were found in tissues at levels greater than those detected in the sediments to which they were exposed. Based on these results, AMEC deemed these sediments suitable for disposal at LA2. These Berth 240B sediments have yet to be dredged. Since it has been less than three years since the sediments have been tested, no further sampling and testing was conducted.

3.0 SCOPE OF STUDY

3.1 Approach

Vibracore samples were taken in each berth area and combined into appropriate composite samples to be representative of the sediment to be dredged. A total of fifty-one locations were sampled within the Port of Los Angeles maintenance dredging project area (Figure 1). Table 1 lists the dredge elevations, the estimated volume of material to be removed, the number of cores collected, and the composite samples formed from each berth area. Core locations are depicted on Figures 2 through 11 and the final sampling coordinates are listed on Table 3. The figures also depict the approximate limits of the dredging operations at each berth location.

Five sampling locations were cored for approximately each 10,000 cy of material to be dredged. Vertical composites were made from each core according to the sampling intervals listed in Table 3. A subsample from each vertical composite was subjected to bulk sediment physical and chemical analyses. The remainder of each vertical composite was used to form the horizontal composites representing all or portions of each berth area. Composite samples consisted of the sediments from the five (or in one case six) sampling locations within each composite area. The proposed dredge area at Berths 226-231 required three composite samples made from the sediments of fifteen sampling locations. The adjacent dredge areas for Berths 90-92 and Berths 93A-93B required only one composite sample comprising sediments from five sampling locations. The proposed dredge area at Berths 153-155 required one composite sample comprising sediments from six sampling locations. The remaining six proposed maintenance-dredging areas each required one composite sample comprising sediments from five sampling locations each.

In addition to the various composites to be formed for maintenance dredging evaluation, three additional composite samples were formed from the core material below the maintenance dredging project elevations to –55 ft MLLW at Berths 122-124, 125-126 and 127-131 for potential future deepening of these berths. More than half of the sediments from Berths 127-131 were sampled for both maintenance dredging and future deepening, and Berths 122-124 sediments were only sampled for the purpose of future deepening because recent data exists for the sediments to be removed for maintenance dredging. Also, most of the Berths 125-126 sediments were only sampled for the purpose of future deepening because the current mudline elevation is below the intended maintenance dredging elevation. The upper potion of a single core was used to sample the surface sediments (-43.2 to –47 ft MLLW) from a small shoaled area within the Berths 125-126 dredge area. This sample was subjected to only bulk sediment physical and chemical testing to see if the upper sediments within the shoaled area were noticeably different from the sediments to be removed for the future-deepening project. Because of the likelihood that deepening sediments consist of virgin material with less anthropogenic influence, the yardage of material to be dredged for deepening purposes is much larger per composite sample (approximately 30,000 cy) then the approximately 10,000 cubic yards per maintenance dredging composite.

For all composite samples, composite testing consisted of bulk sediment physical and chemical analyses and biological and chemical testing of the sediment elutriates. For those composite samples representing sediments that looked like good candidates for open water disposal, bioaccumulation assessments and additional toxicity testing were also conducted.

As a cost savings measure, a phased approach was used for the evaluation of the maintenance dredging sediments. The chemical and biological testing procedures detailed in the Inland Testing Manual (ITM), (USEPA/USACE 1998) were used to evaluate the suitability of these maintenance-dredged sediments for unconfined aquatic (open water) disposal. After each phase of testing was completed, critical data review was performed to direct subsequent test phases. If the results of any test phase indicated that the sediment did not qualify for open water disposal, then subsequent testing was directed toward an alternate disposal option, utilizing a confined disposal facility (CDF) within the harbor or an upland site. New guidance (USACE, 2003a) was used to clarify the test procedures on sediments slated for a confined or upland disposal facility.

The first phase of testing for either open water or CDF disposal was bulk sediment chemical analysis on each composite sample. A determination of whether the sediments were hazardous waste was made from the bulk sediment results using Title 22 criteria, supplemented if necessary by WET testing for any analytes that exceed STLC limits. The results were also used to identify sediments that may not be suitable for open water storage or disposal. In addition to the Title 22 criteria, evaluations were made by comparing data with NOAA sediment quality guidelines consisting of ERL and ERM values (Long and Morgan, 1995). These values correlate concentrations of selected contaminants with the likelihood of adverse biological effects. Table 2 lists available ERL and ERM values. Note that ERLs and ERMs have not been developed for all analytes. Those samples that showed low to moderate levels of contamination that would not be expected to produce severe toxicity proceeded to the next phase of open water testing. Sediments with contaminant levels that were judged likely to produce toxicity were further tested following procedures detailed in the Upland Testing Manual (UTM) (USACE 2003a). Three of the twelve composite samples were determined to be unworthy of further testing for open water placement. These composites were made from the sediments of Berths 153-155, 177-179 and 180-181.

This first phase of testing also included elutriate analyses. Both open water and CDF disposal requires chemical analysis of sediment elutriate prepared with water from the dredge site. For open water disposal, the ITM describes methods for preparation of a "standard elutriate", while the UTM requires analysis of an "effluent elutriate," prepared by slightly different methods, for disposal at a confined disposal facility. Elutriate chemistry results were evaluated by comparing them with water quality standards to assure that, after appropriate dilution and mixing have occurred, water quality criteria would not be exceeded. Except for mercury, the water quality criteria used were the "acute" criterion maximum concentrations (CMC) and "chronic" criterion continuous concentrations (CCC) from the California Toxics Rule (40 CFR Part 131, USEPA 2000a). For evaluation purposes, mercury criteria were used from the water quality objectives for marine aquatic life listed in the California Ocean Plan (SWRCB, 2001).

The second phase of testing for CDF disposal, which included the sediments from Berths 153-155, 177-179 and 180-181, is an elutriate bioassay with a single, sensitive water column species. Elutriate toxicity is evaluated to assure that the Limiting Permissible Concentration (LPC) would not be exceeded by effluent water returning to the disposal environment from the CDF.

Testing prescribed by the ITM for open water disposal comprises elutriate bioassays with three water column species, benthic bioassays with two infaunal species, and evaluation of bioaccumulation potential using two sediment-dwelling organisms. After the bioassays were complete, the results were evaluated to determine if sediment toxicity is severe enough to preclude open water disposal.

Following ITM guidelines, results of the test sediments were compared to reference area sediments in the vicinity of the disposal sites. For this study, an in-harbor reference site has been designated between the Pier 400 submerged storage site and the outer harbor breakwater near 33° 43.5' N and 118° 15.5' W (Figure 1). Reference sediment from near the LA2 ocean disposal site (33° 37.1' N and 118° 17.4' W) was also tested.

Suspended particulate-phase (water column) bioassays using mysids, fish and larvae of mussels or oysters were conducted on sediments considered for open-water disposal in the harbor. Standard elutriates were prepared with water collected from the main channel, and dilution water consisted of clean open-coast seawater at the bioassay laboratory in Santa Cruz. Concurrent bioassays were performed on elutriates and laboratory control water. Results of the elutriate bioassays were statistically compared with control water bioassays. Elutriates that produce significantly greater toxicity than control water were identified, and if mortality and/or development effects were sufficiently high to produce LC50 and/or EC50 values, initial mixing calculations were performed to specify limiting permissible concentrations (LPCs). Sediments that do not exceed their LPCs may be placed at an open-water disposal site.

Solid phase (benthic) bioassays were also conducted on sediments considered for open-water disposal using worms and amphipods. Test sediments underwent bioassay testing concurrently with the reference sediments collected both from the vicinity of the outer harbor disposal site and from the vicinity of the LA2 offshore disposal site, and with control sediments collected from the organisms' home environment. Results of the benthic bioassays were statistically compared with reference sediment bioassay results. Test sediments that produced statistically greater mortality than reference sediments in which test mortality exceeded reference mortality by greater than an allowable percentage, were considered to exceed the Limiting Permissible Concentration (LPC) for disposal.

The 28-day bioaccumulation exposures were performed on sediments considered for open water disposal using worms and clams. Test sediments were exposed concurrently with reference and control sediments. If sediments were not severely toxic to benthic species, the final phase of testing for open water disposal was accomplished by analyzing the tissues of organisms that completed the 28-day exposures to test sediments along with control and reference sediments. Concentrations of metal and organic contaminants in tissues of organisms exposed to reference sediments were compared with concentrations in organisms exposed to test sediments. Constituents that showed statistically significantly elevated concentration in test tissues were considered to be potentially bioaccumulative, and were then evaluated to determine if these levels are biologically important.

4.0 METHODS

4.1 Sampling Methods

4.1.1 Sediment Sampling

Vibracore sampling was conducted from the Kinnetic Laboratories survey vessel the *D.W.HOOD*. This 35-foot survey vessel is equipped with a hydraulic A-frame and winch suitable for handling the coring equipment. Accompanying the *D.W. HOOD*, was a 17-foot Boston Whaler. This chase boat was used to assist the *D.W. HOOD* with three-point anchoring and to transport cores to a shore-based processing area.

Sample coordinates, water depths, and mudline elevations corrected to MLLW were recorded at each sampling location. Navigation and final positioning were conducted using a Garmin 215D series differential GPS navigation system, operating in differential mode. Water depths were measured with a graduated lead line. Tidal stage was determined using *Tide Tool 2.1a* software checked against a local tide gauge. Figures 2 through 11 show the core locations sampled and Table 3 lists the core lengths obtained, mudline and sample recovery elevations, number of cores collected at each sampling location, and final positions of each location.

Coring was conducted with a vibracore built by Kinnetic Laboratories. This vibracore consists of a 4-inch diameter aluminum coring tube lined with clean polyethylene tubing, a stainless steel cutting tip, and a stainless-steel core catcher. The vibrating unit has two counter-rotating motors encased in a waterproof aluminum housing. A three-phase, 240-volt generator powers the motors. The vibracore head and tube were lowered overboard with a hydraulic A-frame and winch. The core tube was allowed to penetrate the surficial materials below the mudline as far as possible under the static weight of the vibracore unit. The unit was then vibrated until it reached project depth plus two feet for overdredge, or until the vibracore was rejected from further penetration. To accurately calculate penetration depth, the lead-line measurements were taken just prior to the coring operation.

After successfully penetrating to the desired depth, power was shut off to the vibracore head, and the vibracore was brought aboard the vessel. A check valve located on at the top of the core tube reduces or prevents sediment loss during pullout. The length of sediment recovered was noted by measuring down the interior of the core tube to the top of the sediment. The core tube was then detached from the vibra-head and the core cutter and catcher were removed. The core liners were then sealed and the core tubes were capped and transported to the shore-based processing facility. Two cores were taken at numerous sampling sites to ensure sufficient material for analytical and biological testing.

Except for the plastic bucket dredge used for reference sediment collection, all sample contact surfaces were either stainless steel, polyethylene, Halar®, or Teflon coated. Compositing tools were stainless steel or Halar®-coated stainless steel. All contact surfaces of the sampling devices were cleaned for each sampling area. The cleaning protocol consisted of a site-water rinse, a Micro-90® soap wash, steam cleaning, and then finished with deionized water rinses.

4.1.2 Water Sampling

Water was collected from the main channel during two different occasions for use in preparing elutriates for chemical analyses and bioassays. A sample of background water was also collected during each occasion to assess ambient aquatic chemistry. The first set of water samples collected were used exclusively for Berths 226-231. The second set was used for the remaining dredge areas.

A peristaltic pump with Teflon tubing was used to collect water from a depth of 1 ft below the water surface. Water for chemical analysis was pumped into protocol-cleaned 10 liter *borosilicate glass bottles.* Water for biological testing was pumped into 5-gallon polyethylene containers. All water samples were iced and shipped to the analytical laboratory where they were held at 4ºC until used.

4.1.3 Core Processing

Following retrieval, all cores were transported to a shore-based processing area and kept in a refrigerated truck until processed. Sediment cores were processed by extruding the core liners and sediment onto cleaned PVC core racks. The liners were then cut open with a clean pair of scissors. If extrusion was not possible, the core tubes were split lengthwise using a double-cut shears to expose the core liner. Once exposed, sediment that came in contact with the core liner was removed with a pre-cleaned stainless steel spoon.

Before sub-sampling, each core was photographed, measured, and lithologically logged according to the United Soil Classification System (USCS). Additional sediment characteristics including likely sediment origin and other observations were also recorded. Logged physical characteristics for each core can be found in the geotechnical report prepared by Diaz Yourman & Associates and attached as Appendix C.

Following logging, a vertical composite was taken from each core by a vertical scrape protocol that resulted in equal sub-sampling along the entire length of the core. Part of each vertical composite was subjected to separate chemical analysis while the other part was used to form a composite sample. Sub-samples were also taken from each core for later analysis of physical characteristics.

Sediment composites were formed for bulk sediment chemistry, elutriate, and possible bioassay testing. Vertical composites were collected first from each core. Then a proportionate amount of the five (or six) vertical composite samples from each composite area were transferred into a pre-cleaned stainless steel pan and manually homogenized. A separate protocol-cleaned compositing vessel was used for each composite area. Composite samples were then transferred into appropriate pre-cleaned sample containers. Sediment samples for bulk sediment and elutriate chemical analysis were placed into pre-cleaned and certified glass jars with Teflon-lined lids. Sediment for bioaccumulation and bioassay assessments were placed into pre-cleaned, polyethylene-lined 3.5 gallon buckets with lids. Except for samples to be analyzed for dissolved sulfides, all sediment samples were either packed on ice or placed into a refrigerated truck where they were maintained at 2-4º C until delivery to the laboratory. Samples for dissolved sulfides were placed in a separate polyethylene jar, frozen immediately with dry ice, and kept frozen until analyzed.

All samples were handled under Chain of Custody protocols beginning at the time of collection. Sampling data was also recorded on field log sheets.

4.1.4 Reference and Control Sediments

Samples of reference sediments were collected for biological and chemical testing. Samples were collected from a designated in-harbor reference site (33° 43.5' N and 118° 15.5' W) in the vicinity of a proposed open-water disposal site (Pier 400 Submerged Storage Site, Figure 1) and at the LA2 reference site (33° 37.1' N and 118° 17.4' W). Reference sediments were collected with a chain-rigged, plastic bucket dredge deployed from the *D.W. HOOD*. The bucket dredge was lowered to the bottom at each site and then towed for several minutes around the target sampling coordinates before retrieval. Retrieved sediments were immediately placed into appropriate containers and iced.

Samples of control sediment were collected for biological testing. Control sediment for amphipod bioassays were the "home sediment" from the area where the amphipods were collected. Control sediment for *Nephtys* bioassays were "home sediment" from the area where polychaetes were collected (Tomales Bay). Tomales Bay sediment also served as the control sediment for bioaccumulation exposures.

4.1.5 Documentation

All samples were handled under Chain of Custody documentation. Samples were marked with pre-printed, waterproof labels listing unique alphanumeric identifications. Duplicate information was recorded on the chain of custody form, which also includes sampling information such matrix, analysis, method, and detection limit. Completed Chain of Custody forms accompany the Laboratory Reports on CD-ROM in Appendix E.

The following information was recorded on unique field logs for each boring: station identification, date and time, climatic and rainfall data, sea state observations, total coring time, boring coordinates, core number, depth of penetration, core length recovery, core length requirement, sample type and interval, stratigraphic observations, tidal stage and water depth. Copies of the field logs are provided in Appendix D.

4.2 Laboratory Testing Methods

4.2.1 Bulk Sediment Analysis

ToxScan, Inc. (Cal-ELAP No. 1515), a State Certified analytical laboratory, performed all chemical and biological analyses. Only USEPA and USACE approved methodologies were used.

Bulk sediment analytical parameters, methods, and proposed detection limits are presented in Tables 4 and 5. Sediment samples were analyzed in a manner consistent with guidelines for dredge material testing methods in the USEPA/USACE ITM (USEPA/USACE 1998). Samples were extracted and analyzed within specified EPA holding times, and all analyses were accomplished with appropriate quality control measures.

4.2.2 Elutriate Preparation Methods

Standard elutriates were prepared according to ITM methods. Sediment was mixed with dredge site water in a 4:1 volumetric ratio. Vigorous mixing proceeded for 30 minutes, and the mixture was allowed to settle undisturbed. The clear supernatant was carefully collected and used as the test media for chemical and bioassay analyses. Dissolved metal analyses were performed on a

0.45µ filtered subsample of elutriate. Total metals and organic analyses utilized unfiltered elutriate.

Effluent elutriates were prepared following the methods described in the ITM, (Appendix B-3.3.) A slurry of sediment and dredge site water was prepared at a concentration of 150 g/L (dry weight basis). The slurry was mixed for five minutes to a uniform consistency with a laboratory mixer, and then vigorously aerated for one hour. The aerated slurry was allowed to settle for 24 hours. Afterwards, the supernatant was siphoned off. Prior to the analysis of dissolved metals, the elutriate was filtered through a 0.45µ filter. All other analyses were performed on unfiltered elutriate. Total metals analysis was not required.

The analytes, test methods, and reporting limits for elutriate chemical analysis are presented in Tables 4 and 5.

4.2.3 DI-WET Tests

Leaching characteristics were evaluated by use of a modification of the State of California, Title 22 Waste Extraction Test (WET) known as the DI-WET. This modified WET uses deionized water as an extractant rather than sodium citrate used in the standard WET test.

The DI-WET test involved extracting 50 grams of sediment for 48 hours at a ratio of one part sediment to ten parts deionized water. After extraction, the solution was filtered through a 0.45-micron filter prior to analysis. Analytical results were reported as micrograms of each constituent per liter of extractant.

The DI-WET results were compared against the Title 22 California Code of Regulations (CCR) Soluble Toxicity Concentration Limit (STLC) values to evaluate whether a sample is regarded by California as a hazardous waste.

4.2.4 Bioassay Analyses

For those berth areas where unconfined aquatic disposal is an option, the composite sediments along with reference-area and control sediments were tested for toxicity and for bioaccumulation potential. Bioassay protocols followed the ITM (USEPA/USACE, 1998) for both Suspended Particulate (elutriate) Phase and Solid Phase bioassays. Phase III testing for CDF disposal requires only a single Suspended Particulate-Phase bioassay.

All species used in this testing program comply with ITM recommendations and guidelines for bioassay and bioaccumulation tests.

For Suspended Particulate-Phase bioassays (open water):

Mysidopsis bahia (mysid)
Menidia beryllina (fish)
larvae of *Mytilus galloprovincialis* (mussel)

For Suspended Particulate-Phase bioassays (CDF disposal):

larvae of *Mytilus galloprovincialis* (mussel)

For Solid Phase Bioassays:

Nephtys caecoides (worm)
Ampelisca abdita (amphipod)

The methods and endpoints used for the bioassays are listed in Table 6.

4.2.5 Bioaccumulation Assessment

The ITM requires a 28-day exposure period of two benthic species to test, reference, and control sediments prior to tissue analysis. The species used for this program, which conform to ITM recommendations, are as follows:

Nereis viriens (worm)
Macoma nasuta (clam)

Following exposure of the organisms to the test sediment, they were placed in a clean, non-stressful environment to purge their systems of test sediment. The purge time was long enough to purge sediment, but not long enough to allow them to depurate accumulated toxicants. Generally, 24 hours was sufficient, but a few organisms were sacrificed to ensure completion of the purge.

Tissue samples were thoroughly homogenized with a stainless steel Tekmar Tissuemizer. The entire blade and barrel assembly was pre-cleaned with hot DI water and Micro 90® detergent and then rinsed thoroughly with DI water. The blade was rinsed again with DI water just prior to use. The Tissuemizer was triple rinsed between samples to minimize sample cross contamination. Samples were triple-wrapped and frozen when not in use. All tissue handling and processing was conducted at a laminar flow bench in a trace-metal clean laboratory.

Bioaccumulation tissue samples for sediment composites that passed the chemical screening and bioassay testing, and qualified as viable candidates for open water disposal were analyzed according to the list of constituents in Table 4. Methods and proposed analytical detection limits for the analysis of these tissues are listed in Tables 4 and 5.

4.2.6 Statistical Evaluations

Statistical analysis of experimental data was performed for each of the bioassay and bioaccumulation assessments. Tests of fundamental assumptions (e.g., variance homogeneity) were followed by the appropriate parametric or non-parametric analyses.

In cases where a contaminant was detected in tissues of organisms exposed to test sediment but was not detected (ND) in reference tissues, a value was assigned to the ND sample which equaled 50% of the analytical detection limit (DL) for that contaminant. This is consistent with interim recommendations published in the ITM (USEPA/USACE, 1998).

Variance homogeneity is one of the underlying assumptions of most parametric statistics. Bartlett's or Cochran's test was therefore applied to the data from the bioassays and the tissue chemistry of the bioaccumulation assessments. Significant results for this and all subsequent parametric tests were determined by the critical value (alpha = 0.05) of the appropriate distributions.

Once homogeneity has been established, the ANOVA and Dunnett's test were employed to analyze differences between treatment responses (e.g., test sediment tanks). Survival responses in the control tanks serve primarily for procedural quality assurance.

When sample variances did not exhibit homogeneity, as determined by Cochran's test, the Testing Manual recommends a data transformation. Arcsine Check was applied to proportional data of bioassays and log(x + 1) was applied to bioaccumulation data which are not homogenous. When the data transformation was unable to compensate the deviation, non-parametric tests were employed.

Non-parametric procedures use ranked values for calculating test statistics and the corresponding hypotheses use rank sums for comparison. Kruskal-Wallace and Wilcoxson-Wilcox tests were used to identify differences between treatment responses.

ITM guidelines for interpretation of suspended particulate-phase bioassays require that initial mixing calculations be performed to determine the concentration of suspended particulate material remaining at the disposal site within four hours after dumping (Csp) for any sample producing toxicity sufficient to generate an LC50. If the Csp does not exceed 1% of the LC50, the sediment was judged to comply with water column toxicity criteria.

Guidelines for interpretation of benthic bioassay results are published in the ITM. If survival responses in test sediment were statistically significantly lower than those in reference sediment *and* if the difference in mean survival between groups was greater than 10% (20% for amphipods), then the test sediment was considered to have the potential to significantly degrade the marine environment.

Guidelines for evaluation of bioaccumulation are described in the ITM and the District Engineer and the Regional Administrator make final interpretation. Therefore, statistical testing of bioaccumulation test phase results was complete when appropriate comparison (Dunnett's or Wilcoxson-Wilcox) described significant or non-significant tissue burden from exposure to dredged material.

4.3 Geotechnical Testing

Diaz Yourman & Associates performed the geotechnical portion of this study. A complete report prepared by Diaz Yourman & Associates, which includes the procedures used to determine grain size distribution and Atterberg limits, has been attached as Appendix C.

5.0 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

Kinnetic Laboratories/ToxScan conducts its activities in accordance with formal QA/QC procedures. The objectives of the QA/QC Program are to fully document the field and laboratory data collected, to maintain data integrity from the time of field collection to storage at the end of the project, and to produce the highest quality data possible. The program is designed to allow the data to be assessed by the following parameters: Precision, Accuracy, Comparability, Representativeness, and Completeness. These parameters are controlled by adhering to documented methods and procedures (SOPs), and by the analysis of quality control (QC) samples on a routine basis. Appendix B describes QA/QC procedures employed in this study as well as a summary of laboratory QA/QC results.

Field Quality Control includes adherence to SOPs and formal sample documentation and tracking. Analytical chemistry Quality Control is formalized by EPA and State Certification agencies, and involves internal quality control checks such as method blanks, matrix spike/spike duplicates, duplicates, surrogates, and calibration standards (USEPA 1994b, 1994c). Standard Reference Materials (SRMs) are also run along with calibration standards for each batch of samples.

Quality assurance measures applied to aquatic toxicity testing are explicitly stated in the various protocols specified. Monitoring of test conditions is important in these quality control measures. Key monitoring factors for the bioassay tests are summarized in Appendix F and include temperature, salinity, pH, dissolved oxygen, dissolved sulfides and ammonia in overlying waters and interstitial waters. Two other important measures are the inclusion of an experimental control, where organisms are simultaneously exposed to laboratory test conditions in the absence of a toxicant stress, and the inclusion of reference toxicant bioassays, where the organisms are exposed to standard toxicants and the results compared to a control chart. A discussion of the QA/QC findings for the biological testing is included in Appendix B, with supporting data tables given in Appendix F.

All analytical data collected for the Malaga Mudstone testing project underwent QA/QC evaluation according to EPA National Functional Guidelines for inorganic and organic data review (USEPA 1994b and 1994c). These data were then qualified if necessary and as appropriate.

A detailed report of laboratory QA/QC findings is located in Appendix B. A summary of findings based upon the validation of the data generated by this project is as follows:

- All chemical analyses were completed within holding times.
- Method blanks for most analyses indicated no contamination associated with most analytical procedures. Exceptions were blanks for chromium, copper nickel, selenium, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, diethyl phthalate, dibutyltin, tributyltin, and monobutyltin associated with some sediment analyses, and chromium, nickel, copper, lead, and zinc associated with some water or elutriate analyses. The concentrations of chromium, copper, and nickel reported in the sediment blanks were insignificant relative to concentrations found in samples. The sediment selenium blank concentration was between 13% and 60% of concentrations reported in the samples. Thus, the associated sediment data were qualified as non-detected (“U”). The organic data warranted qualification (“U”) when sample concentrations were less than five times the blank detection. For the chromium, nickel, copper, lead, and zinc detected in the

water method blanks, all detections were less than five times the project detection limits and therefore no elutriate or water data were qualified.

- Based upon laboratory duplicate analyses, acceptable precision was achieved for all analyses with the exception of total sulfides in sediment and percent lipids in tissues. These results were qualified with a "J" flag.
- Variability between matrix spikes and matrix spike duplicates was within acceptable limits except for dibutyltin, tributyltin, and tetrabutyltin species in sediment and monobutyltin and tetrabutyltin in elutriate samples. One matrix spike duplicate yielded high recoveries for all three species. These results have been annotated with a "J" flag in the chemistry tables. The lack of precision for monobutyltin and dibutyltin is directly related to the consistently poor spike recoveries inherent with the analytical method. In the reference sediments, poor MS recovery for copper and zinc were observed but were not qualified because other QA measures were acceptable. The MS/MSD RPD slightly exceeded QC limits for acenaphthene in reference sediments; no data were qualified because precision was only slightly affected and accuracy was acceptable.
- Surrogate spiked recoveries of metals, chlorinated pesticides, semivolatile compounds and speciated butyltins in sediment and elutriates were all within QC limits with the exception of one compound, 2-Fluorobiphynyl for one sample, which was detected above recovery limits. This resulted in only one compound (acenaphthylene) being qualified as an estimate ("J") for that sample.
- The use and good recovery of standard reference materials, showed a high degree of accuracy for most metals and conventional analyses. The exception was the SRMs for cadmium in one sediment batch and chromium in another. The associated samples were qualified as an estimate ("J").
- Dissolved zinc values associated with some elutriate samples were higher than total values. Even though the QC objectives for the associated samples were met, use of the data should be cautionary.
- Target reporting limits (dry weight basis) were met for most analytes. The exception was butyltins in sediments, where target limits were 1 ug/kg and achieved limits ranged from 1.2 to 1.9 ug/kg. This shortfall in reporting limits is probably not environmentally significant in view of measured concentrations in most sediment samples.
- Bioassay test performance requirements were met except for the *Ampelisca* test where mean survival in home control sediment was 3% below the 90% required for test validity. This survival shortfall was due to high mortality in one of five replicates. The remaining performance criteria were met, and survival in both reference sediments exceeded 90%. The test could not be repeated because of a lack of sediment. The *Ampelisca* test data were judged to be useable, but qualified. All other bioassays met acceptance criteria and were considered valid.
- Monitoring during test performance showed that all measured environmental parameters (temperature, dissolved oxygen, salinity and pH) remained within protocol limits except for a temperature elevation of <1C during the first day of the *Menidia* test started on May 28. This temperature excursion was immediately corrected by adjustment of the temperature controller.
- All bioaccumulation replicate exposure tanks yielded adequate tissue weight to perform required chemical analyses. The temperature of the flow-through seawater system averaged around 14°C, ranging between 12°C and 16°C over the four- week exposure period. Dissolved oxygen, salinity and pH in seawater tanks reflected typical oceanic conditions over the entire exposure period.

- Overall, evaluation of the quality control/quality assurance data indicates that the chemical and toxicity data are generally within established performance criteria and can be used reliably for general characterization of sediments in the proposed project area.

6.0 RESULTS AND DISCUSSION

The results of this study are presented in a series of summary tables. The bulk sediment chemistry results are presented in Tables 7 through 14. Title 22 criteria, ERL and ERM effects levels, and reference sediment results are included in each bulk sediment table to assist in evaluation. The standard and effluent elutriate chemistry results are presented in Tables 15 through 22. California Toxics Rule and Title 22 STLC criteria are included with the elutriate results to assist in evaluation. Survival data for both the solid phase bioassays and LC50 and EC50 data for the suspended particulate phase bioassays are presented in Table 23. Complete analytical laboratory reports are included in Appendix E and bioassay results are included in Appendix F. Summaries of mean tissue concentrations after 30-day exposures of *Macoma nasuta* and *Nereis viriens* to test and reference sediments are presented in Tables 24 and 25.

The results for each berth area sampled for 2003 maintenance dredging and/or future deepening are discussed separately below.

6.1 Berths 90-92 and 93A-93B Maintenance Dredging

Three core samples were collected from Berths 90-92 and two core samples were collected from Berths 93A-93B as illustrated in Figure 2. Each core represents dredge material from the mudline down to –39 ft MLLW. Because of the limited amount of material to be dredged, all five cores from both berth areas were combined into a single composite sample. In addition to bulk sediment and elutriate analyses, bioassays and bioaccumulation exposures were performed on the composite sample. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples.

6.1.1 Bulk sediment chemistry

The composite sample from Berths 90-92 and 93A-93B consisted primarily of sand (59.1%), with lesser amounts of silt (22.1%) and clay (18.9%). In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 90-92 and 93A-93B showed elevated levels of many inorganic and organic constituents (Table 7). However, all hazardous waste constituents were well below Title 22 TTLC criteria. DDE, total DDTs, and several individual PAHs exceeded ERM values, while copper, mercury, total PCBs, and total PAHs exceeded ERL values. Analysis of individual core segments showed generally higher levels of metals contaminants compared to the composite sample, while Sites 3 and 5 appear to contribute a majority of the organics contamination.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 90-92 and 93A-93B composite sample at a concentration of 299 ug/kg. Butyltin concentrations in individual cores ranged from 151 ug/kg (Site 3) to 459 ug/kg (Site 2). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 90-92 and 93A-93B composite sediment results with the reference sites, the Pier 400 reference site showed similar levels of nutrients, metals, petroleum hydrocarbons, DDT, and PCBs but considerably lower levels of butyltins and PAHs. Except for a few metals that were similar in concentration, sediment from the LA2 reference site was generally lower in contaminant concentrations.

6.1.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 90-92 and 93A-93B sediment composite are shown in Table 15.

Dissolved metal concentrations in both the standard and effluent elutriates from Berths 90-92 and 93A-93B were below “chronic” (CCC) screening criteria, and were similar to background water concentrations, although total and dissolve arsenic values were nearly 20 times higher in the standard elutriate and nearly 10 times higher in the effluent elutriate. However, the arsenic values were still below chronic water quality criteria.

Tributyltin concentrations exceeded the CCC criterion by a factor of 37 in the Berths 90-92 and 93A-93B effluent elutriate and by a factor of 80 in the standard elutriate. However, the tributyltin concentration in both elutriates were well below the “acute” (CMC) criterion. The background water sample exceeded the CCC criterion by a factor of seven.

Except for very low concentrations of a few PAHs, none of the organic compounds were detected in either elutriate from Berths 90-92 and 93A-93B, and all organic compounds were undetected in the background water sample.

6.1.3 Toxicity Testing

Water column (suspended particulate phase) bioassay results for Berths 90-92 and 93A-93B sediments (Table 23) indicate no significant toxicity to *Americamysis* or *Menidia* (LC50=>100%) and minor toxicity to *Mytilus* (LC50= 70.9%, EC50 =69%). Initial mixing calculations show that the LPC ***would not*** be exceeded by unconfined aquatic disposal of the sediments.

Benthic (solid phase) bioassay results for the Berths 90-92 and 93A-93B sediment composite are summarized in Table 23. The results indicate that worm survival (*Nephtys*) in these sediments (100%) was not significantly lower than survival in reference sediments from LA2 (98%) or from Pier 400 (94%). Amphipod *(Ampelisca*) survival in Berths 90-92 and 93A-93B sediments (51%) was significantly lower than survival in LA2 reference sediments (92%) and in Pier 400 reference sediments (91%). The difference between survival in test and reference sediments was greater than 20%, meaning that the LPC ***would*** be exceeded for open water disposal.

Note that the *Ampelisca* bioassay showed an 87% survival in home control sediment, which is less than the 90% recommended by the test protocol. This was caused by poor survival in one replicate. This test was judged to be useable because of good reference survival and adequate sediment was not available for a retest.

6.1.4 Bioaccumulation Assessment

<u>Nereis viriens</u>

Analysis of worm (*Nereis*) tissues after exposure to the Berths 90-92 and 93A-93B sediment composite revealed that the mean concentration of only one metal was statistically significantly higher than either of the reference tissue mean concentrations (Table 24). Specifically, the mean tissue concentration of copper was 1.1 times higher than the mean copper concentration in worms exposed to the Pier 400 reference sediment.

Of the organic compounds, no chlorinated pesticides or PCBs were statistically significantly elevated in worm tissue after exposure to Berths 90-92 and 93A-93B sediments (Table 24). However, there were six individual PAH compounds (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, and pyrene) that were statistically significantly elevated when compared with both reference sediments. All six compounds were undetected in the reference tissues. This resulted in tissue burdens for these compounds that ranged from about 9 (benzo(a)pyrene) to 49 (pyrene) times higher than reference tissues. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

Macoma nasuta

Analysis of clam (*Macoma*) tissues after exposure to the Berths 90-92 and 93A-93B sediment composite revealed three metals (copper, lead, and zinc) in mean concentrations that were statistically significantly higher than LA2 reference tissue mean concentrations (Table 25). Copper was 1.3 times higher, lead was 2.6 times higher, and zinc was 1.2 times higher. No metals were significantly elevated above the Pier 400 reference tissues.

Several of the organic compounds in clam tissues exposed to the Berths 90-92 and 93A-93B sediment composite were statistically significantly elevated over reference tissue levels (Table 25). Of the chlorinated pesticides, DDE was 1.6 times higher, DDT was 7.6 times higher, and total DDTs were 2.0 times higher compared to the LA2 reference tissues. Total PCBs were 10.8 times higher and 4.3 times higher compared to the LA2 and Pier 400 reference tissues, respectively. There were also nine PAH compounds (anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, indeno(1,2,3 cd)pyrene, and pyrene) plus total PAHs that were statistically significantly elevated in the test tissues compared to both reference tissue samples. Except for benzo(a)pyrene (33.5 ug/kg) in the Pier 400 tissues, all nine compounds were undetected in the reference tissues. This resulted in tissue burdens for these compounds that ranged from 4.4 (anthracene) to 400 (pyrene) times higher than reference tissues. Note that for statistical evaluation, analytes undetected in the tissues, including DDTs, PCBs, and PAHs, were equivalent to 50% of the detection limit.

6.2 Berths 122-124 Future Deepening

Five core samples were collected from Berths 122-124 as illustrated in Figure 3. Since previous (2001) data exists for the maintenance dredging sediments, the samples collected only represent the sediments proposed for future deepening. Thus each core represents dredge material from -48 ft MLLW to –55 ft MLLW. In addition to bulk sediment and elutriate analyses, bioassays and bioaccumulation exposures were performed on the composite sample. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples.

6.2.1 Bulk Sediment Chemistry

The composite sample from Berths 122-124 consisted primarily of sand (77.6%), with lesser amounts of silt (13.0%) and clay (9.4%). In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 122-124 showed relatively low concentrations (below effects levels) of most inorganic and organic constituents (Table 8). Only total DDTs exceeded ERL values, while no constituents exceeded ERM values. Analysis of individual core segments showed generally higher levels of metals contaminants compared to the composite sample with two of the five core samples exceeding ERL values for copper and nickel and one core sample exceeding the ERL value for arsenic. DDE and total DDTs were also relatively higher in the individual core samples with three core samples exceeding the ERL value for DDE and four of the core samples exceeding the ERL value for total DDTs. The Site 2 sample exceeded ERL values for the PAH compounds acenaphthene and anthracene.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 122-124 composite sample at a concentration of 11.0 ug/kg. Butyltin concentrations in individual cores ranged from below the detection limit (Site 5) to 44.7 ug/kg (Site 3). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 122-124 composite sediment results with the reference sites, the LA2 reference site showed similar levels of nutrients, metals, organotins, and organic pollutants and the Pier 400 reference site showed relatively higher levels of oil and grease, metals, DDTs, and PCBs.

6.2.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 122-124 sediment composite are shown in Table 16.

Dissolved metal concentrations in both the standard and effluent elutriates from Berths 122-124 were below "chronic" (CCC) screening criteria. Except for dissolved zinc in the standard elutriate, metal concentrations in the elutriates (total and dissolved) were similar to background water concentrations. Dissolved zinc was approximately seven times higher in the standard elutriate sample. However, the dissolved zinc data is suspect since the dissolved fraction was around four times higher than the total fraction even though all quality control objectives were met.

Tributyltin concentrations exceeded the CCC criterion by a factor of three in the Berths 122-124 effluent elutriate and by a factor of 11 in the standard elutriate. However, the tributyltin concentration in both elutriates were well below the "acute" (CMC) criterion. The background water sample exceeded the CCC criterion by a factor of seven.

Except for a very low concentration of pyrene in the standard elutriate, none of the organic contaminants were detected in either elutriate from Berths 122-124, and all organic compounds were undetected in the background water sample.

6.2.3 Toxicity Testing

Water column (suspended particulate phase) bioassay results for Berths 122-124 sediment (Table 23) show no significant toxicity to *Americamysis*, *Menidia* or *Mytilus* (LC50 and EC50 for all three species=>100%).

Benthic (solid phase) bioassay results for the Berths 122-124 sediment composite are summarized in Table 23. The results show that worm (*Nephtys*) survival in the test sediments (92%) was not statistically significantly lower than survival in reference sediments from LA2 (98%) or from Pier 400 (94%). Worm survival in control sediment was 98%. Amphipod (*Ampelisca*) survival in Berths 122-124 sediments (77%) was also not significantly lower than survival in LA2 reference sediment (92%) and in Pier 400 reference sediment (91%).

6.2.4 Bioaccumulation Assessment

Nereis viriens

Analysis of worm (*Nereis*) tissues after exposure to the Berths 122-124 sediment composite revealed that none of the mean metal concentrations were statistically significantly higher than either of the reference tissue mean concentrations (Table 24).

Of the organic compounds, only total PCBs were statistically significantly elevated in worm tissue exposed to Berths 122-124 sediments. The Berths 122-124 worm tissue had a mean concentration of total PCBs that was about 3.3 times higher than the reference tissues. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

Macoma nasuta

Like the Nereis tissues, clam (*Macoma*) tissues analyzed after exposure to the Berths 122-124 sediment composite revealed that none of the mean metal concentrations were statistically significantly higher than either of the reference tissue mean concentrations (Table 25).

A few of the organic compounds in clam tissues exposed to the Berths 122-124 sediment composite were statistically significantly elevated over reference tissue levels (Table 25). Total PCBs were 18 times higher and 7.1 times higher compared to the LA2 and Pier 400 reference tissues, respectively. There were also three PAH compounds (benzo(b)fluoranthene, benzo(a)pyrene, and pyrene) plus total PAHs that were statistically significantly elevated in the test tissues compared to both reference tissue samples. Except for benzo(a)pyrene (33.5 ug/kg) in the Pier 400 tissues, all three compounds were undetected in the reference tissues. This resulted in tissue burdens for these compounds that were 11 times higher for benzo(b)fluoranthene, 2.2 times higher for benzo(a)pyrene, and 16.5 times higher for pyrene compare to the reference tissues. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

6.3 Berths 125-126 Future Deepening

Five core samples were collected from Berths 125-126 sediments as illustrated in Figure 4. Since most of this area does not require maintenance dredging, the samples collected only represent the sediments proposed for future deepening. Thus, except for one core location (Site 4), each core represents dredge material from the mudline elevation (-45 to –47 ft MLLW) to –55 ft MLLW. A second sample representing a small shoaled area was collected from Site 4. Therefore, Site 4 had one sample representing the sediments from –43.2 to –47 ft MLLW and one sample representing the sediments from –47 to –55 ft MLLW. In addition to bulk sediment and elutriate analyses, bioassays and bioaccumulation exposures were performed on the composite sample. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples including the top of Site 4.

6.3.1 Bulk sediment chemistry

The composite sample from Berths 125-126 consisted primarily of sand (54.8%), with lesser amounts of silt (24.6%) and clay (20.6%). In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 125-126 showed relatively low concentrations (below effects levels) of most inorganic and organic constituents (Table 9). Only DDE, total DDTs, and total PCBs (from Aroclor 1254) exceeded ERL values, while no constituents exceeded ERM values. Analysis of individual core segments showed generally higher levels of metals contaminants compared to the composite sample with most cores exceeding the ERL values for arsenic, copper, mercury, and nickel and one core sample slightly exceeding the ERL value for zinc. In some cases, DDE, total DDTs, and total PCBs were also relatively higher in the individual core samples with three core samples exceeding the ERM value for DDE and four core samples exceeding the ERM value for total PCBs.
With a few exceptions, the top sample from Site 4 is relatively similar to the sediments below. The top sample contained DDE and total PCB concentrations that were above ERM values while the sediments below only exceeded ERL values for those constituents. PAH compounds were generally low in both the top and bottom samples except for anthracene and Dibenzo(a,h)anthracene, which slightly exceeded ERL values in the top sample but not in the bottom sample.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 125-126 composite sample at a concentration of 54.5 ug/kg. Butyltin concentrations in individual cores ranged from below the detection limit (Site 1) to 148 ug/kg (Site 4 top). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 125-126 composite sediment results with the reference sites, the LA2 reference site showed similar levels of nutrients, metals, butyltins, and organic pollutants and the Pier 400 reference site showed relatively higher levels of metals and DDTs.

6.3.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 125-126 sediment composite are shown in Table 17.

Dissolved metals concentrations in both the standard and effluent elutriates from Berths 125-126 were below "chronic" (CCC) screening criteria, and they were very similar to background water concentrations.

Tributyltin concentrations exceeded the CCC criterion by a factor of 5 in the effluent elutriate and by a factor of 24 in the standard elutriate from Berths 125-126, while the background water sample exceeded the CCC criterion by a factor of seven.

Except for very low concentrations of pyrene, none of the organic contaminants were detected in either elutriate from Berths 125-126, and all organic compounds were undetected in the background water sample.

6.3.3 Toxicity Testing

Water column (suspended particulate phase) bioassay results for Berths 125-126 sediments (Table 23) indicate no significant toxicity to *Americamysis* or *Menidia* (LC50=>100%) and minor toxicity to *Mytilus* (LC50= 70.9%, EC50 =69%). Initial mixing calculations show that the LPC ***would not*** be exceeded by unconfined aquatic disposal of the sediments.

Benthic (solid phase) bioassay results for the Berths 125-126 sediment composite are summarized in Table 23. The results indicate that worm (*Nephtys*) survival in these sediments (90%) was not statistically significantly lower than survival in reference sediments from LA2 (98%) or from Pier 400 (94%). Worm survival in control sediment was 98%. Amphipod *(Ampelisca*) survival in Berth Berths 125-126 sediments (72%) was significantly lower than survival in LA2 reference sediments (92%) and in Pier 400 reference sediments (91%). The difference between survival in test and reference sediments was not greater than 20%, meaning that the LPC ***would*** **not** be exceeded for open water disposal.

6.3.4 Bioaccumulation Assessment

Nereis viriens

Analysis of worm (*Nereis*) tissues after exposure to the Berths 125-126 sediment composite revealed that the mean concentration of only one metal was statistically significantly higher than either of the reference tissue mean concentrations (Table 24). Specifically, the mean tissue concentration of lead was 1.5 times higher than the mean lead concentration in worms exposed to the LA2 reference sediment.

Of the organic compounds, total PCBs and one PAH compound were statistically significantly elevated in worm tissue after exposure to Berths 125-126 sediments (Table 24). The Berths 125-126 worm tissue had a mean concentration of total PCBs that was about 4 times higher than both reference tissue mean concentrations and a mean concentration of pyrene that was 11.7 times higher than both reference tissue mean concentrations. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

Macoma nasuta

Analysis of clam (*Macoma*) tissues after exposure to the Berths 125-126 sediment composite revealed that the mean concentration of only one metal was statistically significantly higher than either of the reference tissue mean concentrations (Table 25). Specifically, the mean tissue concentration of zinc was 1.2 times higher than the mean zinc concentration in clams exposed to the LA2 reference sediment.

Several of the organic compounds in clam tissues exposed to the Berths 125-126 sediment composite were statistically significantly elevated over reference tissue levels (Table 25). Total PCBs were 30 times higher and 11.9 times higher compared to the LA2 and Pier 400 reference tissues, respectively. There were also five PAH compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, fluoranthene, and pyrene) plus total PAHs that were significantly elevated in the test tissues compared to both reference tissue samples. Except for benzo(a)pyrene (33.5 ug/kg) in the Pier 400 tissues, all five compounds were undetected in the reference tissues. This resulted in tissue burdens for these compounds that ranged from 5 (benzo(a)anthracene) to 47 (pyrene) times higher than reference tissues. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit

6.4 Berths 127-131 Maintenance Dredging and Future Deepening.

Five sediment core samples were collected from Berths 127-131 as illustrated in Figure 5. A top and bottom composite sample was generated from this berth area. The top composite sample represents the sediments from the mudline elevation down to the maintenance dredging depth (including overdredge) of –47 ft MLLW, while the bottom composite sample represents the sediments from –47 ft MLLW to the future deepening project depth of –55 ft MLLW. Note in Figure 5 that only a portion of the maintenance dredging area is proposed for future deepening.

In addition to bulk sediment and elutriate analyses, bioassays and bioaccumulation exposures were performed on each of the composite samples. Bulk sediment chemistry and physical testing were also performed on one or two strata from each of the individual core samples.

6.4.1 Bulk sediment chemistry

The composite samples from Berths 127-131 consisted primarily of sand. The sand, silt and clay fraction for the top composite sample was 69.9%, 15.0%, and 15%, respectively. The sand, silt and clay fraction for the bottom composite sample was 88.5%, 6.1%, and 5.5%, respectively. In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite samples from Berths 127-131 showed relatively low concentrations (below effects levels) of most inorganic and organic constituents, with the top composite having slightly higher concentrations for a lot of constituents (Table 10). The top composite exceeded ERL values for copper and mercury but the bottom composite did not. Both composites exceeded the ERL values for DDE and total DDTs with levels about two times higher in the top composite. The top composite exceeded ERM values for Aroclor 1254 and total PCBs while the bottom composite exceeded ERL values for the same two constituents. Semivolatile concentrations were all below ERL values in both composites.

Analysis of individual core segments showed generally higher levels of metal contaminants compared to the composite samples in three of the five top core samples and one of the bottom core samples. Between six and eight metals exceeded ERL values in the worst three top core samples while only copper exceeded the ERL value in another top core sample and no metals exceeded ERL values in the fifth top core sample. For the three bottom core samples, copper, mercury, and nickel exceeded ERL values in one of the core samples with no exceedances occurring in the other two core samples.

The same three top core samples and single bottom core sample with higher metals also had higher levels of DDE, total DDTs, Aroclor 1254, and total PCBs when compared to the composite samples. PAHs were also somewhat higher in the three top core samples.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 127-131 composite samples at concentrations of 122 ug/kg for the top composite sample and 15.2 ug/kg for the bottom composite sample. Butyltin concentrations in individual cores ranged from below the detection limit (Site 4 bottom) to 184ug/kg (Site 3 top). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 127-131 composite sediment results with the reference sites, the LA2 reference site showed somewhat similar levels of nutrients, metals, and organic pollutants except for PCBs when compared to the top composite sample. LA2 oil and grease, TPH, and PCBs were lower than in the top composite sample. The Pier 400 reference sediments showed relatively higher levels of metals and DDTs compared to both composite samples, a relatively lower concentration of total PCBs when compared to the top composite sample, and a relatively higher concentration of oil and grease when compared to the bottom composite sample. Pier 400 nutrients were similar to both composite samples. Concentrations of semivolatile compounds were somewhat similar in both composite samples and both reference site samples, although, PAH compounds were slightly elevated but below ERL values in the top composite sample.

6.4.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the two Berths 127-131 composite samples are shown in Table 18.

Standard and effluent elutriate dissolved metal concentrations from Berths 127-131 were below "chronic" (CCC) screening criteria in both the bottom and top composite samples. Except for arsenic in the standard elutriate of the top composite sample, metal concentrations in the elutriates (total and dissolved) were similar to background water concentrations. Total and dissolved arsenic were approximately eight times higher in the top standard elutriate sample compared to background water, though still below the CCC criteria.

Tributyltin concentrations exceeded the CCC criterion in all Berths 127-131 elutriate samples and in the background water sample with the top composite elutriates containing the highest concentrations. The bottom composite elutriates were similar to the background waters in tributyltin content, while the top standard elutriate tributyltin concentration was nine times higher than the background concentration and top effluent elutriate was four times higher.

Except for the top standard elutriate, no organic contaminants were detected in the elutriate samples from Berths 127-131 and in the background water sample. The top standard elutriate did have slight detections of total DDT, total PCBs, and pyrene, with the concentration of total PCBs exceeding the CCC value. Note though the CCC value for total PCBs is below the project detection limit.

6.4.3 Toxicity Testing

Water column (suspended particulate phase) bioassay results show no significant toxicity to either *Americamysis*, *Menidia* , or to *Mytilus* (LC50=>100%, EC50=>100%) for either the top or bottom composite from Berths 127-131.

Benthic (solid phase) bioassay results for the Berths 127-131 sediment composites are summarized in Table 23. For both the top and bottom composite, worm (*Nephtys*) survival was 100%. Thus, survival in the test sediments was not statistically significantly lower than survival in reference sediments from LA2 (98%) or from Pier 400 (94%). Worm survival in control sediment was 98%. Amphipod *(Ampelisca*) survival in the Berths 127-131 top composite (51%) was statistically significantly lower than survival in LA2 reference sediments (92%) and in Pier 400 reference sediments (91%). The difference between survival in test and reference sediments was greater than 20%, meaning that the LPC ***would*** be exceeded for open water disposal. Amphipod survival in the Berths 127-131 deep sediments (79%) was not significantly lower than survival in LA2 reference sediment (92%) and in Pier 400 reference sediment (91%).

6.4.4 Bioaccumulation Assessment

Nereis viriens

Analysis of worm (*Nereis*) tissues after exposure to the Berths 127-131 sediment composites revealed that the mean concentration of only one metal in tissues from the top composite was statistically significantly higher than either of the reference tissue mean concentrations (Table 24). No metals were significantly elevated in the deep composite tissues. The mean tissue concentration of lead from the top composite was 1.9 times higher than the mean lead concentration in worms exposed to the LA2 reference sediment and 1.7 times higher than Pier 400 reference worms.

Of the organic compounds, only total PCBs were statistically significantly elevated in worm tissue after exposure to the Berths 127-131 top sediments (Table 24). No organic compounds were statistically significantly elevated in worms exposed to the deep composite. The top composite worm tissue had a mean concentration of total PCBs that was 3.3 times higher than both reference tissue mean concentrations. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

Macoma nasuta

Analysis of clam (*Macoma*) tissues after exposure to the Berths 127-131 sediment composites revealed that the mean concentration of three metals (copper, lead, and zinc) were statistically significantly higher in the top composite and only one metal (zinc) was significantly higher in the deep composite when compared to both reference tissue mean concentrations (Table 25). In the top composite clam tissues, the mean copper concentration was 1.35 times higher than the LA2 reference clam tissues, and the mean concentration of lead was 4.4 times higher and zinc was 1.26 times higher than the LA2 reference clam tissues. In the bottom composite, the mean tissue concentration of zinc was 1.23 times higher than the mean zinc concentration in clams exposed to the LA2 reference sediment.

For both Berths 127-131 composites, PCBs and several PAHs were statistically significantly elevated in the clam tissues compared to both sets of reference clam tissues (Table 25). For the top composite, total PCBs in the clam tissues were 29 times higher and 11.5 times higher than LA2 and Pier 400 reference tissues, respectively. For the bottom composite, total PCBs in the clam tissues were 13.2 times higher compared to LA2 reference tissues, and 5.2 times higher compared to Pier 400 reference tissues. There were four individual PAH compounds (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and pyrene) in top composite clam tissues and two PAH compounds (benzo(b)fluoranthene and benzo(a)pyrene) that were statistically significantly elevated in the bottom composite clam tissues compared to both reference tissue samples. Except for benzo(a)pyrene (33.5 ug/kg) in the Pier 400 tissues, all five compounds were undetected in the reference tissues. Pyrene was most significantly elevated (48 times higher than reference) in the top composite clam tissues, and benzo(b)fluoranthene was most significantly elevated (19 times higher than reference) in the bottom composite clam tissues. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

6.5 Berths 153-155 Maintenance Dredging

Six core samples were collected from Berths 153-155 as illustrated in Figure 6. Each core represents dredge material from the mudline down to –39 ft MLLW. All six cores were combined into a single composite sample. Due to elevated levels of sediment contamination, 28-day bioaccumulation exposures and full bioassay testing were not performed on the Berths 153-155 composite sample. Instead, only bulk sediment and elutriate analyses and a single water column bioassay were conducted. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples. Because lead exceeded the Title 22 STLC criterion, a wet extraction test (WET) for lead was performed on the sediment composite.

6.5.1 Bulk sediment chemistry

The composite sample from Berths 153-155 consisted primarily of fine grained material (31.3% silt and 27.1% clay) with a sand content of 41.6%. In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 153-155 showed elevated levels of many inorganic and organic constituents (Table 11). However, all hazardous waste constituents were well below Title 22 TTLC criteria, and only lead exceeded Title 22 STLC criteria. Mercury, DDD, DDE, DDT, total DDTs, and pyrene exceeded ERM values, while arsenic, copper, lead, nickel, zinc, total PCBs, and several PAH compounds along with total PAHs exceeded ERL values. Analysis of individual core segments showed additional ERL exceedances for cadmium and chromium in a few of the cores, and several more ERM exceedances for individual PAH compounds in a few of the cores. Note that Aroclor 1260 was detected in the individual core samples at levels exceeding ERL and ERM values but not in the composite sample. This probably was a result of analyst interpretation of the Aroclor 1260 and Aroclor 1254 chromatogram peaks, which overlap each other considerably.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 153-155 composite sample at a concentration of 179 ug/kg. Butyltin concentrations in individual cores ranged from 70.5 ug/kg (Site 6) to 426 ug/kg (Site 4 top). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 153-155 composite sediment results with the reference sites, the Pier 400 reference site showed similar levels of nutrients, most metals, and chlorinated pesticides, and lower levels of petroleum hydrocarbons, oil and grease, mercury, tributyltin, PCBs, and PAHs. Except for a few metals that were similar in concentration, sediment from the LA2 reference site was generally much lower in contaminant concentrations.

6.5.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 153-155 sediment composite are shown in Table 19.

Except for dissolved arsenic in the standard elutriate, dissolved metal concentrations in both the standard and effluent elutriates from Berths 153-155 were below “chronic” (CCC) screening criteria. In addition, total and dissolved arsenic, total chromium, total copper, total nickel, and dissolved zinc in the standard elutriate were somewhat elevated above background waters. However, the dissolved zinc data is suspect since the dissolved fraction was around four times higher than the total fraction even though all quality control objectives were met. The dissolved metal concentrations in the effluent elutriate were fairly similar to background water concentrations.

Tributyltin concentrations exceeded the CCC criterion by a factor of four in the effluent elutriate and by a factor of 15 in the standard elutriate from Berths 153-155, while tributyltin concentrations in the background water sample were seven times higher than the CCC criterion.

Several organic compounds were detected in the standard elutriate from Berths 153-155, while only low levels of acenaphthylene and pyrene were detected in the effluent elutriate. Of the organic compounds found in the standard elutriate, only total PCBs exceeded CCC criteria. No organic compounds were detected in the background water sample.

6.5.3 DI-WET

Since lead exceeded the Title 22 STLC criterion in the Berths 153-155 sediment composite, a DI WET for lead was performed to determine if leached lead exceeds water quality criteria. A concentration of 1.8 ug/l was detected in the extractant, which is far below the STLC and CCC criteria.

6.5.4 Toxicity Testing

Initial examination of bulk sediment chemistry data strongly suggested that the Berths 153-155 sediment composite was contaminated with metals, pesticides, PCBs and PAHs at concentrations generally exceeding ERM values. Consequently, the decision was made to subject the Berths 153-155 sediment to only the limited bioassay testing required for disposal in an upland site or in a confined aquatic disposal facility. Only a single water column bioassay using *Mytilus galloprovincialis* was performed with this sediment sample. Minor toxicity was shown to *Mytilus* survival (LC50=73.8) and to *Mytilus* normal development (EC50=69.5%). Note that *Mytilus* survival and development was significantly decreased from controls only in the 100% elutriate, but not in the 50% elutriate concentration. This shows that a 1:1 dilution of elutriate would eliminate all toxicity to *Mytilus* larvae.

6.6 Berths 177-179 Maintenance Dredging

Five core samples were collected from Berths 177-179 sediments as illustrated in Figure 7. Each core represents dredge material from the mudline down to –38 ft MLLW. All five cores were combined into a single composite sample. Due to elevated levels of sediment contamination, 28-day bioaccumulation exposures and full bioassay testing were not performed on the Berths 177-179 composite sample. Instead, only bulk sediment and elutriate analyses and a single water column bioassay were conducted. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples. Because lead exceeded the Title 22 STLC criterion, a wet extraction test (WET) for lead was performed on the sediment composite.

6.6.1 Bulk sediment chemistry

The composite sample from Berths 177-179 consisted primarily of fine grain material (32.8% silt and 25.0% clay) with a sand content of 42.2%. In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 177-179 showed elevated levels of many inorganic and organic constituents (Table 12). However, all hazardous waste constituents were well below Title 22 TTLC criteria, and only lead exceeded Title 22 STLC criteria. Mercury, DDD, DDE, DDT, total DDTs, Aroclor 1254, total PCBs, and dibenzo(a,h)anthracene exceeded ERM values, while arsenic, cadmium, copper, lead, nickel, zinc, and several PAH compounds along with total PAHs exceeded ERL values. Analysis of individual core segments showed additional ERL exceedances for chromium in most cores, and several more ERM exceedances for nickel and individual PAH compounds in a few of the cores. Note that Aroclor 1260 was detected in the individual core samples at levels exceeding ERL and ERM values but not in the composite sample. This probably was a result of analyst interpretation of the Aroclor 1260 and Aroclor 1254 chromatogram peaks, which overlap each other considerably.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 177-179 composite sample at a concentration of 151 ug/kg. Butyltin concentrations in individual cores ranged from 117 ug/kg (Site 5) to 688 ug/kg (Site 2). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 177-179 composite sediment results with the reference sites, the Pier 400 reference site showed similar levels of most metals and DDE, and lower levels of petroleum hydrocarbons, oil and grease, mercury, tributyltin, chlorinated pesticides, PCBs, and PAHs. Except for selenium and silver that were similar in concentration, sediment from the LA2 reference site was generally much lower in contaminant concentrations.

6.6.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 177-179 sediment composite are shown in Table 20.

Dissolved metal concentrations in both the standard and effluent elutriates from Berths 177-179 were below "chronic" (CCC) screening criteria. However, total and dissolved arsenic, total chromium, and total lead in the standard elutriate were somewhat elevated above background waters. Except for the dissolved zinc concentration, the dissolved metal concentrations in the effluent elutriate were fairly similar to background water concentrations. Dissolved zinc was approximately two times higher in the effluent elutriate.

Tributyltin concentrations exceeded the CCC criterion by a factor of two in the effluent elutriate and by a factor of 80 in the standard elutriate from Berths 177-179, while tributyltin concentrations in the background water sample were seven times higher than the CCC criterion. Tributyltin concentrations in both elutriates were well below the "acute" (CMC) criterion.

Organic contamination was for the most part absent in the standard and effluent elutriates from Berths 177-179. Low levels of fluoranthene and pyrene were detected in both elutriates, and benzo(a)pyrene was detected in the standard elutriate at concentration slightly higher than the detection limit. No organic compounds were detected in the background water sample.

6.6.3 DI-WET

Since lead exceeded the Title 22 STLC criterion in the Berths 177-179 sediment composite, a DI WET for lead was performed to determine if leached lead exceeds water quality criteria. Dissolved lead was not detected in the extractant above the reporting limit of 1.0 ug/l.

6.6.4 Toxicity Testing

Initial examination of bulk sediment chemistry data strongly suggested that the Berths 177-179 sediment composite was contaminated with metals, pesticides, PCBs and PAHs at concentrations generally exceeding ERM values. Consequently, the decision was made to subject the Berths 177-179 sediment to only the limited bioassay testing required for disposal in an upland site or in a confined aquatic disposal facility. Only a single water column bioassay using *Mytilus galloprovincialis* was performed with this sediment sample. No toxicity was shown to *Mytilus* survival (LC50=>100%) or to *Mytilus* normal development (EC50=>100%).

6.7 Berths 180-181 Maintenance Dredging

Five core samples were collected from Berths 180-181 sediments as illustrated in Figure 8. Each core represents dredge material from the mudline down to –37 ft MLLW. All five cores were combined into a single composite sample. Due to elevated levels of sediment contamination, 28-day bioaccumulation exposures and full bioassay testing were not performed on the Berths 180-181 composite sample. Instead, only bulk sediment and elutriate analyses and a single water column bioassay were conducted. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples. Because lead exceeded the Title 22 STLC criterion, a wet extraction test (WET) for lead was performed on the sediment composite.

6.7.1 Bulk sediment chemistry

The composite sample from Berths 180-181 consisted primarily of fine grained material (32.1% silt and 30.8% clay) with a sand content of 37.1%. In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

The composite sample from Berths 180-181 showed elevated levels of many inorganic and organic constituents (Table 13). However, all hazardous waste constituents were well below Title 22 TTLC criteria, and only lead exceeded Title 22 STLC criteria. Lead, mercury, nickel, zinc, DDD, DDE, total DDTs, Aroclor 1254, total PCBs, benzo(a)pyrene, and dibenzo(a,h)anthracene exceeded ERM values, while arsenic, cadmium, chromium, copper, and several other PAH compounds along with total PAHs exceeded ERL values. The composite chemistry was similar to the individual core segment chemistry. Note that Aroclor 1260 was detected in the individual core samples at levels exceeding ERL and ERM values but not in the composite sample. This probably was a result of analyst interpretation of the Aroclor 1260 and Aroclor 1254 chromatogram peaks, which overlap each other considerably.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the Berths 180-181 composite sample at a concentration of 218 ug/kg. Butyltin concentrations in individual cores ranged from 205 ug/kg (Site 2) to 466 ug/kg (Site 1). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 180-181 composite sediment results with the reference sites, analyte concentrations were lower in the reference sediments for most constituents. The few exceptions were arsenic, DDE, and total DDTs in the Pier 400 sediment, which were similar in concentrations.

6.7.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 180-181 sediment composite are shown in Table 21.

Dissolved metal concentrations in both the standard and effluent elutriates from Berths 180-181 were below "chronic" (CCC) screening criteria. However, total and dissolved arsenic and chromium and total lead and nickel in the standard elutriate were somewhat elevated above background waters. Except for the dissolved zinc concentration, the dissolved metal concentrations in the effluent elutriate were fairly similar to background water concentrations. Dissolved zinc was approximately two times higher in the effluent elutriate.

Tributyltin concentrations were similar to the CCC criterion in both the effluent and standard elutriates from Berths 180-181. Tributyltin concentrations in the background water sample were seven times higher than the CCC criterion.

Organic contamination was for the most part absent in the standard and effluent elutriates from Berths 180-181. A few PAHs were detected in both elutriates at levels one to three times the detection limits. No organic compounds were detected in the background water sample.

6.7.3 WET Testing

Since lead exceeded the Title 22 STLC criterion in the Berths 177-179 sediment composite, a DI WET for lead was performed to determine if leached lead exceeds water quality criteria. Dissolved lead was not detected in the extractant above the reporting limit of 1.0 ug/l.

6.7.4 Water Column Bioassay

Initial examination of bulk sediment chemistry data strongly suggested that this sediment composite was contaminated with metals, pesticides, PCBs and PAHs at concentrations generally exceeding ERM values. Consequently, the decision was made to subject the Berths 180-181 sediment to only the limited bioassay testing required for disposal in an upland site or in a confined aquatic disposal facility. Only a single water column bioassay using *Mytilus galloprovincialis* was performed with this sediment sample. No toxicity was shown to *Mytilus* survival (LC50=>100%) and to *Mytilus* normal development (EC50=>100%).

6.8 Berths 226-231 Maintenance Dredging

Fifteen core samples were collected from Berths 226-231 sediments as illustrated in Figures 9 through 11. Each core represents dredge material from the mudline down to –48 ft MLLW. The fifteen core samples were combined into three composite samples (Composite A, B and C) containing five cores each. In addition to bulk sediment and elutriate analyses, bioassays and bioaccumulation exposures were performed on each of the composite samples. Bulk sediment chemistry and physical testing were also performed on each of the individual core samples.

6.8.1 Bulk sediment chemistry

The three sediment composite samples from Berths 226-231 consist primarily of sand (47-80%), with lesser amounts of silt (11-31%) and clay (9-22%). In comparison, the LA2 and Pier 400 reference sites consisted of 81.6% and 23.2% sand, respectively.

Among metal analytes, ERL guidelines were exceeded for copper, lead, mercury and nickel in composite A, and for copper and mercury in composite C. Individual cores from the A and C composite areas all showed copper and mercury concentrations that were greater than ERL guidelines. Core samples A-2 and C-2 showed the highest concentrations of metal contaminants, with ERL exceedances of five or six metals. No metals exceeded any ERL value in composite B, and only one individual core from Composite B exceeded the ERL values for copper and mercury. Metal concentrations in all samples were well below ERM values. All metal concentrations were far below Title 22 TTLC criteria.

Among the chlorinated pesticides, DDE was detected in concentrations above the ERM value in composites A and C, and in nine of the ten individual cores comprising those composites. DDE exceeded the ERL value in composite B and exceeded either the ERL or ERM values in four of five individual core samples. DDE was the primary DDT compound detected in the samples. The ERM value for total DDTs was exceeded in Composite A and in six of the fifteen individual core samples. All remaining samples contained total DDTs in excess of the ERL value. There were a few additional chlorinated pesticides detected at very low concentrations, near their method detection limits. All DDT concentrations were far below Title 22 TTLC criteria.

One PCB, Aroclor 1254, exceeded the ERL value in Composites A and C. The ERL value for Aroclor-1254 was also exceeded in all of the individual core samples from Composite Area A and in four of the five individual core samples from Composite Area C. Although PCBs were not detected in the Composite B sample, two of the five individual core samples from Composite Area B exceeded the ERL for Aroclor 1254. No samples contained PCB concentrations approaching ERM values, and all PCB concentrations were far below Title 22 TTLC criteria.

Among the semivolatile compounds, fluorene slightly exceeded the ERL value in all three composite samples, but concentrations were well below the ERM value. None of the remaining PAH compounds exceeded ERL values in any of the composite samples. However, one individual core sample (A-5) exceeded ERL values for seven of the eleven individual PAH compounds for which guideline values exist. Core sample A-5 also exceeded the ERL value for total PAHs.

Total speciated butyltins (as dibutyltin, monobutyltin, tributyltin and tetrabutyltin) were detected in the composites in concentrations ranging from 36 to 132 ug/kg. Butyltin concentrations in individual cores ranged from 3.3 ug/kg (core B-4) to 393 ug/kg (core A-4). Sediment quality guidelines do not exist for speciated butyltins.

When comparing the Berths 226-231 composite sediment results with the reference sites, Composite B was more chemically similar to the LA2 reference site, while composites A and C were more similar to the Pier 400 reference site. The exceptions to this were for oil and grease, some nutrients, speciated butyltins, and semivolatile compounds, which were generally higher in the composite samples than in the reference site samples.

6.8.2 Elutriate Chemistry

Results of the chemical analysis of both standard and effluent elutriate from the Berths 226-231 composite samples are shown in Table 22.

Standard and effluent elutriate dissolved metal concentrations from Berths 226-231 were below “chronic” (CCC) screening criteria in all three composite samples. Except for total and dissolved arsenic and dissolved zinc in the standard elutriate of the Composite A sample, metal concentrations (total and dissolved) in the elutriates were similar to background water concentrations. Total and dissolve arsenic were more than ten times higher in the Composite A standard elutriate sample compared to background water, and dissolved zinc was about four times higher. However, the dissolved zinc data is suspect since the dissolved fraction was more than four times higher than the total fraction even though all quality control objectives were met.

Tributyltin concentrations exceeded the CCC criterion in the Berths 226-231 Composite A and B standard elutriate samples by a factor of 6 and 24, respectively. A low concentration (four times higher than the CCC criterion) was also found in the background water sample. Tributyltin was not detected in any other sample and no other speciated butyltins were detected in any of the Berths 226-231 elutriate samples.

Except for low concentrations of DDE and a few PAH compounds in some of the composite samples, no organic compounds were detected in the elutriates from Berths 226-231. Similarly, no organic compounds were detected in the background water sample.

6.8.3 Toxicity Testing

Water column (suspended particulate phase) bioassay results for Composite A sediments from Berths 226-231 (Table 23) indicate no significant toxicity to *Americamysis* or *Menidia* (LC50=>100%) and minor toxicity to *Mytilus* (LC50= 71.1%, EC50 =71.9%). Initial mixing calculations show that the LPC ***would not*** be exceeded by unconfined aquatic disposal of the Composite A sediments. Water column bioassay results for Composites B and C indicated no significant toxicity to either *Americamysis*, *Menidia* or *Mytilus* (LC50 and EC50 for all three species=>100%).

Benthic (solid phase) bioassay results for the three composite sediments from Berths 226-231 are summarized in Table 23. *Nephtys* survival was 100% in both Composites A and B and 96% in Composite C. Thus, survival in the composite sediments was not statistically significantly lower than survival in reference sediments from LA2 (98%) or from Pier 400 (94%). *Nephtys* survival in control sediment was 98%. *Ampelisca* survival in the three composites, which ranged from 78% to 84%, was not significantly lower than survival in LA2 reference sediments (92%) and in Pier 400 reference sediments (91%).

6.8.4 Bioaccumulation Assessment

<u>Nereis viriens</u>

When compared with either LA2 or Pier 400 reference tissues, there was no significant accumulation of metals, chlorinated pesticides, PCBs or PAHs in worm (*Nereis*) tissues from any of the three composite samples exposed to Berths 226-231 sediments see (Table 24)

<u>Macoma nausta</u>

Concentrations of metals in clam (*Macoma*) tissues exposed to the three Berths 226-231 sediment composite samples were similar, especially among Composites A and C (Table 25). The mean concentrations of both copper and zinc in clams from Composites A and C were statistically significantly higher (but less than two times) than the mean concentration of copper and zinc in clams exposed to LA2 reference sediments. There was no significant accumulation of metals in Composite B clam tissues.

Presence of organic compounds in clam tissues exposed to the Berths 226-231 sediment composites was also similar among composites (Table 25). Clam tissues from all three composites had statistically significantly elevated concentrations of DDE, total PCBs (Aroclor 1254), three PAH compounds benzo(b)fluoranthene, benzo(a)pyrene, and pyrene, and total PAHs compared to either the LA2 reference tissues or both LA2 and Pier 400 reference tissues. Tissue burdens for DDE ranged from 1.3 to 1.5 times higher than the LA2 reference tissues. Total PCBs were two to seven times higher in the composite tissues compared to both reference tissues, and the PAH compounds were anywhere from 5.5 times higher for total PAHs in Composite A tissues to 33 times higher for pyrene in Composite B tissues compared to both reference sites. Note that for statistical evaluation, analytes undetected in the tissues were equivalent to 50% of the detection limit.

7.0 CONCLUSIONS, AND RECOMMENDATIONS

Each berth area or composite area sampled for maintenance dredging or future deepening is a candidate for one or more disposal options including ocean disposal, in-harbor unconfined aquatic disposal, in-harbor confined aquatic disposal, and disposal at an upland facility. Based on the evaluation of all data, initial categories of suitability for reuse/disposal of the tested sediments are given in Table 26. This table also summarizes the data leading to a particular conclusion or recommendation. Final determinations of suitabilities of these sediments for given categories of reuse/disposal will be made by regulatory agencies and matched to options available to the Port for these maintenance dredging sediments.

To obtain these initial categories of suitability for reuse/disposal for each of the maintenance dredging sediments tested, the sediment testing results were evaluated. Contaminants of concern were found in all composites at concentrations in excess of ERL and/or ERM sediment guidance values. Decisions were made not to further test sediments for open water disposal from Berths 36, 153-155, 165-167, 177-179, and 180-181 because of generally high concentrations of multiple contaminants of concern.

Sediments from most of the other berth areas that were further tested showed fairly substantial bioaccumulation of PCBs and PAHs that would seem to preclude open water disposal as an option, though toxicity of tested sediments generally did not exceed Limiting Permissible Concentrations (LPCs). Only the future maintenance dredging sediments from Berths 122-124 were judged suitable for ocean disposal at LA2 or at an in-harbor unconfined aquatic disposal facility based on the lack of or minor toxicity, low levels of observed bioaccumulation, and the lack of a significant potential to impact water quality.

The lack of toxicity exceeding LPCs and minimal contamination found in elutriate samples should allow the sediments from all berth areas to be suitable for placement at an in-harbor confined aquatic disposal facility. Because all analytes from all samples were below Title 22 criteria and very little contaminant leaching occurred, the sediment from all berth areas should also be acceptable for upland disposal.

Because the bioaccumulation results, mainly with clams, determined the reuse/disposal categories of many of the sediments to be dredged, the bioaccumulation results were also evaluated using the USACE Biota/Sediment Accumulation Factors (BSAFs) database for *Macoma nausta* (http://www.wes.army.mil/el/bsaf/bsaf.html) to see if the nonpolar organic tissue concentrations measured were within expected ranges for given sediment concentrations. Data were also compared to the USACE/USEPA Environmental Residue Effects Database (ERED) (http://www.wes.army.mil/ el.ered) to assess if toxicity results were consistent with the tissue burdens measured.

To make comparisons with the BSAF database, Accumulation Factors (AFs) were calculated and compared directly to the BSAF database. AFs and BSAFs are the ratio of sediment concentrations normalized to the total organic carbon content of the sediment and tissue concentrations normalized to the percent lipid fraction. Table 27 summarizes these comparisons for *Macoma nasuta*. With a few exceptions, most of them minor, the *Macoma nausta* AFs calculated for this program fall within the range of BSAFs found in the Corps of Engineers database for *Macoma nasuta*. Therefore, the substantially elevated levels of organic compounds found in the *Macoma* tissues are reliable estimates and were not found to be abnormally high.

To see if the toxicity results were generally consistent with the tissue burdens measured in the longer-term (28 day) bioaccumulation tests and to put this bioaccumulation in a better perspective, there are some generalizations that can be made, as follows:

- Accumulation of copper and zinc by both clams and worms was minor in magnitude, although statistically significant. Incremental increases in concentration over LA2 reference tissue were less than 1.5 times in all tissues, and absolute tissue concentrations were well below the lowest No Observable Effects Concentration (NOEC) values for survival (25 mg/kg copper for *Macoma balthica*, 279 mg/kg zinc for *Mytilus edulis*) reported in the ERED database.

- Accumulation of lead was slightly greater in magnitude, with a peak increment over LA2 reference tissue of 4.4 times in clams exposed to Berths 127-131 top sediment. Increments in all other tissues were less than 2 times. The lowest NOEC reported in ERED for lead was 11.4 mg/kg (for growth in *Crassostrea gigas*), well above the highest tissue value found in this study (8.4 mg/kg in Berth 127-131 top clams).

- DDE accumulated in clams exposed to several test sediments but only to a minor degree, showing increments over LA2 reference tissue of 1.5 or less. The highest reported tissue value in this study was 134 ug/kg. The lowest reported invertebrate NOEC for DDE in ERED was 20,000 ug/kg for development in *Chironomous tentans*. The lowest reported NOEC for DDE in ERED was approximately 1500 ug/kg for mortality in *Salvelinus namaycush.*

- DDT accumulated in Berths 90-92 and 93A-93B clams to an increment of 7.6 times over both reference clam tissues. This increment is misleading because DDT was not detected in any reference tissue, and the statistical comparison was made against 50% of the detection limit. Furthermore, the DDT tissue concentration found (30.2 ug/kg) was far below the lowest NOEC reported in ERED (620 ug/kg) for feeding behavior in *Mercenaria mercenaria*.

- PCBs (as Aroclor 1254) were statistically significantly accumulated by clams from virtually all sediment composites tested, and by worms from three sediment composites. The magnitude of the accumulation was often large, ranging from increments of 5.6 to 30 times over LA2 reference tissues and increments of 2.2 to 12 times over Pier 400 reference tissues. Aroclor 1254 was not detected in LA2 tissues, thus the comparison was made with 50% of the detection limit. Aroclor 1254 was detected in one replicate of Pier 400 tissue, allowing comparison with a higher basis. The highest increments over reference tissues were found in clams exposed to sediments from Berths122-124 (17.9 times/7.1times over LA2 and Pier 400), Berths125-126 (30 times/12 times), and the top of Berths 127-131 (29 times/11.5 times). Even the maximum tissue value reported in this study (610 ug/kg) was far below the lowest NOEC reported in EPA (2000) for a mollusk (13,800 ug/kg for burrowing behavior in *Macoma nasuta*).

- Some individual PAHs showed statistically significant accumulation by clams from each of the sediments tested and by worms only from the Berths 90-92 and 93A-93B sediments. The magnitude of the accumulation of individual PAHs was often very large, with increments over reference tissues as high as 400 times for pyrene in *Macoma* and 100 times for pyrene in *Nereis.* Berths 90-92 and 93A-93B sediments produced significant accumulation of 9 individual PAHs by clams, with increments over reference tissues ranging from 4.4 times (anthracene) to 400 times (pyrene). Berths 90-92 and 93A-93B sediments also produced significant accumulation of 6 individual PAHs by worms, with increments ranging from 8.6 times (Bernzo(a)pyrene) to 99 times (pyrene). Sediments from Berths 125-126 produced accumulation by clams of 5 individual PAHs with incremental increases between 5 times (Benzo(a)anthracene) and 47 times (pyrene). Berths 127-131 sediments produced accumulation of 4 individual PAHs with increments of 29 times (benzo(k)fluoranthene) to 48 times (pyrene) over reference tissues. Sediments from the remaining berths produced accumulation of 2 two or three PAH compounds, with incremental increases ranging from 2.2 times to 33 times.

- Pyrene was the PAH compound that was most often accumulated by clams. Total PAHs were statistically significantly elevated in tissues exposed to all test sediments. The incidence of statistical significance was somewhat influenced by the absence of detectable PAHs in both tissues, so that comparisons were made using reference tissue values equal to 50% of detection limit. The large incremental increases, however, suggest that this was not a major factor. Despite the very large incremental increases over reference tissues, the absolute tissue concentrations were generally much below the NOEC levels reported in ERED, with a few exceptions.

- The highest tissue concentration of any individual PAH was 8400 ug/kg of pyrene in clams exposed to Berths 90-92 and 93A-93B sediments. The lowest NOEC reported in ERED for pyrene was 5400 ug/kg, for survival in *Dreissena polymorpha*, a freshwater mussel. Clearly this high concentration of tissue pyrene might be expected to produce biological effects in mollusks.

- ERED reports a NOEC of 10 ug/kg of benzo(a)pyrene for feeding behavior in *Mercenaria mercenaria*. The next lowest NOEC for benzo(a)pyrene in a mollusk is 1500 ug/kg for reproduction in *Mytilus edulis*, which seems more in line with reported NOECs for other PAHs. Tissue concentrations of benzo(a)pyrene in this study ranged from 144 to 2480 ug/kg, exceeding the 10ug/kg NOEC in all test tissues, but exceeding the 1500 ug/kg NOEC only in clams exposed to sediments from Berths 90-92 and 93A-93B.

- Using the critical Body Residue approach for non-polar narcosis developed by McCarty and Mackay (1993), measured tissue concentrations of total PAHs were converted to molar equivalents and then compared to the effects range reported for chronic narcosis. The measured tissue residue for total PAHs in clams exposed to Berths 90-92 and 93A-93B sediments was 0.011 mmol/kg, well below the levels found to cause toxicity (0.2 to 0.8 mmol/kg). In other words, with the exception of pyrene and benzo(a)pyrene in clams exposed to Berths 90-92 and 93A-93B sediments, tissue residue values in study organisms were below reported biological effects levels.

To summarize, with few exceptions, mostly minor, and within the expected limitations of these generalized databases, the results of these bioaccumulation tests fall within the range of predicted BSAFs values and the toxicity results are generally as expected from the Residue Effects Database.

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FIGURE 1

West Basin Ambient Water Quality

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04/18/07

NW SLIP SEDIMENT CHEMISTRY DATA

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	**Study Name**	**Agency**	**StationID**	**Latitude**	**Longitude**	**Water Body**	**Watershed**	**County**	**SampleID**	**Sample Method**	**Sample Type**	**Date Sampled**	**Date Analyzed**
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00
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Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	%Solid-160.3M	1	Conventional	Solids	NA	70	PCT		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides	NA	99	MG/KG		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides dissolved	NA	83	MG/KG		-99	-99
0	61	GrSz-seive	1	Grain Size	Clay	NA	11.5	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Gravel	NA	1.1	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Sand	NA	63.2	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Silt	NA	24.2	PCT		-99	-99
0	61	Metals-Ag-7761	1	Metal	Silver	7440-22-4	0.1	MG/KG	U	-99	-99
0	61	Metals-As-7060	1	Metal	Arsenic	7440-38-2	6.6	MG/KG		-99	-99
0	61	Metals-Cd-7131	1	Metal	Cadmium	7440-43-9	0.6	MG/KG		-99	-99
0	61	Metals-Cr-7191	1	Metal	Chromium	7440-47-3	39	MG/KG		-99	-99
0	61	Metals-Cu-7211	1	Metal	Copper	7440-50-8	62	MG/KG		-99	-99
0	61	Metals-Hg-7471	1	Metal	Mercury	7439-97-6	0.5	MG/KG		-99	-99
0	61	Metals-Ni-7521	1	Metal	Nickel	7440-02-0	16	MG/KG		-99	-99
0	61	Metals-Pb-7421	1	Metal	Lead	7439-92-1	110	MG/KG		-99	-99
0	61	Metals-Se-7741	1	Metal	Selenium	7782-49-2	0.3	MG/KG		-99	-99
0	61	Metals-Zn-7950	1	Metal	Zinc	7440-66-6	310	MG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Dibutyltin	1002-53-5	89	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Monobutyltin	78763-54-9	3	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Tetrabutyltin	1461-25-2	1	UG/KG	U	-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Tributyltin	688-73-3	210	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB	PCBs	NA	430	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1242	53469-21-9	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1248	12672-29-6	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1254	11097-69-1	430	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1260	11096-82-5	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDD	72-54-8	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDE	72-55-9	50	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDT	50-29-3	23	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Aldrin	309-00-2	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-BHC	319-84-6	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-Chlordane	5103-71-9	3.3	UG/KG	J	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	beta-BHC	319-85-7	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Chlordane	57-74-9	16.3	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	DDTs	NA	73	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	delta-BHC	319-86-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Dieldrin	60-57-1	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan I	959-98-8	4	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan II	33213-65-9	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan sulfate	1031-07-8	20	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endrin	72-20-8	2.9	UG/KG		-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA														
StudyID	**Study Name**	**Agency**	**StationID**	**Latitude**	**Longitude**	**Water Body**	**Watershed**	**County**	**SampleID**	**Sample Method**	**Sample Type**	**Date Sampled**	**Date Analyzed**	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00	
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00	
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00	
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-1	33.7678	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-1-1	Vibracore	RESULT	############	1/1/1900 0:00	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00	
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00	
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00	

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	Pest-PCB-8080	1	Pesticide	gamma-BHC	58-89-9	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	gamma-Chlordane	5566-34-7	13	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor	76-44-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor epoxide	1024-57-3	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Toxaphene	8001-35-2	60	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	2-Methylnaphthalene	91-57-6	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthene	83-32-9	2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthylene	208-96-8	110	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Anthracene	120-12-7	4.5	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benz(a)anthracene	56-55-3	6	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(a)pyrene	50-32-8	17	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(b)fluoranthene	205-99-2	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(g,h,i)perylene	191-24-2	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(k)fluoranthene	207-08-9	4.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Chrysene	218-01-9	12	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Dibenz(a,h)anthracene	53-70-3	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Fluoranthene	206-44-0	4.5	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Fluorene	86-73-7	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	HPAH	NA	2000	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Indeno(1,2,3-c,d)pyrene	193-39-5	6.8	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	LPAH	NA	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Naphthalene	91-20-3	1.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	PAHs	NA	2000	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	PAHs_R	NA	2110	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Phenanthrene	85-01-8	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Phenols	NA	-99	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Pyrene	129-00-0	2000	UG/KG		-99	-99
0	61	Semivol-8270	1	Phthalate	Phthalates	NA	10	UG/KG	U	-99	-99
0	61	Standard Method 5520C	1	Conventional	Oil and Grease	NA	770	MG/KG		-99	-99
0	61	Standard Method 5520F	1	Conventional	TRPH	NA	350	MG/KG		-99	-99
0	61	TOC-GM	1	Conventional	TOC	NA	0.6	PCT		-99	-99
0	61	%Solid-160.3M	1	Conventional	Solids	NA	48	PCT		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides	NA	420	MG/KG		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides dissolved	NA	120	MG/KG		-99	-99
0	61	GrSz-seive	1	Grain Size	Clay	NA	37.4	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Gravel	NA	0	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Sand	NA	29.1	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Silt	NA	33.6	PCT		-99	-99
0	61	Metals-Ag-7761	1	Metal	Silver	7440-22-4	0.2	MG/KG		-99	-99
0	61	Metals-As-7060	1	Metal	Arsenic	7440-38-2	14	MG/KG		-99	-99
0	61	Metals-Cd-7131	1	Metal	Cadmium	7440-43-9	1.7	MG/KG		-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
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Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	Metals-Cr-7191	1	Metal	Chromium	7440-47-3	150	MG/KG		-99	-99
0	61	Metals-Cu-7211	1	Metal	Copper	7440-50-8	120	MG/KG		-99	-99
0	61	Metals-Hg-7471	1	Metal	Mercury	7439-97-6	0.88	MG/KG		-99	-99
0	61	Metals-Ni-7521	1	Metal	Nickel	7440-02-0	34	MG/KG		-99	-99
0	61	Metals-Pb-7421	1	Metal	Lead	7439-92-1	110	MG/KG		-99	-99
0	61	Metals-Se-7741	1	Metal	Selenium	7782-49-2	0.7	MG/KG		-99	-99
0	61	Metals-Zn-7950	1	Metal	Zinc	7440-66-6	290	MG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Dibutyltin	1002-53-5	130	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Monobutyltin	78763-54-9	4	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Tetrabutyltin	1461-25-2	1	UG/KG	U	-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Tributyltin	688-73-3	280	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB	PCBs	NA	1400	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1242	53469-21-9	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1248	12672-29-6	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1254	11097-69-1	1400	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1260	11096-82-5	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDD	72-54-8	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDE	72-55-9	150	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDT	50-29-3	8.1	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Aldrin	309-00-2	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-BHC	319-84-6	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-Chlordane	5103-71-9	8.1	UG/KG	J	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	beta-BHC	319-85-7	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Chlordane	57-74-9	62.1	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	DDTs	NA	158.1	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	delta-BHC	319-86-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Dieldrin	60-57-1	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan I	959-98-8	4	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan II	33213-65-9	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan sulfate	1031-07-8	5	UG/KG	J	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endrin	72-20-8	13	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	gamma-BHC	58-89-9	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	gamma-Chlordane	5566-34-7	54	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor	76-44-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor epoxide	1024-57-3	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Toxaphene	8001-35-2	60	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	2-Methylnaphthalene	91-57-6	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthene	83-32-9	2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthylene	208-96-8	2.6	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Anthracene	120-12-7	4.5	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benz(a)anthracene	56-55-3	6	UG/KG	U	-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	**Study Name**	**Agency**	**StationID**	**Latitude**	**Longitude**	**Water Body**	**Watershed**	**County**	**SampleID**	**Sample Method**	**Sample Type**	**Date Sampled**	**Date Analyzed**
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-2	33.767	-118.276	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-2-1	Vibracore	RESULT	############	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
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Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	Semivol-8270	1	PAH	Benzo(a)pyrene	50-32-8	17	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(b)fluoranthene	205-99-2	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(g,h,i)perylene	191-24-2	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(k)fluoranthene	207-08-9	4.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Chrysene	218-01-9	12	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Dibenz(a,h)anthracene	53-70-3	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Fluoranthene	206-44-0	29000	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Fluorene	86-73-7	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	HPAH	NA	34600	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Indeno(1,2,3-c,d)pyrene	193-39-5	6.8	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	LPAH	NA	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Naphthalene	91-20-3	1.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	PAHs	NA	34600	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	PAHs_R	NA	34600	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Phenanthrene	85-01-8	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Phenols	NA	-99	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Pyrene	129-00-0	5600	UG/KG		-99	-99
0	61	Semivol-8270	1	Phthalate	Phthalates	NA	37500	UG/KG		-99	-99
0	61	Standard Method 5520C	1	Conventional	Oil and Grease	NA	830	MG/KG		-99	-99
0	61	Standard Method 5520F	1	Conventional	TRPH	NA	440	MG/KG		-99	-99
0	61	TOC-GM	1	Conventional	TOC	NA	2.1	PCT		-99	-99
0	61	%Solid-160.3M	1	Conventional	Solids	NA	48	PCT		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides	NA	480	MG/KG		-99	-99
0	61	EPA/SW846 Method 9060	1	Conventional	Sulfides dissolved	NA	0.1	MG/KG	U	-99	-99
0	61	GrSz-seive	1	Grain Size	Clay	NA	38.6	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Gravel	NA	0	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Sand	NA	28.2	PCT		-99	-99
0	61	GrSz-seive	1	Grain Size	Silt	NA	33.2	PCT		-99	-99
0	61	Metals-Ag-7761	1	Metal	Silver	7440-22-4	0.2	MG/KG		-99	-99
0	61	Metals-As-7060	1	Metal	Arsenic	7440-38-2	11	MG/KG		-99	-99
0	61	Metals-Cd-7131	1	Metal	Cadmium	7440-43-9	0.8	MG/KG		-99	-99
0	61	Metals-Cr-7191	1	Metal	Chromium	7440-47-3	81	MG/KG		-99	-99
0	61	Metals-Cu-7211	1	Metal	Copper	7440-50-8	92	MG/KG		-99	-99
0	61	Metals-Hg-7471	1	Metal	Mercury	7439-97-6	0.49	MG/KG		-99	-99
0	61	Metals-Ni-7521	1	Metal	Nickel	7440-02-0	34	MG/KG		-99	-99
0	61	Metals-Pb-7421	1	Metal	Lead	7439-92-1	64	MG/KG		-99	-99
0	61	Metals-Se-7741	1	Metal	Selenium	7782-49-2	0.4	MG/KG		-99	-99
0	61	Metals-Zn-7950	1	Metal	Zinc	7440-66-6	230	MG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Dibutyltin	1002-53-5	120	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Monobutyltin	78763-54-9	4	UG/KG		-99	-99
0	61	Organotin-GC/FPD	1	Organotin	Tetrabutyltin	1461-25-2	1	UG/KG	U	-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	**Study Name**	**Agency**	**StationID**	**Latitude**	**Longitude**	**Water Body**	**Watershed**	**County**	**SampleID**	**Sample Method**	**Sample Type**	**Date Sampled**	**Date Analyzed**
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
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15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	Organotin-GC/FPD	1	Organotin	Tributyltin	688-73-3	200	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB	PCBs	NA	1400	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1242	53469-21-9	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1248	12672-29-6	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1254	11097-69-1	1400	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1260	11096-82-5	40	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDD	72-54-8	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDE	72-55-9	88	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	4,4'-DDT	50-29-3	17	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Aldrin	309-00-2	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-BHC	319-84-6	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	alpha-Chlordane	5103-71-9	21	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	beta-BHC	319-85-7	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Chlordane	57-74-9	21	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	DDTs	NA	105	UG/KG		-99	-99
0	61	Pest-PCB-8080	1	Pesticide	delta-BHC	319-86-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Dieldrin	60-57-1	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan I	959-98-8	4	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan II	33213-65-9	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endosulfan sulfate	1031-07-8	5	UG/KG	J	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Endrin	72-20-8	1	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	gamma-BHC	58-89-9	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	gamma-Chlordane	5566-34-7	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor	76-44-8	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Heptachlor epoxide	1024-57-3	10	UG/KG	U	-99	-99
0	61	Pest-PCB-8080	1	Pesticide	Toxaphene	8001-35-2	60	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	2-Methylnaphthalene	91-57-6	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthene	83-32-9	2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Acenaphthylene	208-96-8	2.6	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Anthracene	120-12-7	4.5	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benz(a)anthracene	56-55-3	6	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(a)pyrene	50-32-8	17	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(b)fluoranthene	205-99-2	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(g,h,i)perylene	191-24-2	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Benzo(k)fluoranthene	207-08-9	4.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Chrysene	218-01-9	12	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Dibenz(a,h)anthracene	53-70-3	10	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Fluoranthene	206-44-0	4.5	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Fluorene	86-73-7	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	HPAH	NA	750	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Indeno(1,2,3-c,d)pyrene	193-39-5	6.8	UG/KG	U	-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	**Study Name**	**Agency**	**StationID**	**Latitude**	**Longitude**	**Water Body**	**Watershed**	**County**	**SampleID**	**Sample Method**	**Sample Type**	**Date Sampled**	**Date Analyzed**
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
15	ACOE Portwide Prelim Testing	Army Corps of Engineers	NWB-3	33.7667	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	NWB-3-1	Vibracore	RESULT	5/1/1993 0:00	1/1/1900 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	61	Semivol-8270	1	PAH	LPAH	NA	7	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Naphthalene	91-20-3	1.2	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	PAHs	NA	750	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	PAHs_R	NA	750	UG/KG		-99	-99
0	61	Semivol-8270	1	PAH	Phenanthrene	85-01-8	4	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Phenols	NA	-99	UG/KG	U	-99	-99
0	61	Semivol-8270	1	PAH	Pyrene	129-00-0	750	UG/KG		-99	-99
0	61	Semivol-8270	1	Phthalate	Phthalates	NA	10	UG/KG	U	-99	-99
0	61	Standard Method 5520C	1	Conventional	Oil and Grease	NA	600	MG/KG		-99	-99
0	61	Standard Method 5520F	1	Conventional	TRPH	NA	310	MG/KG		-99	-99
0	61	TOC-GM	1	Conventional	TOC	NA	1.3	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Clay	NA	13	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Clay F	NA	3	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Fines	NA	79	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Granule	NA	0	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Gravel	NA	0	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Sand C	NA	2	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Sand F	NA	6	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Sand M	NA	4	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Sand VC	NA	0	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Sand VF	NA	8	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Silt C	NA	15	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Silt F	NA	19	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Silt M	NA	16	PCT		-99	-99
0	2	11/2/98-51	1	Grain Size	Silt VF	NA	13	PCT		-99	-99
0	2	36279-397	2	LAB	C10LAB-2	4537-13-7	2.44	UG/KG	U	4.79	5
0	2	36279-397	2	LAB	C10LAB-3	4621-36-7	1.64	UG/KG	U	4.79	5
0	2	36279-397	2	LAB	C10LAB-4	12/6/4537	4.11	UG/KG	U	4.79	5
0	2	36279-397	2	LAB	C10LAB-5	11/5/4537	1.37	UG/KG	U	4.79	5
0	2	36279-397	2	LAB	C11LAB-2	4536-88-3	6.18	UG/KG		2.01	5
0	2	36279-397	2	LAB	C11LAB-3	4536-87-2	3.25	UG/KG	J	2.01	5
0	2	36279-397	2	LAB	C11LAB-4	4536-86-1	2.22	UG/KG	J	2.01	5
0	2	36279-397	2	LAB	C11LAB-5	4537-15-9	2.14	UG/KG	J	2.01	5
0	2	36279-397	2	LAB	C11LAB-6	4537-14-8	1.31	UG/KG	U	2.01	5
0	2	36279-397	2	LAB	C12LAB-2	2719-61-1	3.94	UG/KG	J	1.9	5
0	2	36279-397	2	LAB	C12LAB-3	2400-00-2	2.51	UG/KG	J	1.9	5
0	2	36279-397	2	LAB	C12LAB-4	2719-64-4	3.11	UG/KG	J	1.9	5
0	2	36279-397	2	LAB	C12LAB-5	2719-63-3	2.73	UG/KG	J	1.9	5
0	2	36279-397	2	LAB	C12LAB-6	2719-62-2	2.89	UG/KG	J	1.9	5
0	2	36279-397	2	LAB	C13LAB-2	NF	1.87	UG/KG	J	1.67	5
0	2	36279-397	2	LAB	C13LAB-3	4534-52-5	2.52	UG/KG	J	1.67	5

NW SLIP SEDIMENT CHEMISTRY DATA														
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/6/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
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89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
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89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
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89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	2	36279-397	2	LAB	C13LAB-4	4534-51-4	0.69	UG/KG	U	1.67	5
0	2	36279-397	2	LAB	C13LAB-5	4534-50-3	1.72	UG/KG	J	1.67	5
0	2	36279-397	2	LAB	C13LAB-7/6	NA	1.81	UG/KG	J	1.67	5
0	2	36279-397	2	LAB	C14LAB-2	4534-59-2	1.29	UG/KG	J	0.89	5
0	2	36279-397	2	LAB	C14LAB-3	4534-58-1	2.94	UG/KG	J	0.89	5
0	2	36279-397	2	LAB	C14LAB-4	4534-57-0	1.29	UG/KG	J	0.89	5
0	2	36279-397	2	LAB	C14LAB-5	4534-56-9	1.2	UG/KG	J	0.89	5
0	2	36279-397	2	LAB	C14LAB-6	4534-55-8	1.56	UG/KG	J	0.89	5
0	2	36279-397	2	LAB	C14LAB-7	4534-54-7	1.56	UG/KG	J	0.89	5
0	2	4-435	NA	PCB congener	PCB006	25569-80-6	9.69	UG/KG		0.357	1
0	2	4-435	NA	PCB congener	PCB018	37680-65-2	1	UG/KG	J	0.737	1
0	2	4-435	NA	PCB congener	PCB028	7012-37-5	2.43	UG/KG		1	1
0	2	4-435	NA	PCB congener	PCB037	38444-90-5	1	UG/KG	J	0.266	1
0	2	4-435	NA	PCB congener	PCB044	41464-39-5	7.95	UG/KG		0.308	1
0	2	4-435	NA	PCB congener	PCB049	41464-40-8	5.1	UG/KG		0.308	1
0	2	4-435	NA	PCB congener	PCB052	35693-99-3	15.5	UG/KG		0.676	1
0	2	4-435	NA	PCB congener	PCB070	32598-11-1	8.66	UG/KG		0.233	1
0	2	4-435	NA	PCB congener	PCB074	32690-93-0	1	UG/KG	J	0.157	1
0	2	4-435	NA	PCB congener	PCB077	32598-13-3	1	UG/KG	J	0.39	1
0	2	4-435	NA	PCB congener	PCB081	70362-50-4	1	UG/KG	J	0.202	1
0	2	4-435	NA	PCB congener	PCB087	38380-02-8	1	UG/KG	J	0.282	1
0	2	4-435	NA	PCB congener	PCB099	38380-01-7	16.1	UG/KG		0.25	1
0	2	4-435	NA	PCB congener	PCB101	37680-73-2	23.8	UG/KG		0.824	1
0	2	4-435	NA	PCB congener	PCB105	32598-14-4	21.2	UG/KG		0.342	1
0	2	4-435	NA	PCB congener	PCB110	38380-03-9	52.1	UG/KG		0.133	1
0	2	4-435	NA	PCB congener	PCB114	74472-37-0	1	UG/KG	J	0.889	1
0	2	4-435	NA	PCB congener	PCB118	31508-00-6	35.6	UG/KG		0.209	1
0	2	4-435	NA	PCB congener	PCB119	56558-17-9	1	UG/KG	J	0.253	1
0	2	4-435	NA	PCB congener	PCB123	65510-44-3	3.14	UG/KG		0.226	1
0	2	4-435	NA	PCB congener	PCB126	57465-28-8	1	UG/KG	U	1	1
0	2	4-435	NA	PCB congener	PCB128	38380-07-3	11	UG/KG		0.557	1
0	2	4-435	NA	PCB congener	PCB138	35065-28-2	37.6	UG/KG		0.65	1
0	2	4-435	NA	PCB congener	PCB149	38380-04-0	27.2	UG/KG		0.24	1
0	2	4-435	NA	PCB congener	PCB151	52663-63-5	13.3	UG/KG		0.136	1
0	2	4-435	NA	PCB congener	PCB153/168	NA	41	UG/KG		0.436	1
0	2	4-435	NA	PCB congener	PCB156	38380-08-4	1	UG/KG	J	0.229	1
0	2	4-435	NA	PCB congener	PCB157	69782-90-7	1	UG/KG	J	0.154	1
0	2	4-435	NA	PCB congener	PCB158	74472-42-7	1	UG/KG	J	0.164	1
0	2	4-435	NA	PCB congener	PCB167	52663-72-6	1.76	UG/KG		0.348	1
0	2	4-435	NA	PCB congener	PCB169	32774-16-6	1	UG/KG	J	0.21	1
0	2	4-435	NA	PCB congener	PCB170	35065-30-6	6.59	UG/KG		0.347	1

NW SLIP SEDIMENT CHEMISTRY DATA														
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
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89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
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89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	2	4-435	NA	PCB congener	PCB177	52663-70-4	1	UG/KG	J	0.219	1
0	2	4-435	NA	PCB congener	PCB180	35065-29-3	1	UG/KG	J	0.874	1
0	2	4-435	NA	PCB congener	PCB183	52663-69-1	2.89	UG/KG		0.332	1
0	2	4-435	NA	PCB congener	PCB187	52663-68-0	5.63	UG/KG		0.295	1
0	2	4-435	NA	PCB congener	PCB189	39635-31-9	1	UG/KG	J	0.304	1
0	2	4-435	NA	PCB congener	PCB194	35694-08-7	1	UG/KG	J	0.259	1
0	2	4-435	NA	PCB congener	PCB201	40186-71-8	1	UG/KG	U	1	1
0	2	4-435	NA	PCB congener	PCB206	40186-72-9	1.23	UG/KG		0.388	1
0	2	4-435	NA	Pesticide	2,4'-DDD	53-19-0	1	UG/KG	J	0.228	1
0	2	4-435	NA	Pesticide	2,4'-DDE	3424-82-6	17.3	UG/KG		0.168	1
0	2	4-435	NA	Pesticide	2,4'-DDT	789-02-6	1	UG/KG	J	0.135	1
0	2	4-435	NA	Pesticide	4,4'-DDD	72-54-8	31.2	UG/KG		0.199	1
0	2	4-435	NA	Pesticide	4,4'-DDE	72-55-9	74.6	UG/KG		0.094	1
0	2	4-435	NA	Pesticide	4,4'-DDT	50-29-3	51.7	UG/KG		0.185	1
0	2	4-435	NA	Pesticide	alpha-Chlordane	5103-71-9	0.5	UG/KG	U	0.5	0.5
0	2	4-435	NA	Pesticide	Chlordane	57-74-9	21.5	UG/KG		-99	-99
0	2	4-435	NA	Pesticide	DDTs	NA	174.8	UG/KG		-99	-99
0	2	4-435	NA	Pesticide	gamma-Chlordane	5566-34-7	21.5	UG/KG		1	1
0	2	5-445	NA	PAH	1-Methylnaphthalene	90-12-0	25.6	UG/KG	J	15.1	50
0	2	5-445	NA	PAH	1-Methylphenanthrene	832-69-9	530	UG/KG		25.9	50
0	2	5-445	NA	PAH	2,3,5-Trimethylnaphthalene	2245-38-7	25.2	UG/KG	J	21.9	50
0	2	5-445	NA	PAH	2,6-Dimethylnaphthalene	581-42-0	77.3	UG/KG		17.3	50
0	2	5-445	NA	PAH	2-Methylnaphthalene	91-57-6	59.9	UG/KG		17.3	50
0	2	5-445	NA	PAH	Acenaphthene	83-32-9	24.5	UG/KG	J	18.6	50
0	2	5-445	NA	PAH	Acenaphthylene	208-96-8	214	UG/KG		18	50
0	2	5-445	NA	PAH	Anthracene	120-12-7	579	UG/KG		19.9	50
0	2	5-445	NA	PAH	Benz(a)anthracene	56-55-3	423	UG/KG		26.4	50
0	2	5-445	NA	PAH	Benzo(a)pyrene	50-32-8	1287	UG/KG		23.4	50
0	2	5-445	NA	PAH	Benzo(b)fluoranthene	205-99-2	2428	UG/KG		29.5	50
0	2	5-445	NA	PAH	Benzo(e)pyrene	192-97-2	1022	UG/KG		27.3	50
0	2	5-445	NA	PAH	Benzo(g,h,i)perylene	191-24-2	550	UG/KG		28.7	100
0	2	5-445	NA	PAH	Benzo(k)fluoranthene	207-08-9	50	UG/KG	J	33.3	50
0	2	5-445	NA	PAH	Biphenyl	92-52-4	33	UG/KG	J	16	50
0	2	5-445	NA	PAH	Chrysene	218-01-9	1031	UG/KG		36	50
0	2	5-445	NA	PAH	Dibenz(a,h)anthracene	53-70-3	134	UG/KG		30.7	100
0	2	5-445	NA	PAH	Fluoranthene	206-44-0	383	UG/KG		29.8	50
0	2	5-445	NA	PAH	Fluorene	86-73-7	77.5	UG/KG		22	50
0	2	5-445	NA	PAH	HPAH	NA	5304	UG/KG		-99	-99
0	2	5-445	NA	PAH	Indeno(1,2,3-c,d)pyrene	193-39-5	581	UG/KG		28.2	100
0	2	5-445	NA	PAH	LPAH	NA	1620.8	UG/KG		-99	-99
0	2	5-445	NA	PAH	Naphthalene	91-20-3	50	UG/KG	J	20.6	50

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	11/8/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/19/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/19/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/19/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/19/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	7/19/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	6/17/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	2/4/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	2/9/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	2/24/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	3/2/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	10/7/1998 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	#############
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	2/11/1999 0:00
89	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	2169	33.768	-118.278	Los Angeles Harbor	Dominguez Watershed	Los Angeles	2169	Sediment Grab	RESULT	############	2/11/1999 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	1/1/1900 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	2	5-445	NA	PAH	PAHs	NA	6924.8	UG/KG		-99	-99
0	2	5-445	NA	PAH	Perylene	198-55-0	425	UG/KG		22.4	50
0	2	5-445	NA	PAH	Phenanthrene	85-01-8	214	UG/KG		26.2	50
0	2	5-445	NA	PAH	Pyrene	129-00-0	599	UG/KG		26.4	50
0	2	6/17/99-457	2	AVS/SEM	Cadmium SEM	NA	0.004	MG/KG		0.001	0.001
0	2	6/17/99-457	2	AVS/SEM	Copper SEM	NA	0.7	MG/KG		0.001	0.001
0	2	6/17/99-457	2	AVS/SEM	Lead SEM	NA	0.41	MG/KG		0.001	0.001
0	2	6/17/99-457	2	AVS/SEM	Nickel SEM	NA	0.1	MG/KG		0.006	0.006
0	2	6/17/99-457	2	AVS/SEM	Zinc SEM	NA	2.54	MG/KG		0.02	0.02
0	2	6/17/99-458	NA	AVS/SEM	AVS	NA	356.34	MG/KG		3.13	3.13
0	2	98-09-32-520	NA	Metal	Antimony	7440-36-0	10	MG/KG	U	10	10
0	2	98-09-32-521	NA	Metal	Selenium	7782-49-2	1	MG/KG	U	1	1
0	2	98-09-32-522	NA	Metal	Silver	7440-22-4	2.8	MG/KG		0.2	0.2
0	2	98-09-32-523	NA	Metal	Lead	7439-92-1	86	MG/KG		9.3	9.3
0	2	98-09-32-525	NA	Metal	Aluminum	7429-90-5	36897	MG/KG		125	30
0	2	98-09-32-525	NA	Metal	Arsenic	7440-38-2	22	MG/KG		1.6	1.6
0	2	98-09-32-525	NA	Metal	Barium	7440-39-3	220	MG/KG		50	-99
0	2	98-09-32-525	NA	Metal	Beryllium	7440-41-7	1.6	MG/KG		0.2	0.2
0	2	98-09-32-525	NA	Metal	Cadmium	7440-43-9	1	MG/KG		0.2	0.2
0	2	98-09-32-525	NA	Metal	Chromium	7440-47-3	110	MG/KG		16	16
0	2	98-09-32-525	NA	Metal	Copper	7440-50-8	140	MG/KG		7	7
0	2	98-09-32-525	NA	Metal	Iron	7439-89-6	51000	MG/KG		125	-99
0	2	98-09-32-525	NA	Metal	Nickel	7440-02-0	48	MG/KG		4.2	4.2
0	2	98-09-32-525	NA	Metal	Zinc	7440-66-6	310	MG/KG		30	30
0	2	98-09-32-532	NA	Metal	Mercury	7439-97-6	0.29	MG/KG		0.03	0.03
0	2	FE1199-1-628	NA	Conventional	TN	NA	1680	MG/KG		30	410
0	2	FE1199-1-628	NA	Conventional	TOC	NA	2.537	PCT		0.0203137	0.28436
0	-99	GrSz-seive	1	Grain Size	Clay	NA	19.68	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Granule	NA	0.35	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Gravel	NA	0.35	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand	NA	64.93	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand C	NA	1.62	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand F	NA	18.75	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand M	NA	40.86	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand VC	NA	0.69	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Sand VF	NA	3.01	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Silt	NA	15.05	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Silt C	NA	1.16	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Silt F	NA	3.47	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Silt M	NA	3.47	PCT		-99	-99
0	-99	GrSz-seive	1	Grain Size	Silt VF	NA	3.47	PCT		-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/22/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/23/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/29/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/29/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/29/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/29/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	-99	Metals-6010	1	Metal	Cadmium	7440-43-9	0.125	MG/KG	U	0.125	0.125
0	-99	Metals-6010	1	Metal	Chromium	7440-47-3	39.8	MG/KG		-99	0.1
0	-99	Metals-6010	1	Metal	Copper	7440-50-8	44.8	MG/KG		-99	0.1
0	-99	Metals-6010	1	Metal	Lead	7439-92-1	44.7	MG/KG		-99	0.1
0	-99	Metals-6010	1	Metal	Nickel	7440-02-0	19.1	MG/KG		-99	0.1
0	-99	Metals-6010	1	Metal	Silver	7440-22-4	0.063	MG/KG	U	0.063	0.1
0	-99	Metals-6010	1	Metal	Zinc	7440-66-6	99.7	MG/KG		-99	2
0	-99	Metals-As-206.2/7060	1	Metal	Arsenic	7440-38-2	5.03	MG/KG	D	-99	0.1
0	-99	Metals-Hg-7471	1	Metal	Mercury	7439-97-6	0.378	MG/KG	D	-99	0.02
0	-99	Metals-Se-7740	1	Metal	Selenium	7782-49-2	0.625	MG/KG	D	-99	0.1
0	-99	NH4-N-350.3	1	Nutrient	Ammonia	NA	4.8	MG/KG		-99	-99
0	-99	Organotin-GC/FPD	1	Organotin	Dibutyltin	1002-53-5	1	UG/KG	U	1	1
0	-99	Organotin-GC/FPD	1	Organotin	Monobutyltin	78763-54-9	1	UG/KG	U	1	1
0	-99	Organotin-GC/FPD	1	Organotin	Tributyltin	688-73-3	1	UG/KG	U	1	1
0	-99	Pest-PCB-8080	1	PCB	PCBs	NA	-99	UG/KG	U	-99	-99
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1016	12674-11-2	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1221	11104-28-2	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1232	11141-16-5	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1242	53469-21-9	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1248	12672-29-6	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1254	11097-69-1	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	PCB (Aroclor mi	Aroclor 1260	11096-82-5	20	UG/KG	U	20	20
0	-99	Pest-PCB-8080	1	Pesticide	4,4'-DDD	72-54-8	2.91	UG/KG		2	2
0	-99	Pest-PCB-8080	1	Pesticide	4,4'-DDE	72-55-9	9.69	UG/KG		2	2
0	-99	Pest-PCB-8080	1	Pesticide	4,4'-DDT	50-29-3	1.94	UG/KG		2	2
0	-99	Pest-PCB-8080	1	Pesticide	Aldrin	309-00-2	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	alpha-BHC	319-84-6	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	alpha-Chlordane	5103-71-9	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	beta-BHC	319-85-7	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Chlordane	57-74-9	2	UG/KG	U	-99	-99
0	-99	Pest-PCB-8080	1	Pesticide	DDTs	NA	14.54	UG/KG		-99	-99
0	-99	Pest-PCB-8080	1	Pesticide	delta-BHC	319-86-8	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Dieldrin	60-57-1	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Endosulfan I	959-98-8	10	UG/KG	U	10	10
0	-99	Pest-PCB-8080	1	Pesticide	Endosulfan II	33213-65-9	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Endosulfan sulfate	1031-07-8	25	UG/KG	U	25	25
0	-99	Pest-PCB-8080	1	Pesticide	Endrin	72-20-8	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Endrin aldehyde	7421-93-4	10	UG/KG	U	10	10
0	-99	Pest-PCB-8080	1	Pesticide	gamma-BHC	58-89-9	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	gamma-Chlordane	5566-34-7	2	UG/KG	U	2	2
0	-99	Pest-PCB-8080	1	Pesticide	Heptachlor	76-44-8	2	UG/KG	U	2	2

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
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9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
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9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
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9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/24/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/23/1995 0:00

Upper Sed Depth(cm)	Lower Sed Depth (cm)	QABatch	LabRep	Chemical Group	Chemical Name	CAS Number	Result	Units	Qualifier	MDL	RL
0	-99	Pest-PCB-8080	1	Pesticide	Heptachlor epoxide	1024-57-3	10	UG/KG	U	10	10
0	-99	Pest-PCB-8080	1	Pesticide	Toxaphene	8001-35-2	25	UG/KG	U	25	25
0	-99	Semivol-8270	1	PAH	Acenaphthene	83-32-9	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Acenaphthylene	208-96-8	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Anthracene	120-12-7	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Benz(a)anthracene	56-55-3	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Benzo(a)pyrene	50-32-8	172	UG/KG		20	20
0	-99	Semivol-8270	1	PAH	Benzo(b)fluoranthene	205-99-2	213	UG/KG		20	20
0	-99	Semivol-8270	1	PAH	Benzo(g,h,i)perylene	191-24-2	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Benzo(k)fluoranthene	207-08-9	154	UG/KG		20	20
0	-99	Semivol-8270	1	PAH	Chrysene	218-01-9	88.8	UG/KG		20	20
0	-99	Semivol-8270	1	PAH	Dibenz(a,h)anthracene	53-70-3	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Fluoranthene	206-44-0	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Fluorene	86-73-7	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	HPAH	NA	370.8	UG/KG		-99	-99
0	-99	Semivol-8270	1	PAH	Indeno(1,2,3-c,d)pyrene	193-39-5	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	LPAH	NA	20	UG/KG	U	-99	-99
0	-99	Semivol-8270	1	PAH	Naphthalene	91-20-3	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	PAHs	NA	370.8	UG/KG		-99	-99
0	-99	Semivol-8270	1	PAH	PAHs_R	NA	737	UG/KG		-99	-99
0	-99	Semivol-8270	1	PAH	Phenanthrene	85-01-8	20	UG/KG	U	20	20
0	-99	Semivol-8270	1	PAH	Phenols	NA	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	PAH	Pyrene	129-00-0	110	UG/KG		20	20
0	-99	Semivol-8270	1	Phenol	2,4,6-Trichlorophenol	88-06-2	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	2,4-Dichlorophenol	120-83-2	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	2,4-Dimethylphenol	105-67-9	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	2,4-Dinitrophenol	51-28-5	50	UG/KG	U	50	50
0	-99	Semivol-8270	1	Phenol	2-Chlorophenol	95-57-8	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	2-Nitrophenol	88-75-5	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	4,6-Dinitro-2-methylphenol	534-52-1	50	UG/KG	U	50	50
0	-99	Semivol-8270	1	Phenol	4-Chloro-3-methylphenol	59-50-7	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phenol	4-Nitrophenol	100-02-7	50	UG/KG	U	50	50
0	-99	Semivol-8270	1	Phenol	Pentachlorophenol	87-86-5	100	UG/KG	U	100	100
0	-99	Semivol-8270	1	Phthalate	Bis(2-ethylhexyl) Phthalate	117-81-7	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phthalate	Butylbenzyl Phthalate	85-68-7	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phthalate	Dibutyl phthalate	84-74-2	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phthalate	Diethyl phthalate	84-66-2	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phthalate	Dimethyl phthalate	131-11-3	695	UG/KG		10	10
0	-99	Semivol-8270	1	Phthalate	Dioctyl phthalate	117-84-0	10	UG/KG	U	10	10
0	-99	Semivol-8270	1	Phthalate	Phthalates	NA	695	UG/KG		-99	-99
0	-99	TD-Sulfides-4500SD	1	Conventional	Sulfides	NA	29.4	MG/KG		-99	-99

NW SLIP SEDIMENT CHEMISTRY DATA													
StudyID	Study Name	Agency	StationID	Latitude	Longitude	Water Body	Watershed	County	SampleID	Sample Method	Sample Type	Date Sampled	Date Analyzed
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/26/1995 0:00
9	POLA Berths 127-131 Final Report	Port of Los Angeles	Test Site	33.7668	-118.279	Los Angeles Harbor	Dominguez Watershed	Los Angeles	Test-Comp	Core	RESULT	############	5/18/1995 0:00

Upper Sed Depth(cm)	**Lower Sed Depth (cm)**	**QABatch**	**LabRep**	**Chemical Group**	**Chemical Name**	**CAS Number**	**Result**	**Units**	**Qualifier**	**MDL**	**RL**
0	-99	TOC-9060	1	Conventional	TOC	NA	0.55	PCT		-99	-99
0	-99	TRPH-418.1	1	Conventional	TRPH	NA	129	MG/KG		-99	-99

Final Report
Tier II Sediment Testing Results
Port of Los Angeles
Berths 127-131

Final Report
Tier II Sediment Testing Results
Port of Los Angeles
Berths 127-131

Prepared for

Manson Construction & Engineering Co.
1605 Pier D Street
Long Beach, CA 90802

Prepared by

Ogden Environmental and Energy Services Co., Inc.
5510 Morehouse Drive
San Diego, California 92121
(619) 458-9044

May 1997
Project No. 317371000

Table 3-2. Bulk Sediment Chemistry - Berths 127-131

Analyte	Units	127-131 Composite	Guideline Values NOAA ER-L	Guideline Values NOAA ER-M
Percent Solid	%	66.2	- -	- -
Sulfide	mg/kg	2.42	- -	- -
Dissolved Sulfide	mg/kg	ND	- -	- -
Ammonia	mg/kg	6.0	- -	- -
Petreoleum Hydrocarbons (TRPH)	mg/kg	240	- -	- -
Total Organic Carbon (TOC)	%	- -	- -	- -
Metals				
Cadmium	mg/kg	**1.66**	1.2	9.6
Chromium	mg/kg	40	81	370
Copper	mg/kg	31	34	270
Lead	mg/kg	29	46.7	218
Nickel	mg/kg	16	20.9	51.6
Mercury	mg/kg	**0.59**	0.15	0.71
Zinc	mg/kg	77	150	410
Arsenic	mg/kg	ND	8.2	70
Selenium	mg/kg	ND	- -	- -
Silver	mg/kg	ND	1	3.7
Organotins				
Tributyltin	µg/kg	13.6	- -	- -
Dibutyltin	µg/kg	ND	- -	- -
Monobutyltin	µg/kg	ND	- -	- -
Total Phenols				
4-Chloro-3-Methylphenol	µg/kg	ND	- -	- -
2-Chlorophenol	µg/kg	ND	- -	- -
2,4-Dichlorophenol	µg/kg	ND	- -	- -
2,4-Dimethylphenol	µg/kg	ND	- -	- -
2,4-Dinitrophenol	µg/kg	ND	- -	- -
2-Methyl-2,6-Dinitrophenol		ND	- -	- -
2-Nitrophenol	µg/kg	ND	- -	- -
4-Nitrophenol	µg/kg	ND	- -	- -
Pentachlorophenol	µg/kg	ND	- -	- -
Phenol	µg/kg	ND	- -	- -
2,4,6-Trichlorophenol	µg/kg	ND	- -	- -
PAH's				
Naphthalene	µg/kg	ND	160	2100
Acenaphthylene	µg/kg	ND	44	640
Acenaphthene	µg/kg	ND	16	500
Fluorene	µg/kg	ND	19	540
Anthracene	µg/kg	ND	240	1500
Benzo (A) Anthracene	µg/kg	ND	85	1100
Benzo (A) Pyrene	µg/kg	189	600	5100
Benzo (B) Fluoranthene	µg/kg	378	665	2600
Benzo (GHI) Perylene	µg/kg	ND	261	1600
Benzo (K) Fluoranthene	µg/kg	ND	384	2800
Chrysene	µg/kg	ND	- -	- -
Dibenzo (A,H) Anthracene	µg/kg	ND	- -	- -
Flouranthene	µg/kg	ND	430	1600
Indeno (1,2,3-CD) Pyrene	µg/kg	ND	63	260
Phenanthrene	µg/kg	ND	- -	- -
Pyrene	µg/kg	331	- -	- -
Total PAH's	µg/kg	1028	4022	44792
Organochlorine Pesticides				
Aldrin	µg/kg	ND		
Alpha-BHC	µg/kg	ND	- -	- -
Beta-BHC	µg/kg	ND	2.2	27
Gamma BHC (LINDANE)	µg/kg	ND	- -	- -
Delta-BHC	µg/kg	ND	- -	- -
Chlordane	µg/kg	ND	- -	- -
4,4' - DDD	µg/kg	ND	- -	- -
4,4' - DDE	µg/kg	ND	- -	- -
4,4' - DDT	µg/kg	ND	- -	- -
Dieldrin	µg/kg	ND	- -	- -
Endosulfan I	µg/kg	ND	- -	- -
Endosulfan II	µg/kg	ND	- -	- -
Endosulfan Sulfate	µg/kg	ND	- -	- -
Endrin	µg/kg	ND	- -	- -
Endrin Aldehyde	µg/kg	ND	0.02	45
Heptachlor	µg/kg	ND	- -	- -
Heptachlor Epoxide	µg/kg	ND	- -	- -
Methoxychlor	µg/kg	ND	- -	- -
Toxaphene	µg/kg	ND	- -	- -
PCBs				
PCB-1016	µg/kg	ND	- -	- -
PCB-1221	µg/kg	ND	- -	- -
PCB-1232	µg/kg	ND	- -	- -
PCB-1242	µg/kg	ND	- -	- -
PCB-1248	µg/kg	ND	- -	- -
PCB-1254	µg/kg	ND	- -	- -
PCB-1260	µg/kg	ND	- -	- -
Total PCB's	µg/kg	- -	2.7	180

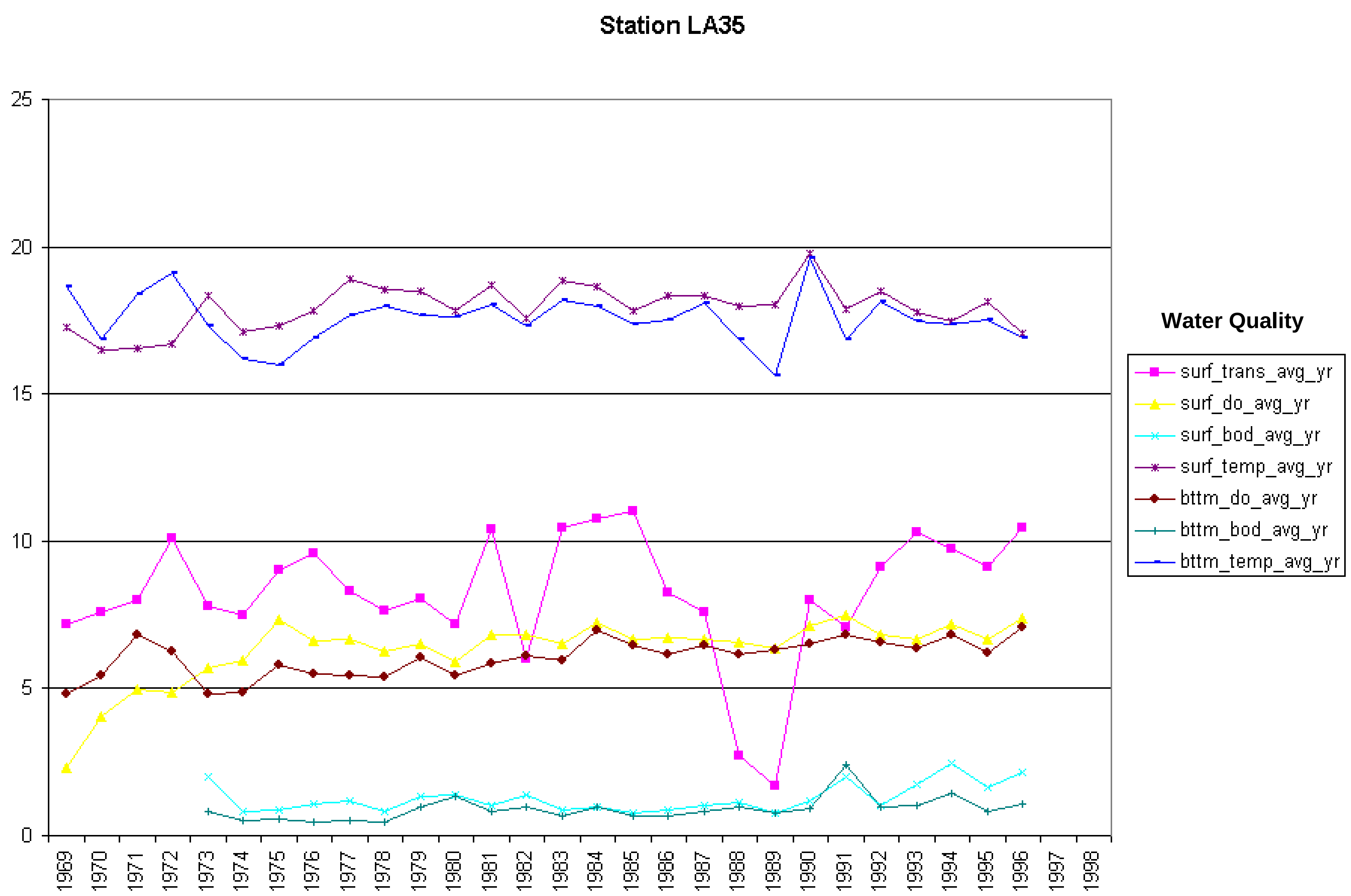
Bold values are greater than the NOAA ER-L

ER-L = Effects Range - Low
ER-M = Effects Range - Median

Water Quality Samples

Water Quality Samples																	
							Surface						Bottom				
Station	Month	Year	Odor	Color	Oil&Grease	Solids	Transparency	DO	BOD	Temp	Coliform	pH	DO	BOD	Temp	Ph
							(feet)	(mg/l)	(mg/l)	(Degrees C)	mpn	(pH)	(mg/l)	(mg/l)	(Degrees C)	(pH)
LA35	1	1993	N	OG	N	N	1	6.7	0.1	15.9			6.1	0	15.3	
LA35	2	1993	N	OG	N	N	11	5.5	3.2	15.8			6.4	0	15.8	
LA35	3	1993	N	OG	N	N	11.5	6	0	17.2			7	0.7	16.6	
LA35	4	1993	N	OG	N	N	13.5	7	2.7	16.9			5.4	1.8	16.6	
LA35	6	1993	N	OG	N	N	7	6.8	1.3	17.8			5.6	0.5	17.6	
LA35	7	1993	N	OG	N	N	10	6.6	0	21.6			8.3	1.5	21	
LA35	9	1993	N	OG	N	N	11	10	2.6	19.9			6.2	0	19.4	
LA35	10	1993	N	OG	N	N	15	5.5	1.1	18.8			5.5	0	18.8	
LA35	11	1993	N	OG	N	N	11	6.2	1.3	17.1			6.6	1	17	
LA35	12	1993	N	OG	N	N	12	6.5	1.6	16.8			6.2	0.8	16.8	

Water Quality Samples																	
							Surface						Bottom				
Station	Month	Year	Odor	Color	Oil&Grease	Solids	Transparency	DO	BOD	Temp	Coliform	pH	DO	BOD	Temp	Ph
							(feet)	(mg/l)	(mg/l)	(Degrees C)	mpn	(pH)	(mg/l)	(mg/l)	(Degrees C)	(pH)
LA35	2	1995	N	OG	N	N	7	7.1	1.1	15.8			6.7	0.5	15.3	
LA35	3	1995	N	OG	N	N	7	6	2	16.8			6	1	16.8	
LA35	4	1995	N	OG	N	N	0	0	0	0			0	0	0	
LA35	5	1995	N	OG	N	N	5	6.4	1.1	18.4			6	1.6	17.4	
LA35	6	1995	N	OG	N	N	10	7.7	1.7	19.6			6.9	0.9	18.8	
LA35	7	1995	N	OG	N	N	12	6.9	1.8	18.6			6.5	0.7	17.8	
LA35	8	1995	N	OG	N	N	8	7.1	2.4	20.4			4.4	0	18.6	
LA35	9	1995	N	OG	N	N	12	7	2.4	18.9			7	0.7	18.4	
LA35	10	1995	N	OG	N	N	8	6.9	1.2	17.6			6.7	1	17.5	
LA35	11	1995	N	OG	N	N	12	6	2.2	18.6			6	0.6	18.4	
LA35	12	1995	N	OG	N	N	10	5.7	0.5	16.4			5.7	0.4	16.3	



Station LA35
25
20
15
10
5
0
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
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1981
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1983
1984
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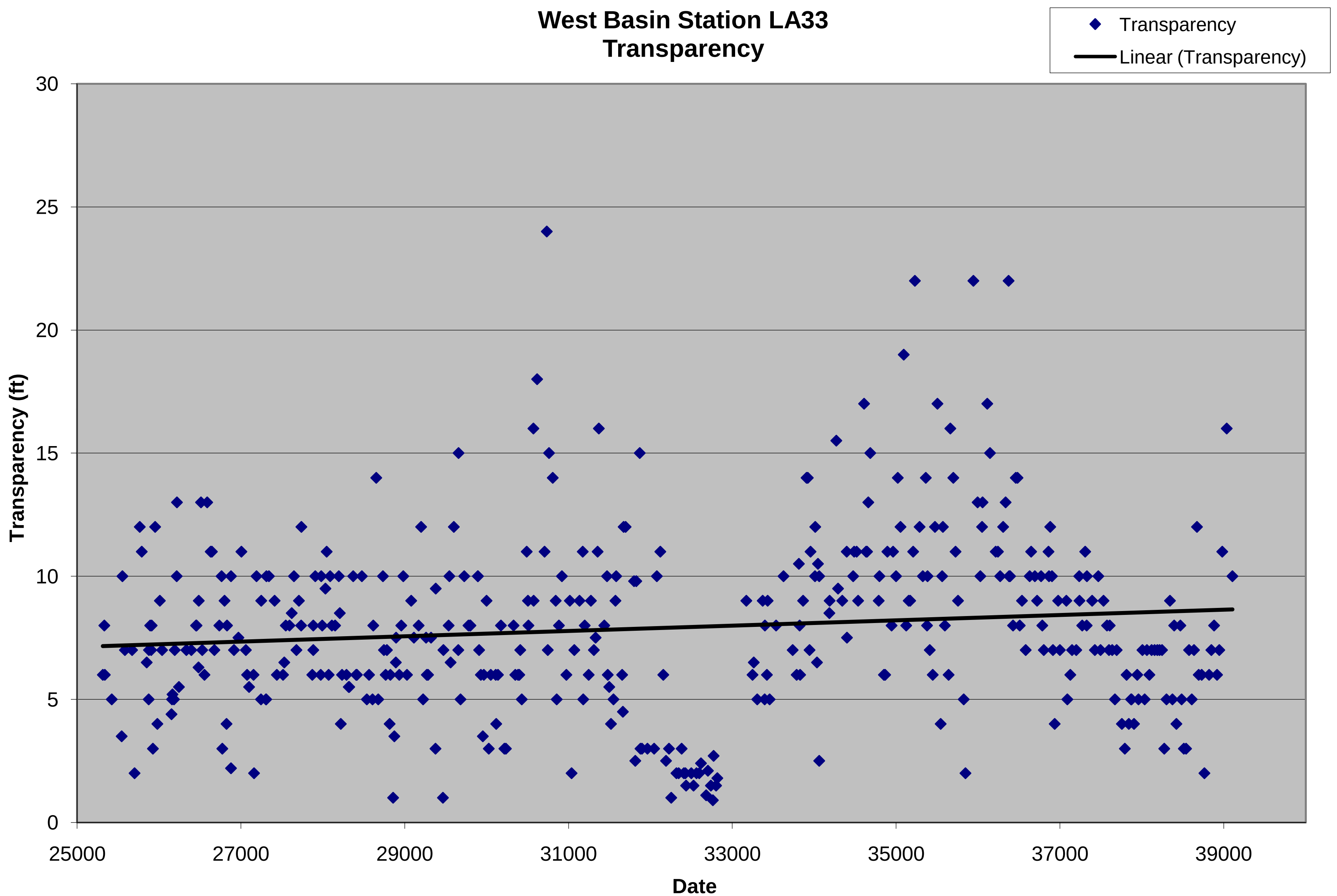
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
Water Quality
surf_trans_avg_yr
surf_do_avg_yr
surf_bod_avg_yr
surf_temp_avg_yr
bttm_do_avg_yr
bttm_bod_avg_yr
bttm_temp_avg_yr

West Basin Data Graphics



West Basin Station LA33
Transparency
Transparency
Linear (Transparency)
Transparency (ft)
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15
20
25
30
25000
27000
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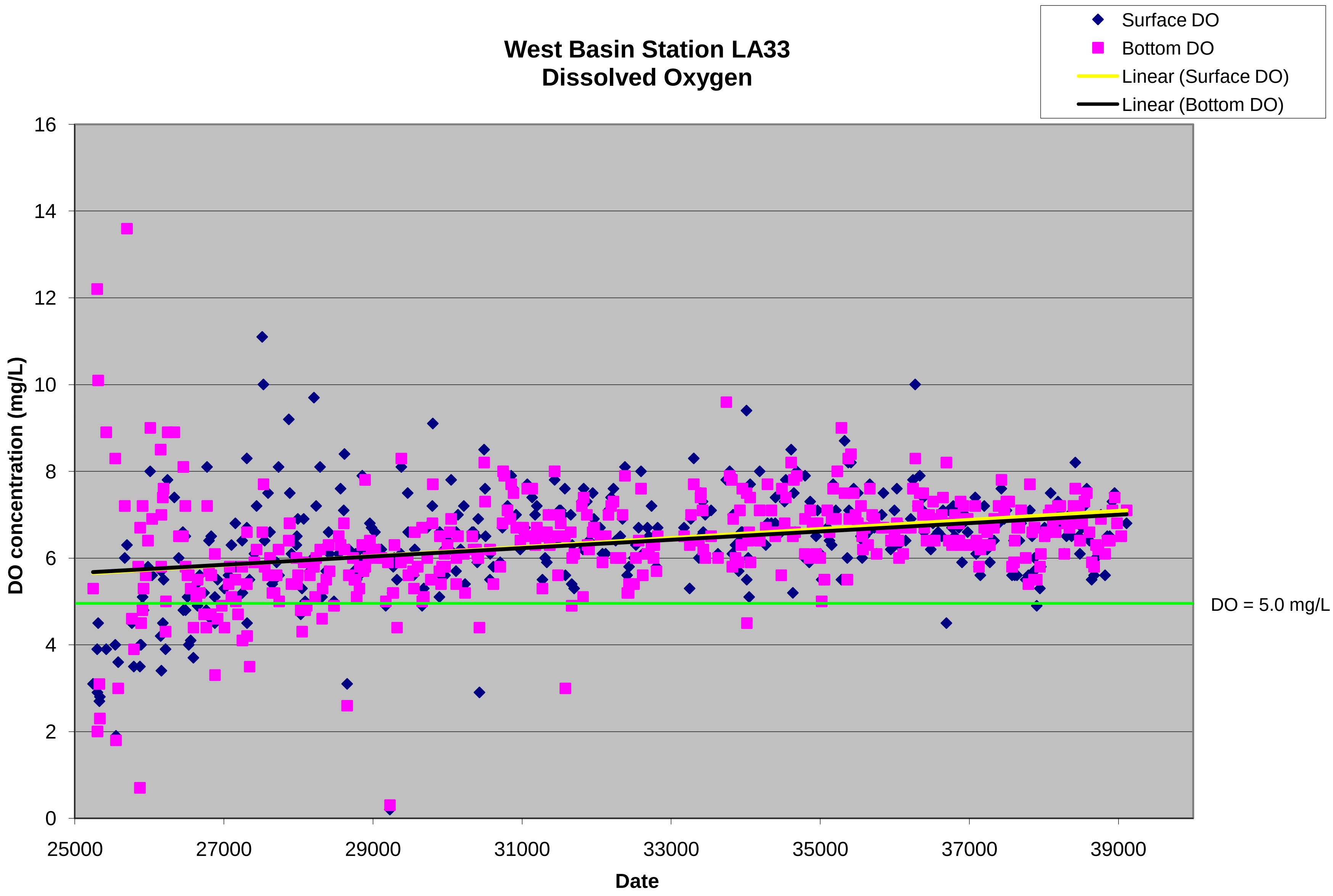
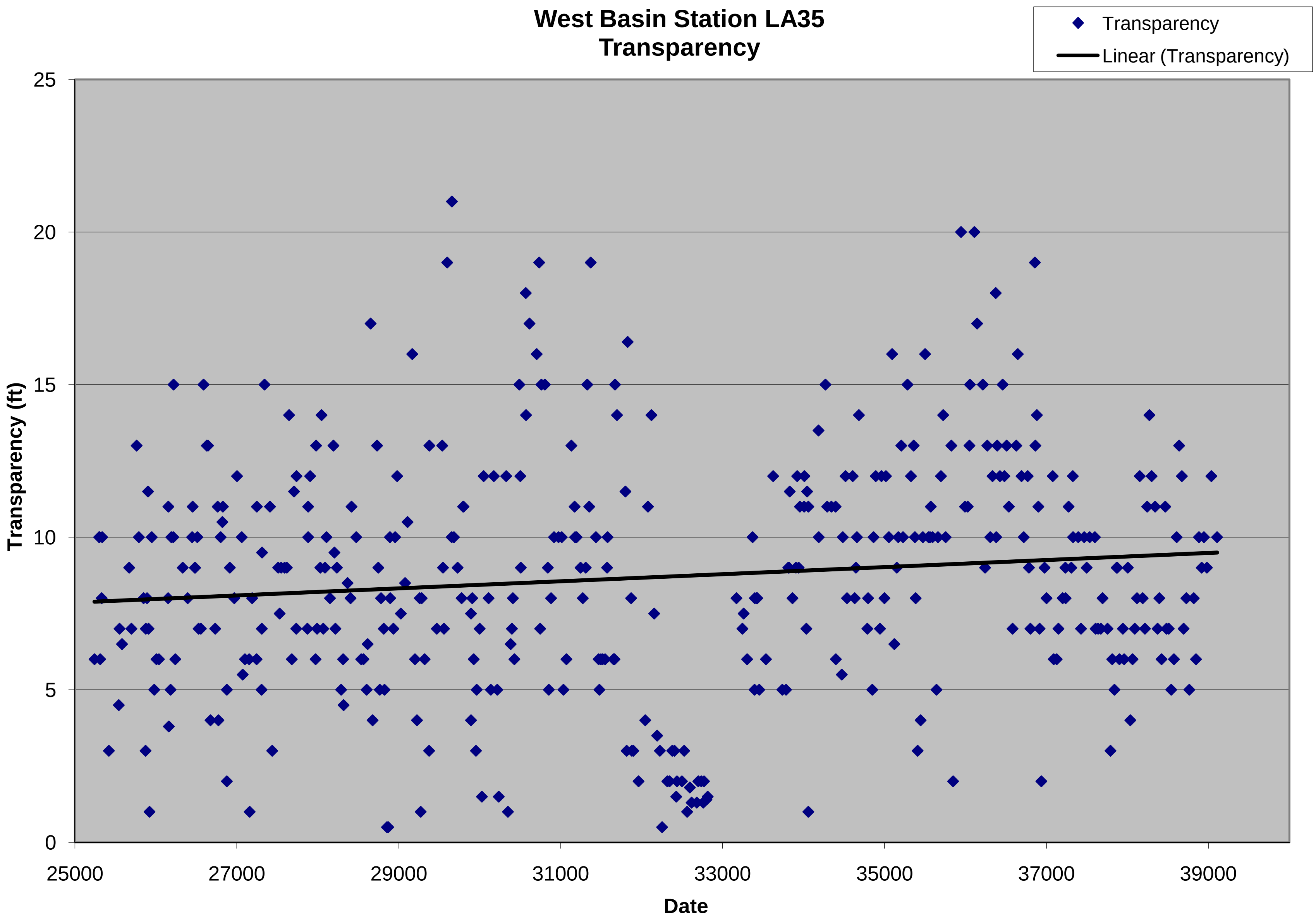
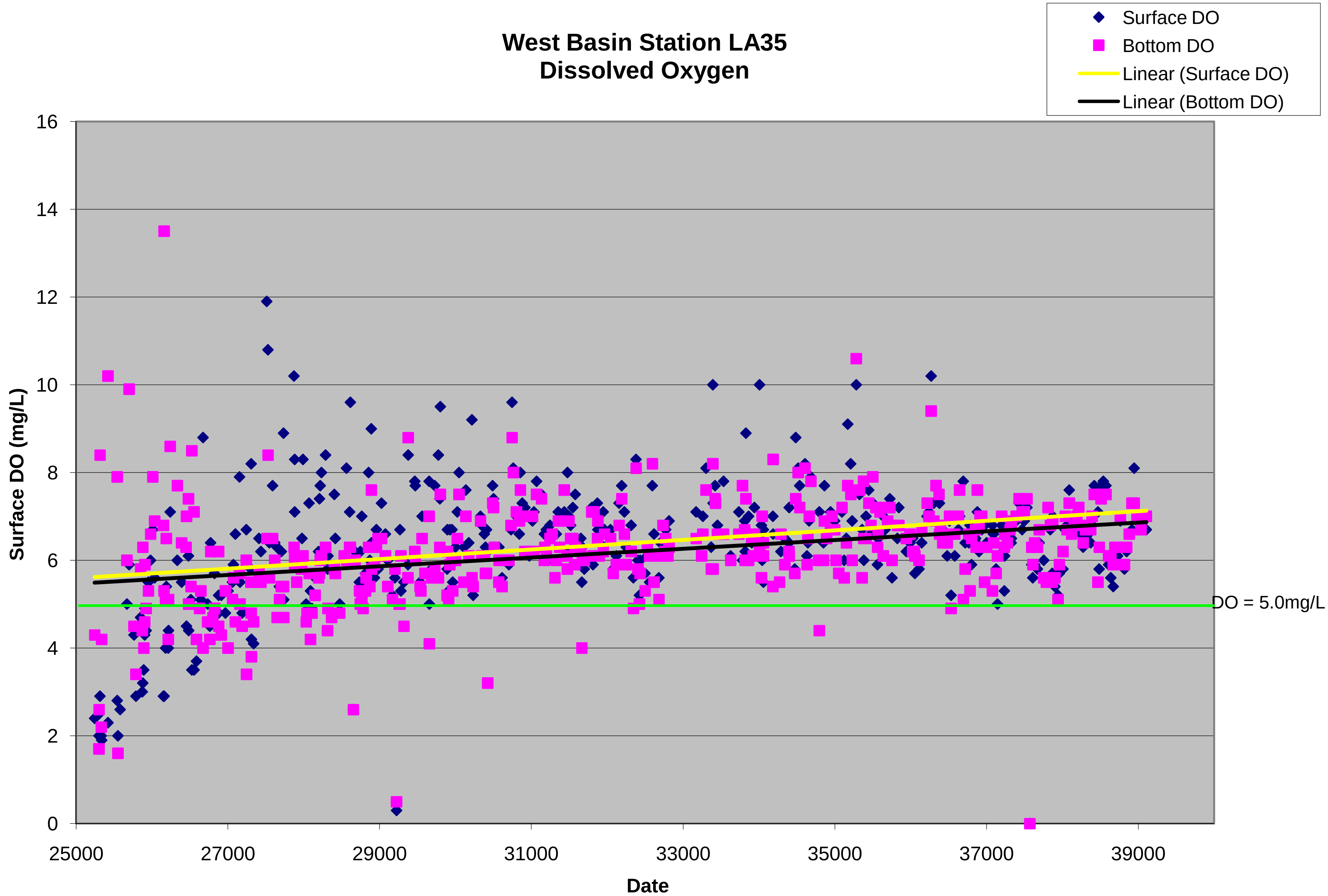
33000
35000
37000
39000
Date



West Basin Station LA33
Dissolved Oxygen
Surface DO
Bottom DO
Linear (Surface DO)
Linear (Bottom DO)
DO concentration (mg/L)
0
2
4
6
8
10
12
14
16
25000
27000
29000
31000
33000
35000
37000
39000
Date
DO = 5.0 mg/L


West Basin Station LA35
Transparency
Transparency
Linear (Transparency)
Transparency (ft)
0
5
10
15
20
25
25000
27000
29000
31000
33000
35000
37000
39000
Date


West Basin Station LA35
Dissolved Oxygen
Surface DO
Bottom DO
Linear (Surface DO)
Linear (Bottom DO)
Surface DO (mg/L)
16
14
12
10
8
6
4
2
0
DO = 5.0mg/L
25000
27000
29000
31000
33000
35000
37000
39000
Date

MBC

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
2003 RECEIVING WATER MONITORING REPORT
HARBOR GENERATING STATION
LOS ANGELES COUNTY, CALIFORNIA

2003 Survey

Prepared for:

Los Angeles Department of Water and Power

Prepared by:

MBC *Applied Environmental Sciences*
3000 Redhill Avenue
Costa Mesa, California 92626

EXECUTIVE SUMMARY

The 2003 National Pollutant Discharge Elimination System (NPDES) marine monitoring program for the Harbor Generating Station was conducted in accordance with specifications set forth by the California Regional Water Quality Control Board, Los Angeles Region (LARWQCB) in NPDES Permit No. CA0000361 dated 27 February 1995. The 2003 studies included physical and chemical monitoring of the receiving waters and sediments, and biological monitoring of benthic infaunal and fish and macroinvertebrate assemblages. Results of the 2003 surveys were compared among stations and with previous studies to determine if the beneficial uses of the receiving waters continue to be protected.

WATER COLUMN MONITORING

Water quality parameters were measured in winter and summer 2003 at three stations in the West Basin. No thermal influence from the Harbor Generating Station discharge was evident during the 2003 winter sampling. In summer, a surface lens of warm water was detected at Station RW1 near the discharge on flood tide. The warm surface water lens was not detected at the other two stations during flood tide or at any station on ebb tide. Dissolved oxygen concentrations were normal during both seasonal surveys. No aeration effect from the Harbor Generating Station discharge was noted during either season. Subsurface dissolved oxygen maxima were found at all stations in summer, likely related to phtyoplankton productivity in the area. Only slight variations in pH values were noted in 2003, and slight difference in salinity between surveys was likely seasonal in nature. No influence on pH or salinity in the area of the Harbor Generating Station discharge was evident. All temperature, dissolved oxygen, pH, and salinity values were within ranges considered normal for the study area.

SEDIMENT MONITORING

Sediment Grain Size

Sediments in the study area in 2003 were composed primarily of sand, with lesser amounts of silt and clay. Overall, sediments averaged 50% sand, 34% silt, and 16% clay. Sediments were increasingly finer with distance from the Harbor Generating Station discharge. Overall, mean grain size in the study area this year was the finest since 1999. Coarsest sediments collected at the discharge could have resulted from turbulence associated with the Harbor Generating Station cooling water discharge. However, sediment characteristics in West Basin have varied greatly since 1990, and bimodal particle size distributions suggest ongoing disturbance of the sediments from multiple sources. Aside from the generating station, potential sources include tidal currents, surge from ship traffic, and dredging and construction in West Basin.

Sediment Chemistry

Concentrations of chromium, copper, nickel, and zinc in sediments decreased from 2002 to 2003 at Stations B1 and B2, while those at Station B3 (at the entrance to West Basin) increased slightly since last year. Almost all metal concentrations were below the Effects-Range-Low (ERL) values, the levels at which metal concentrations could potentially affect marine biota. The exception to this was the copper concentration recorded at Station B3, which was slightly higher than the ERL. All metal levels were similar to levels recorded in the study area since 1990. As with sediment grain size, multiple factors likely affect the distribution of sediment metals. Though it is possible the Harbor Generating Station discharge affects grain size distribution in the vicinity of the discharge structure, there was no indication the generating station is an appreciable source of metals in West Basin.

MUSSEL BIOACCUMULATION

In 2003, bay mussels (*Mytilus galloprovincialis*) were collected from pier pilings in West Basin in the vicinity of the Harbor Generating Station discharge. Tissues from the mussels were analyzed for bioaccumulation of the metals chromium, copper, nickel, and zinc.

Copper and zinc were detected in all three replicates, while concentrations of chromium and nickel were below reporting levels in all replicates. Copper and zinc levels were approximately five to seven times lower than levels found previously in studies conducted in the nearby Back Channel of Long Beach Harbor. Levels of both metals were notably lower than values considered elevated by the California State Mussel Watch Program. Similar concentrations of metals were detected in tissues of mussels collected at a coastal pier reference site.

All metal concentrations in mussel tissues from the vicinity of the discharge were within ranges found previously in the Los Angeles/Long Beach Harbor area and throughout the Southern California Bight. The comparatively low tissue metal levels, based on EDL values, the similarity of tissue metal levels to an open coast reference site, and the notable reduction of levels of some metals from previous nearby studies suggests that the operation of the Harbor Generating Station is not elevating metal levels above background levels.

BIOLOGICAL MONITORING

Benthic Infauna

The infaunal communities in West Basin in 2003 were dominated by small polychaete annelids, clams, and nemertean worms. The Asian clam *Theora lubrica* and the polychaetes *Euchone limnicola* and *Cossura* sp A were the most abundant species; these have been among the core group of species occurring at the three benthic stations since 1978. Abundance, species richness, and biomass were greatest at the station between the discharge and the basin entrance, and were lowest near the entrance. Species diversity was highest near the entrance. Values for the discharge area were intermediate between those for the other two stations. Community composition was most similar between the discharge and intermediate stations. Abundance averaged 6,570 individuals/m^2 for the study area, slightly below the long-term mean, and biomass was lower than in any previous survey. Species richness in 2003, averaging 21 species per station (11 species per replicate), and species diversity (means of 1.87 per station and 1.58 per replicate) were the lowest recorded since 1990. The reduction in sample size due to a resource exchange for the LARWQCB Bight-wide sampling program may account for some of this decline, but the replicate mean values were also lower than those in the previous two years. Both abundance and species richness appear to have increased slightly since 1990. Species diversity has been similar among surveys.

Even though the long-term core group of species continued to dominate the community in 2003, some shifts in community composition were apparent. A few annelid species considered to be indicators of pollution have become less dominant, while introduced, or non-native, species have increased. Some of these have long been established in the harbor area, while the appearance of other species has been documented more recently and seems to be related to the increase in shipping from Asia. The infaunal community in West Basin is similar to but less speciose than those found in other areas of the Los Angeles-Long Beach harbor complex.

Impingement

Fish impingement monitoring was conducted at Harbor Generating Station for the first time since 1979. Three normal operation impingement surveys resulted in the take of seven species of fish and 52 individuals, and four macroinvertebrates representing three species. Round stingray was the most abundant fish, comprising 81% of impingement abundance and 94% of the biomass. The impingement rate calculated from the three surveys was much lower than that from 1978-1979.

CONCLUSIONS

The overall results of the 2003 NPDES monitoring program indicated that operation of the Harbor Generating Station had no detectable adverse effects on the beneficial uses of the receiving waters.

ERDC/EL/CHL TR-00-X

Environmental and
Coastal and
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Port of Los Angeles Pier 300 Expansion Water Quality and Hydrodynamic Study

Barry W. Bunch, Dorothry H. Tillman, and David J. Mark

April 2000

ERDC/EL TR-00-
April 2000

Port of Los Angeles Pier 300 Expansion Water Quality and Hydrodynamic Study

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Final report

Approved for public release; distribution is unlimited

Prepared for U.S. Army Engineer District, Los Angeles

Under Military Interdepartmental Purchase Request No. W81EYN91969556

Contents

Preface

This report summarizes the findings of an investigation to determine whether a proposed main channel deepening and expansion of Port of Los Angeles' (POLA) Pier 300 will impact water quality within San Pedro Bay, California (Los Angeles-Long Beach Harbors). This study was performed by the U.S. Army Engineer Research and Development Center (ERDC), Waterways Experiment Station, Vicksburg, Mississippi for the U.S. Army Engineer District, Los Angeles (SPL). The study was funded under the Military Interdepartmental Purchase Request No. W81EYN91969556 dated 26 July 1999. Appreciation is extended to Dr. Ralph Appy, Mr. John Foxworthy, and Ms. Stacey Jones, Port of Los Angeles, and to Ms. Jane Grandon, Mr. Arthur Shak, and Mr. Lawrence Smith, SPL, for their assistance during this study.

Two numerical models, one hydrodynamic and one water quality model, were used in assessing possible water quality impacts resulting from the proposed harbor modifications. The Curvilinear Hydrodynamic 3-Dimensional (CH3D) model study was used for simulating currents within the bay, which were subsequently used to force mass transport in the water quality model. The CE-QUAL-ICM model simulated the water quality in the study area.

Principal Investigators for the water quality component of this study were Dr. Barry W. Bunch and Ms. Dorothy H. Tillman of the Water Quality and Contaminant Modeling Branch (WQCMB), Environmental Processes and Effects Division, Environmental Laboratory (EL), ERDC. Ms. Tillman and Dr. Bunch conducted their portion of the study under the direct supervision of Dr. Mark S. Dortch, Chief, WQCMB, and under the general supervision of Dr. Richard E. Price, Chief, EPED, and Dr. John W. Keeley, Director, EL. The water quality technical review was conducted by Dr. Patrick N. Deliman and Ms. Lillian T. Schneider, WQCMB.

The Principal Investigator for the hydrodynamic component of the study was Mr. David J. Mark, Coastal Hydrodynamics Branch (HN-C), Coastal and Hydraulics Laboratory (CHL), ERDC. Mr. Mark performed his portion of the study under the direct supervision of Dr. Zeki Demirbilek, Acting Chief, HN-C, and under the general supervision of Dr.

James R. Houston, Director, CHL, and Mr. Thomas W. Richardson, Deputy Director, CHL. The hydrodynamic technical review was conducted by Dr. Norman W. Scheffner, HN-C.

A third component of this study involved investigating harbor resonance induced by the proposed harbor modifications. As opposed to using a numerical model, a physical model was used for this investigation. The Principal Investigator was Mr. Robert Carver, Harbors and Entrances Branch (HN-H), CHL. Results from this component are published in a separate report. Mr. Carver performed his portion of the study under the direct supervision of Mr. Dennis G. Markle, Chief, HN-H, CHL. Mr. Markle also served as Study Coordinator for the three components of the study.

At the time of publication of this report, Dr. Lewis E. Link was Acting Director of ERDC, and COL Robin R. Cababa, EN was commander.

This report should be cited as follows:

Bunch, B. W., Tillman D. H., and Mark, D. J. (2000). "Port of Los Angeles (POLA) Pier 300 Expansion Water Quality and Hydrodynamic Modeling Study," Technical Report EL-00-XXX, U.S. Army Engineer Research and Development

1 Introduction

The U.S. Army Engineer Engineering Research and Development Center (ERDC) has conducted a hydrodynamic and water quality modeling study of Los Angeles and Long Beach Harbors to determine possible water quality impacts resulting from the extension of Pier 300, the proposed deepening of the Main Channel, and the possible closing of the gap in the causeway leading to Pier 400. The proposed Pier 300 expansion will contain sediment dredged from the Main Channel, where the channel depth will be increased from approximately 45 ft mean low water (MLW) to 55 ft MLW.

Three proposed Pier 300 expansion configurations were investigated in this study. For each configuration, the pier is expanded directly east and into the water basin that is referred to as the shallow water habitat. Furthermore, the southern edge of the expansions will run parallel to, and aligned with, the southern edge of the existing pier. Two proposed configurations will increase the surface area of the existing pier (and thereby decrease the size of the shallow water habitat) by 80 acres. The third configuration will increase the size of the pier by 40 acres.

One of the 80-ac expansions, referred to in this report as the 80-ac "wide" configuration, has the dimensions of 1870 ft by 1870 ft, and extends 1870 ft into the shallow water habitat. The second 80-acre expansion, referred to as the 80-ac "narrow" configuration, has the dimensions of 3443 ft by 1010 ft, and extends 1010 ft into the shallow water habitat. The 40-ac configuration has the dimensions of 935 ft by 1870 ft, and extends 1870 ft into the shallow water habitat.

Two groins reside within the expansion area. The first or outer groin runs parallel to, and is aligned with, the southern edge of Pier 300, partially separating the northern channel (running between Piers 300 and 400) from the shallow water habitat. The second or inner groin separates the shallow water habitat from seaplane lagoon, which lies directly northward of the habitat. Given that the length of the outer groin is shorter than the widths of all three expansion configurations, each expansion will decrease the conveyance area (or cross-sectional area) at the entrance to the shallow water habitat. A decrease in the conveyance area can be expected to reduce the volume of water flowing into and out of the shallow water habitat and seaplane lagoon basins, potentially increasing the residence time (resulting in lower dissolved oxygen concentrations) of water residing in these basins.

The objective of this study is to investigate whether expanding Pier 300 will adversely impact water quality within the shallow water habitat and seaplane lagoon basins. Two numerical models, one hydrodynamic and one water quality, were used to make this evaluation. The hydrodynamic flow field of the system was simulated with the Curvilinear Hydrodynamics in Three Dimensions (CH3D) model, whereas water quality processes were modeled using CE-QUAL-ICM (ICM).

The Los Angeles-Long Beach Harbor complex was simulated using the above models to determine whether the three proposed Pier 300 expansion configurations and associated main channel deepening adversely impact water quality within the system. In order to provide a basis for making this determination (by noting changes in water quality parameters, such as dissolved oxygen concentrations, within the study area), the existing harbor condition was simulated to permit comparison with the proposed expansion configurations. Presently, base conditions include an open gap in the causeway leading to Pier 400, permitting mixing or exchange of water between the open bay and the shallow water habitat and seaplane lagoon, and the presence of the groin that separates these two basins. In addition to present base conditions, model simulations were conducted assuming the gap is closed, and with the gap closed together with the removal of the inner groin. Furthermore, each expansion configuration was simulated with the gap open, with the gap closed, with the gap closed together with the inner groin removed. The number of simulation conducted totals 12.

This report is divided into six chapters, with Chapter 1 being the introduction. Chapter 2 describes the hydrodynamic modeling effort, and Chapter 3 describes the water quality model. Calibration of the water quality model is described in Chapter 4. A description of the modeling scenario results is provided in Chapter 5. Chapter 6 presents a summary and the conclusions reached in this study. Appendix A describes the water quality kinetics used in the model, and Appendix B presents the minimum dissolved oxygen concentrations predicted by the water quality model. Appendix C presents time-series of water discharge computed at various transects in San Pedro Bay. Appendix D contains vector diagrams illustrating water velocity in the vicinity of Pier 300.

2 Hydrodynamic Modeling

Several modeling applications of the Los Angeles/Long Beach Harbors have been conducted over the years by the ERDC. The first three-dimensional numerical application studying tidal and wind-driven circulation, reported in CERC (1990), was calibrated and verified using measured field data collected over the period of 25 July through 31 August 1987. Subsequent studies investigating tidal circulation and water quality impacts resulting from proposed harbor expansions have adapted this calibrated and verified version of the CH3D model to match their particular application. Except for the numerical grid, the version of CH3D and input data sets being used in the present hydrodynamic modeling application are identical to those used in the study that investigated the possible closure of the gap in the Pier 400 causeway. Results of this study are presented in Miller et al. (1998). Because harbor modifications made since 1987 may affect model validity, an additional verification exercise was conducted in the 1998 Pier 400 causeway study. In this verification exercise, model-generated velocities were compared with currents measured at the causeway opening for a 25-hr period on 13-14 December 1997. Miller et al. (1998) found that the magnitude of the model-generated velocities was within 10 percent of those measured at the opening, and therefore concluded that the hydrodynamic model provides reliable current estimates in the vicinity of the shallow water habitat. It is in this region where the Pier 300 expansion is proposed.

To accurately depict the three proposed Pier 300 expansion configurations within the model, it was necessary to insert two columns into the numerical grid that was used by Miller et al. (1998). One of the inserted columns extends through the shallow water habitat and sea-plane lagoon system. A second column was needed to minimize an abrupt change in cell widths caused by adding the first column. The second column was added to the opposite side of the causeway from the shallow water habitat. Model tests, conducted to ensure model accuracy was not degraded by modifying the grid, showed negligible changes in water-surface elevation and water velocity in the study area.

Hydrodynamic Model Scenario Results

Twelve scenarios were conducted to depict changes in the flow field resulting from the proposed expansions. These scenarios are:

1. Base condition with Pier 400 causeway gap open.
2. Base condition with Pier 400 causeway gap closed
3. Base condition with Pier 400 causeway gap closed and seaplane lagoon groin removed
4. 80-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap open.
5. 80-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed.
6. 80-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed and seaplane lagoon groin removed.
7. 80-ac narrow Pier 300 expansion with deepened main channel with Pier 400 causeway gap open.
8. 80-ac narrow Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed.
9. 80-ac narrow Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed and seaplane lagoon groin removed.
10. 40-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap open.
11. 40-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed.
12. 40-ac wide Pier 300 expansion with deepened main channel with Pier 400 causeway gap closed and seaplane lagoon groin removed.

Base condition is defined as the Pier 400, Stage II configuration (Miller et al. 1998). Each scenario listed above was simulated with the hydrodynamic model, and the duration of these simulations was 31 days. Output saved from the hydrodynamic model includes hourly flow rates and volumes subsequently used as input to the water quality model, time-series of water surface elevations and discharges, and vector flow fields (or current "snapshots").

Transects, or cross-sections, where discharge information was saved are presented in Figure 1. For transects 1, 5 and 7, positive discharges denote flows directed from left to right on Figure 1; for transects 2, 4, and 6, positive discharges denote flows directed from the bottom to the top of 1. Figures 2 through 7 present comparisons of discharge between the base and 80-ac wide configurations for transects 1 through 6, respectively.

Shown in Figures 2 and 3, the 80-ac wide expansion configuration decreases the discharge, and thereby the volume of water flowing into the shallow water habitat. Differences in peak discharge varied as much as 1500 cfs at transect 1 during the first 15 days of the simulation period. Differences computed at transect 2 were approximately equal to those computed at transect 1. However, Figure 4, which presents discharges computed at transect 3, show a minimal change in discharge resulting from the 80-ac wide expansion. Minimal differences in discharge (peak of 50 cfs) were also computed at transects 4 through 6 (Figures 5 through 7, respectively). Consequently, the difference in discharge computed at transects 1 and 2 is attributed to the decreased storage volume in the shallow water habitat resulting from the expansion, and that the volume of water entering seaplane lagoon will remain essentially unchanged. Furthermore, changes in flow patterns resulting from the 80-ac wide expansion appear to be localized and confined to the immediate project area.

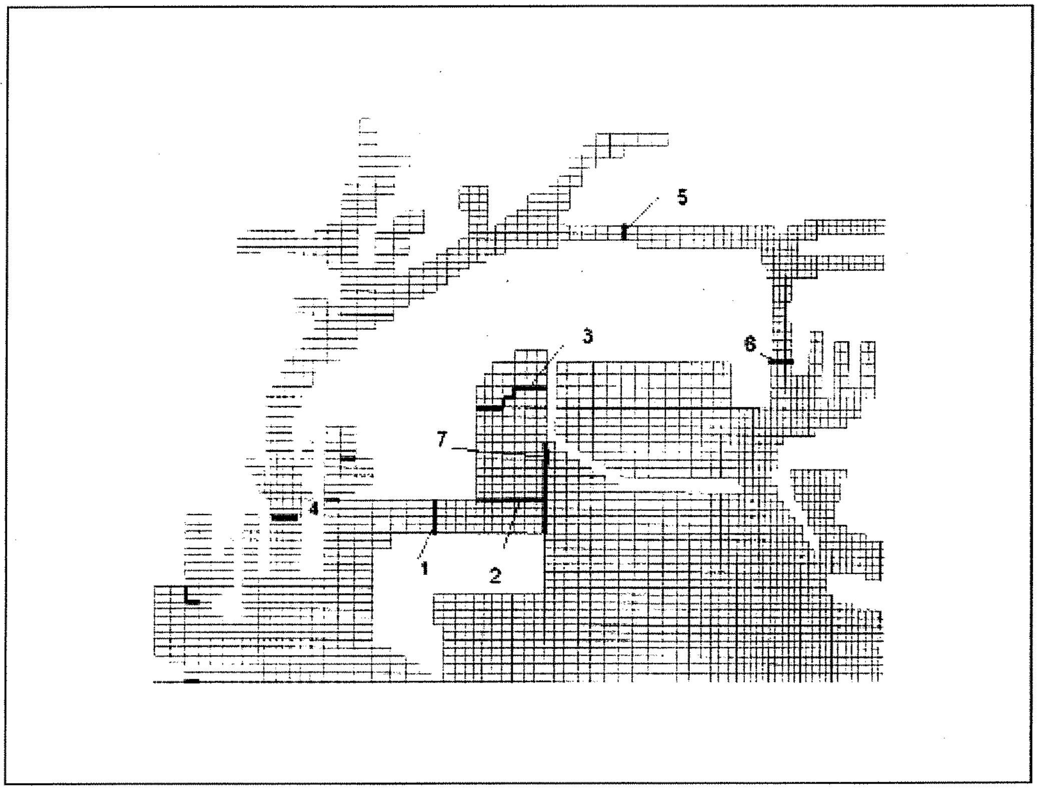

Figure 1. Schematic displaying locations of transects.

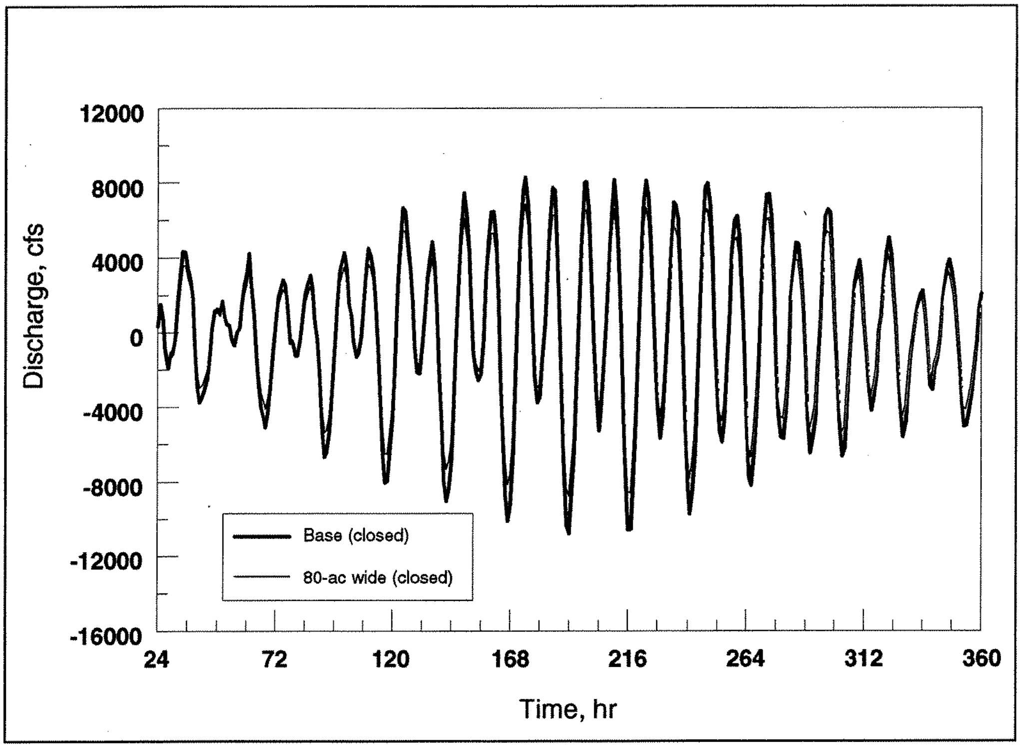

Figure 2. Comparison of discharge time-series for base and 80-ac wide configurations at transect 1 (closed gap).

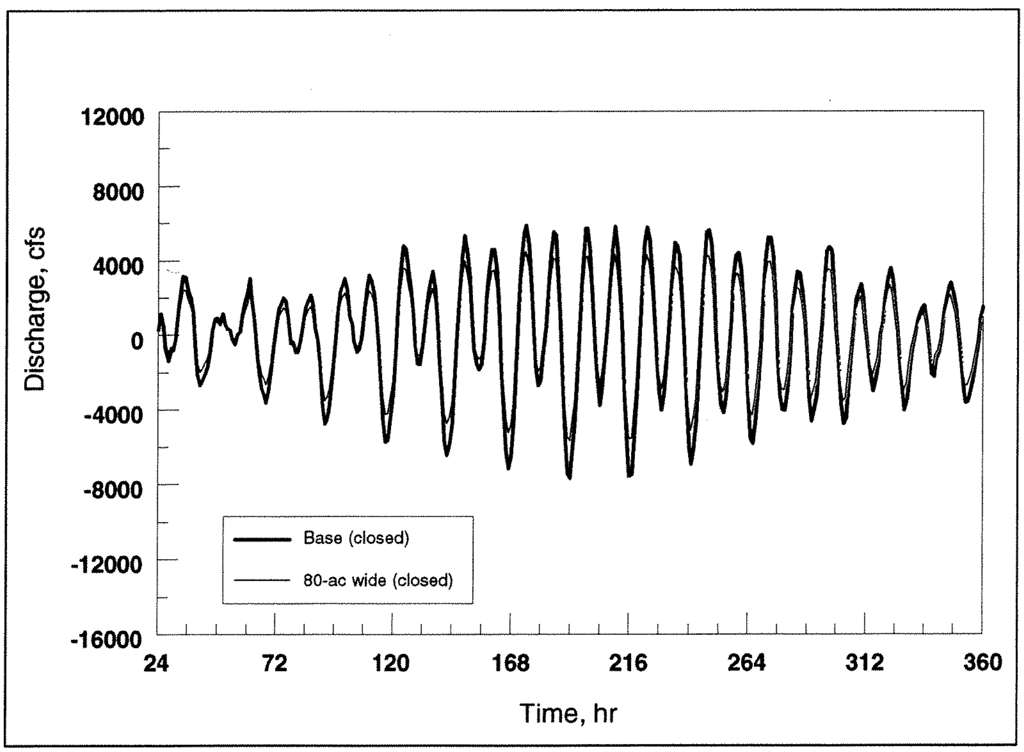

Figure 3. Comparison of discharge time-series for base and 80-ac wide configuration at transect 2 (closed gap).

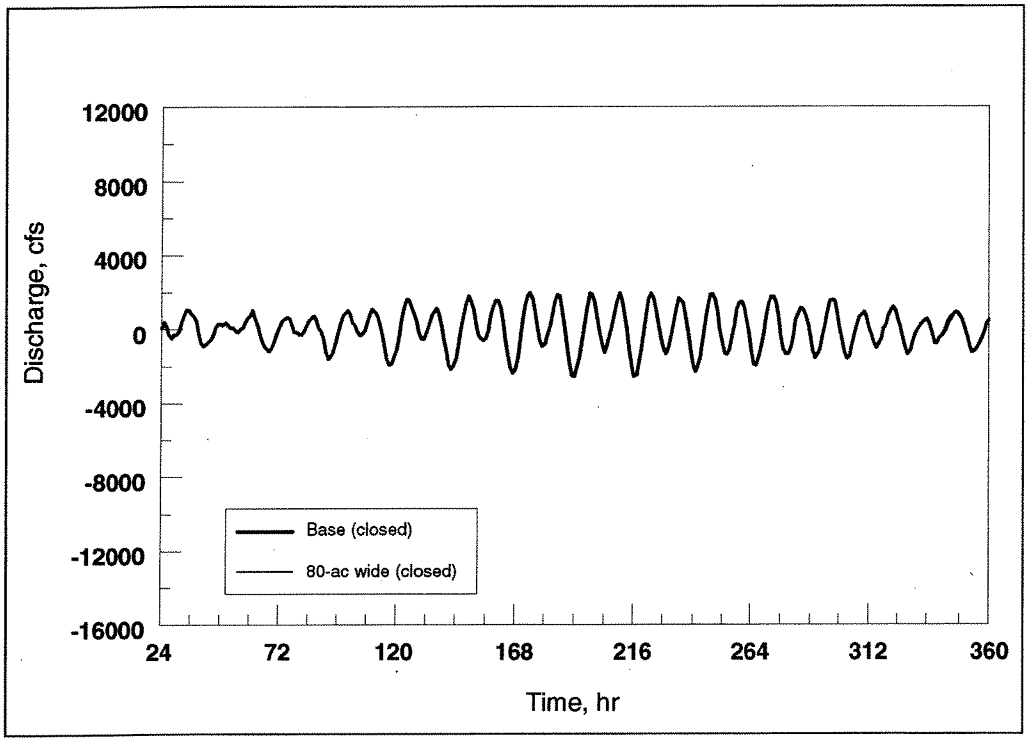

Figure 4. Comparison of discharge time-series for base and 80-ac wide configuration at transect 3 (closed gap).

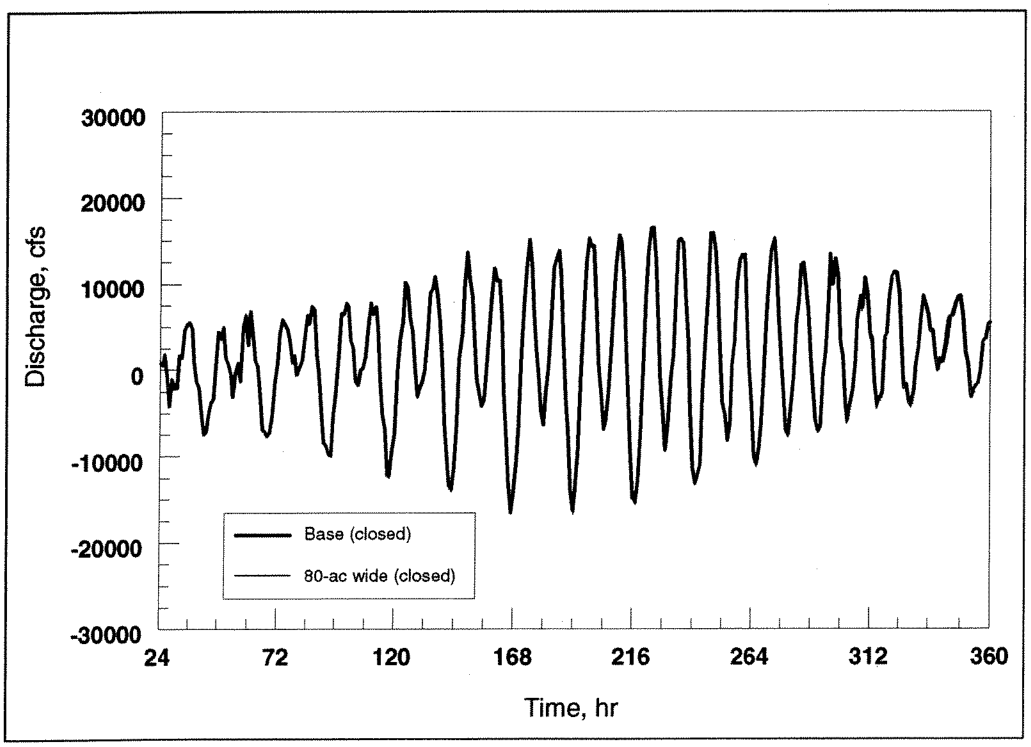

Figure 5. Comparison of discharge time-series for base and 80-ac wide configuration at transect 4 (closed gap).

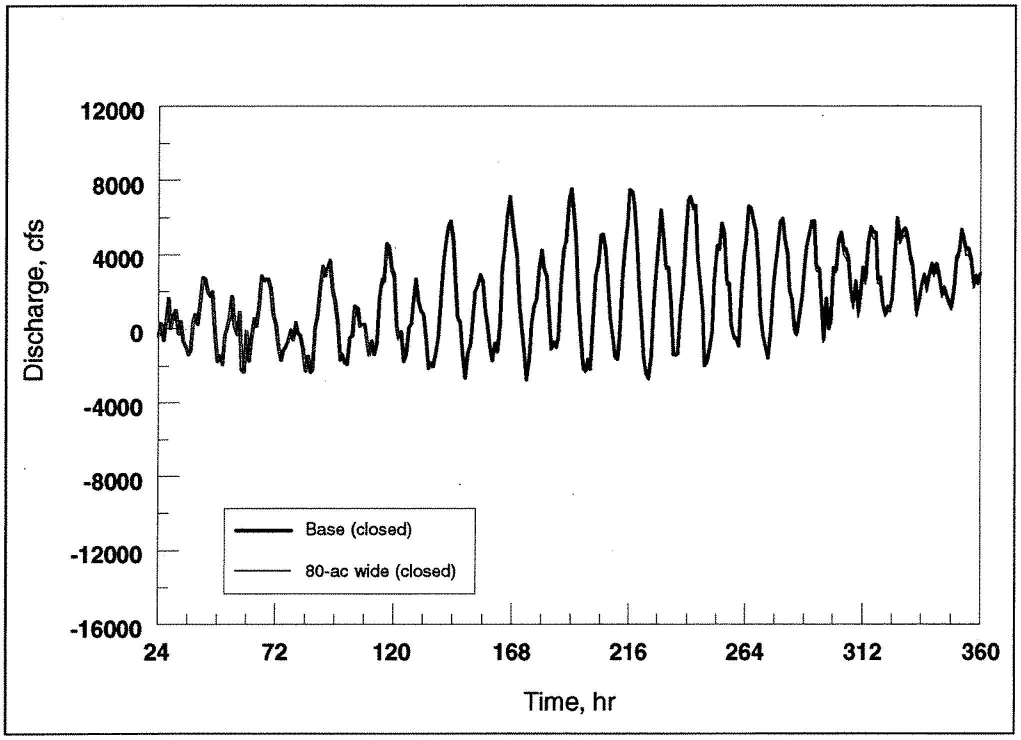

Figure 6. Comparison of discharge time-series for base and 80-ac wide configuration at transect 5 (closed gap).

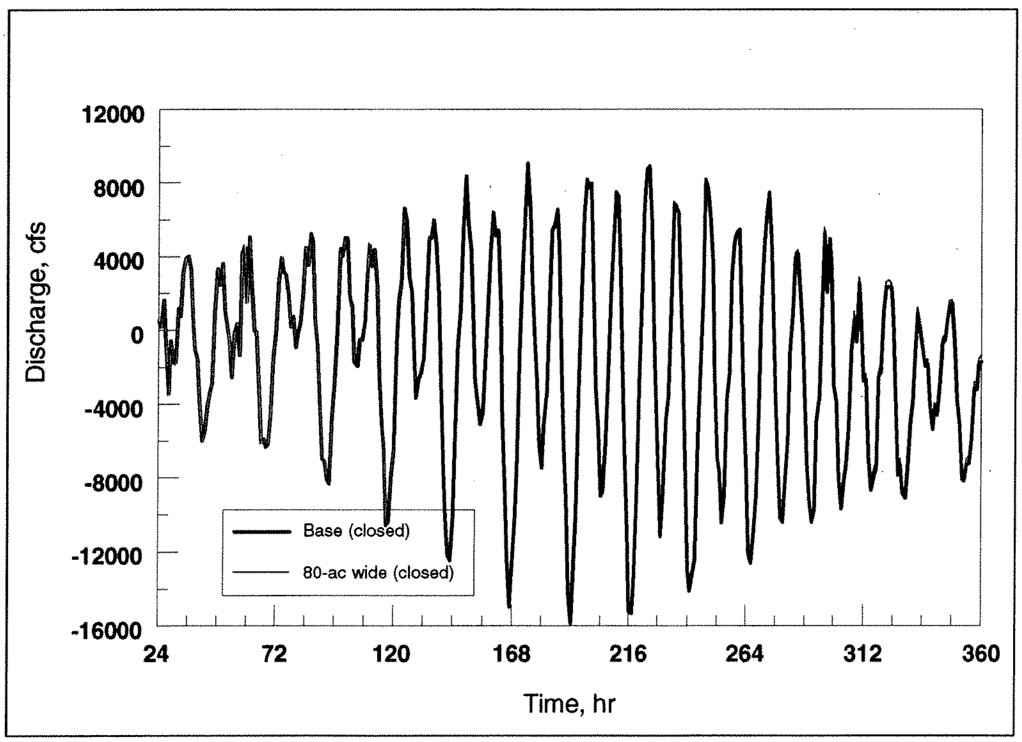

Figure 7. Comparison of discharge time-series for base and 80-ac wide configuration at transect 6 (closed gap).

Similarly, discharges for the 80-ac narrow and 40-ac wide expansion configurations also decreased at transects 1 and 2 when compared to the base configuration. Furthermore, for both configurations, differences in discharge were minimal at the remaining transects. Comparison of discharge between the 40-ac wide and base configurations at transects 2 and 3 are presented in Figures 8 and 9, respectively, and the comparison of discharge between the 80-ac narrow and base configurations at transects 2 and 3 are presented in Figures 10 and 11, respectively.

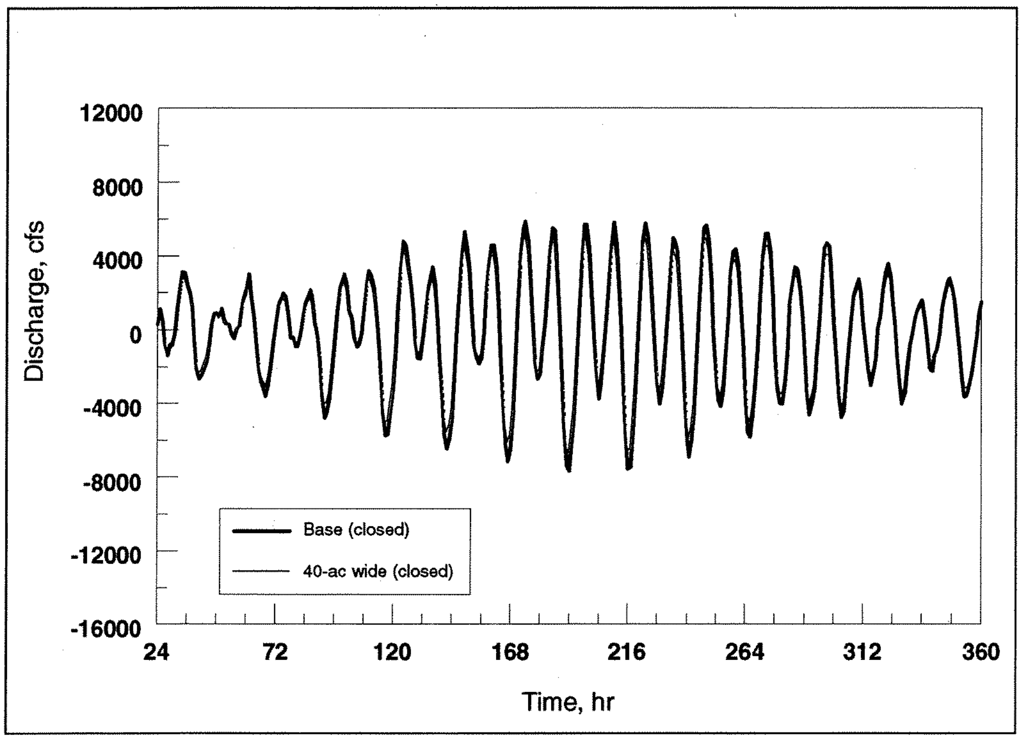

Figure 8. Comparison of discharge time-series for base and 40-ac wide configuration at transect 2 (closed gap).

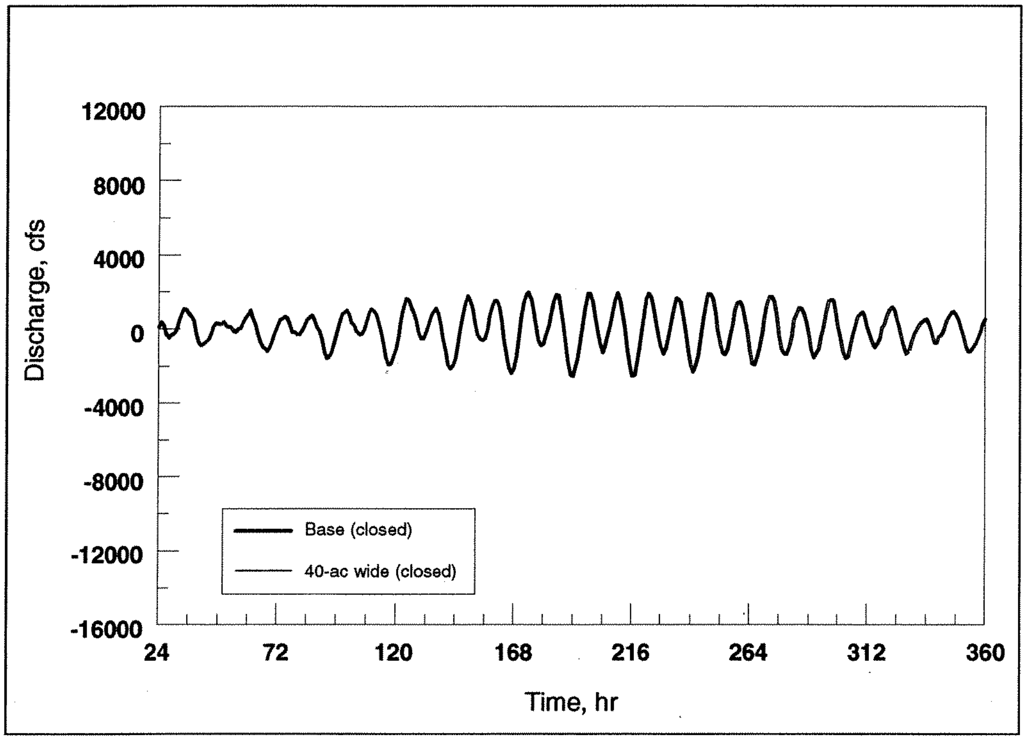

Figure 9. Comparison of discharge time-series for base and 40-ac wide configuration at transect 3 (closed gap).

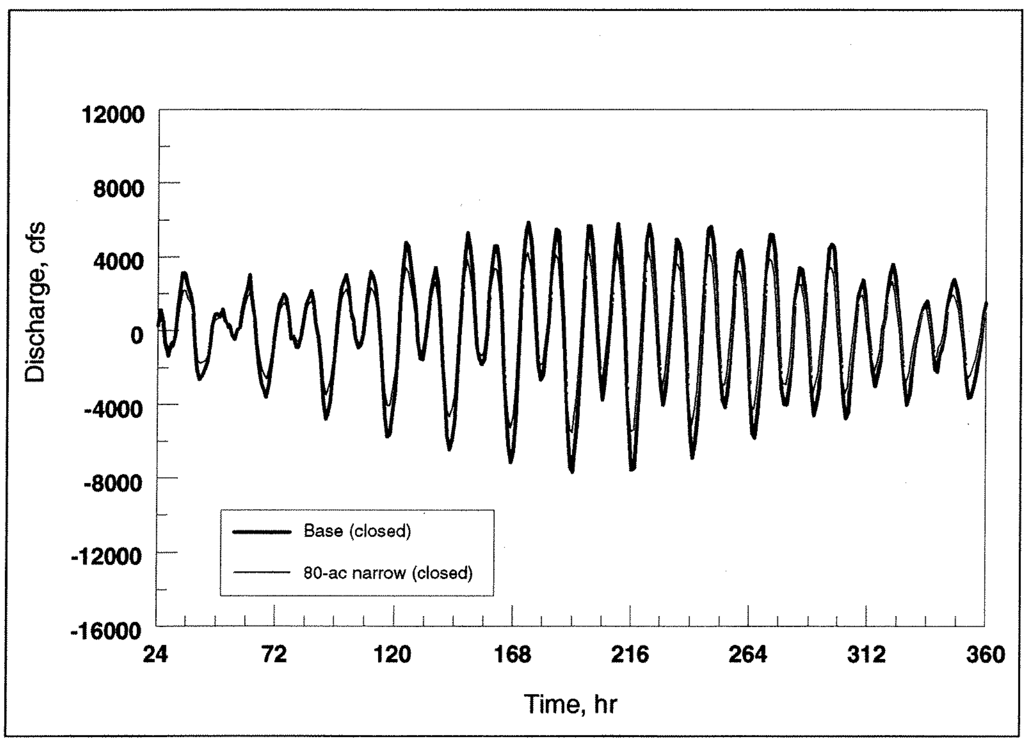

Figure 10. Comparison of discharge time-series for base and 80-ac narrow configuration at transect 2 (closed gap).

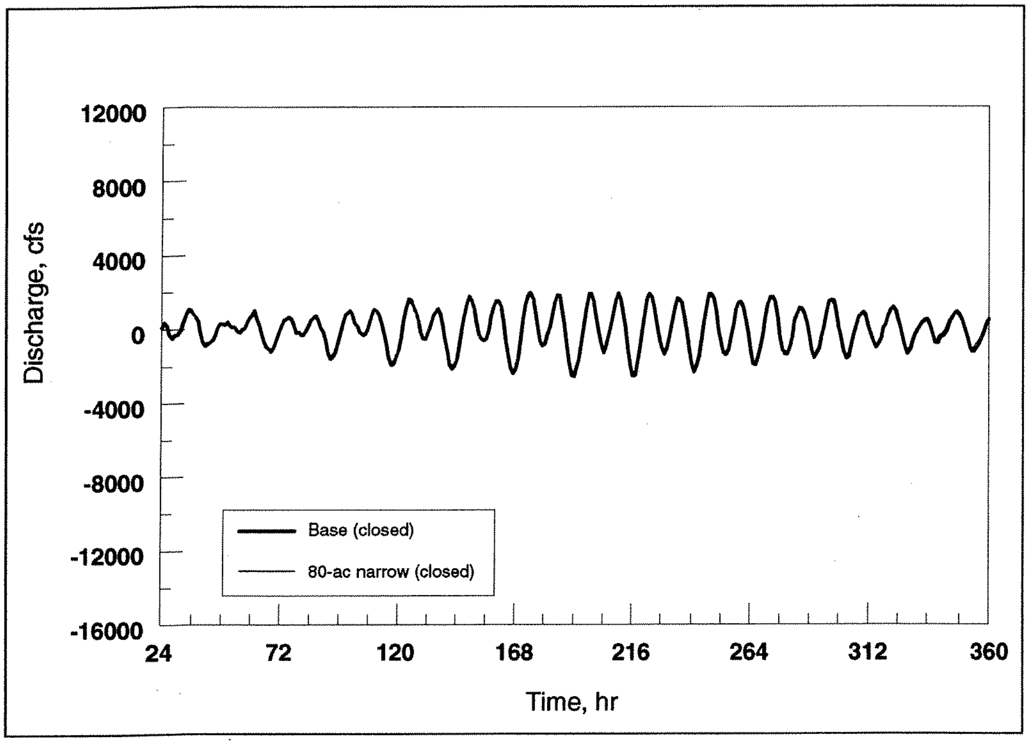

Figure 11. Comparison of discharge time-series for base and 80-ac narrow configuration at transect 3 (closed gap).

Closure of Gap

Presently, a gap exists in the causeway leading to Pier 400, permitting exchange of water between the shallow water habitat and the open harbor area. Closing this gap would permit further harbor development. However, without the exchange of waters, concern exists that its closure would lead to degradation in water quality within the shallow water habitat and seaplane lagoon basins. Therefore, water quality was modeled for the base and the three proposed expansion configurations with the causeway gap open and closed.

Figures 12 and 13 compare discharges computed at transects 1 and 2 for the base configuration with the causeway gap open and closed. At both transects, the peak discharge during flood tide are, for the closed configuration, about 900 cfs lower than the open condition. At peak ebb tide, greater discharge is computed for the closed configuration than the open configuration, and the difference in discharge can exceed 4,000 cfs during spring tide (hr 216). At transect 3, however, discharges computed for both configurations were equivalent (Figure 14). Differences in discharge, therefore, are due to the net discharge of water through the open gap.

To show this, discharge computed at transect 7 is compared to the difference in discharge at transect 2 between the open and closed gap scenarios. This comparison is presented in Figure 15, which shows minimal variation between the discharge computed at transect 7 and the difference in discharge calculated for transect 2. The lack in variation illustrates that mass is conserved in the system. Furthermore, the figure shows that the discharge computed at transect 7 is predominately positive in value; thus, water flows from the shallow water habitat into the central bay almost continuously during a tidal cycle (although the magnitude of efflux does change). Water flows from the central bay and into the shallow water habitat during peak flood tide.

Similar phenomena are computed for the 80-ac wide, 80-ac narrow, and 40-ac wide expansion configurations, which are illustrated in Figures 16 through 18, respectively.

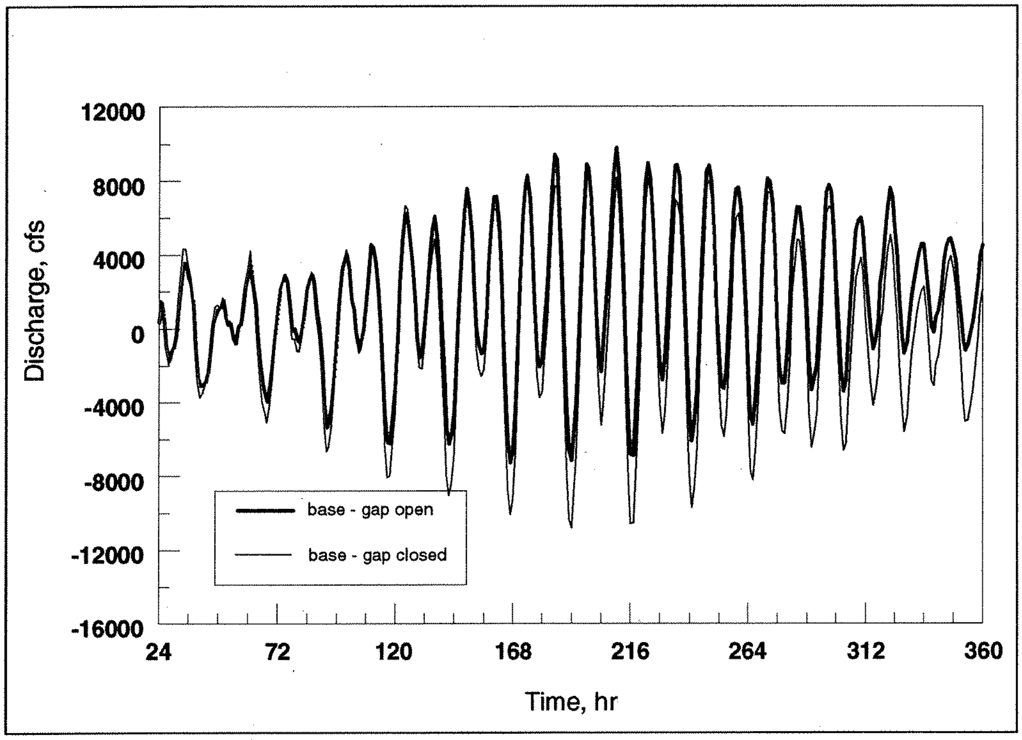

Figure 12. Comparison of discharge time-series for base conditions at transect 1.

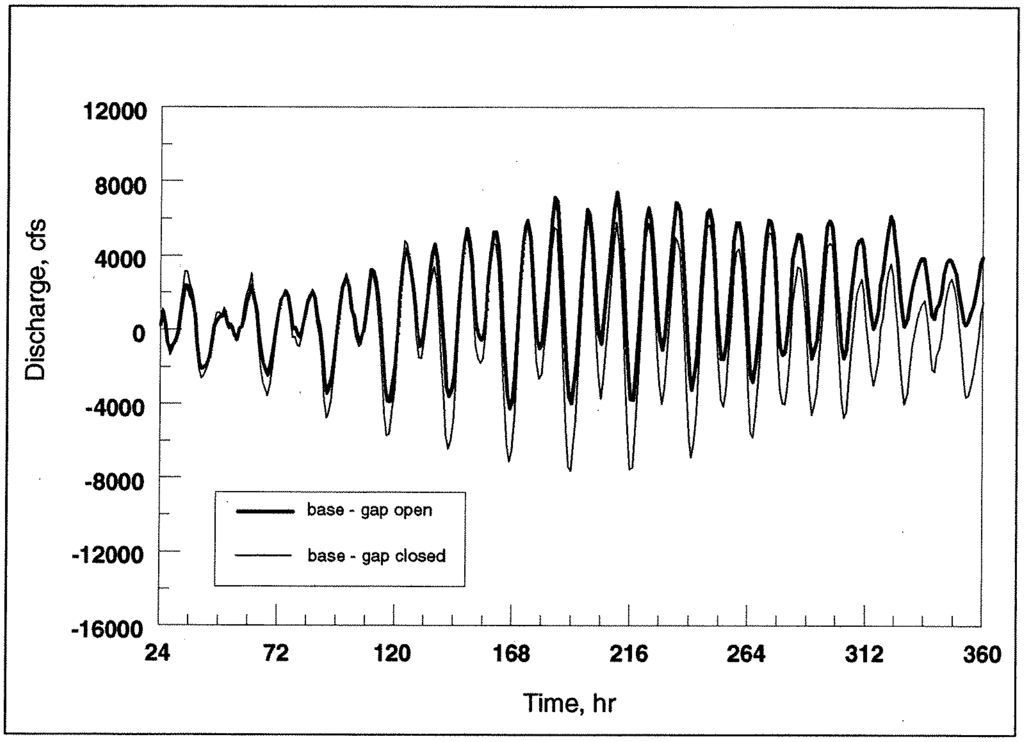

Figure 13. Comparison of discharge time-series for base conditions at transect 2.

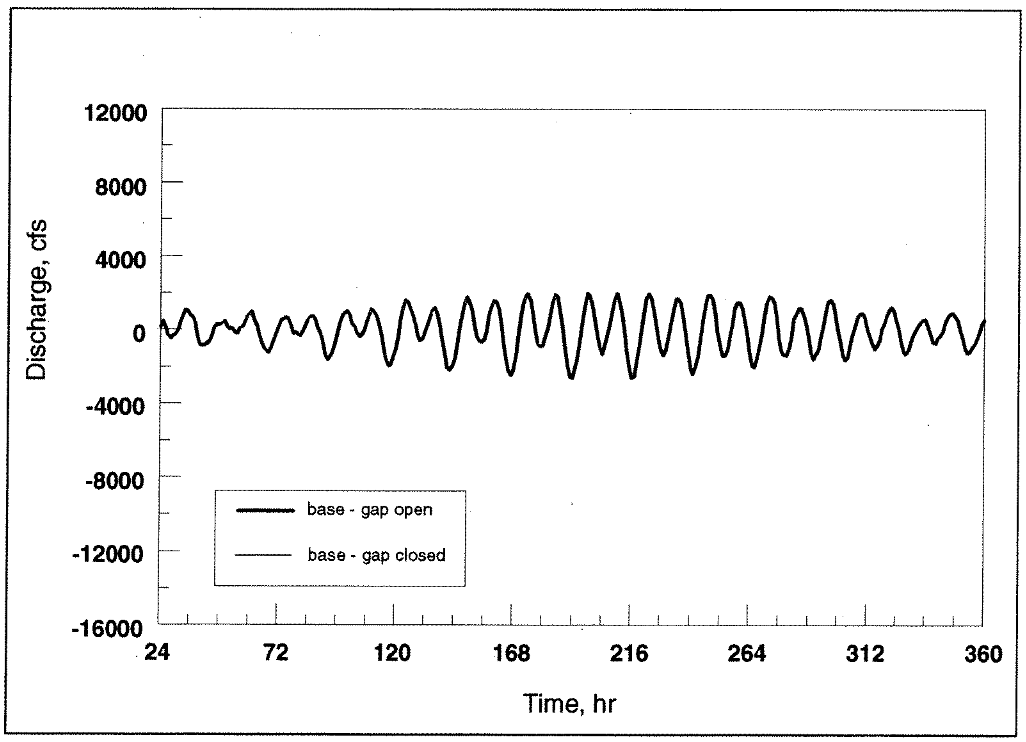

Figure 14. Comparison of discharge time-series for base conditions at transect 3.

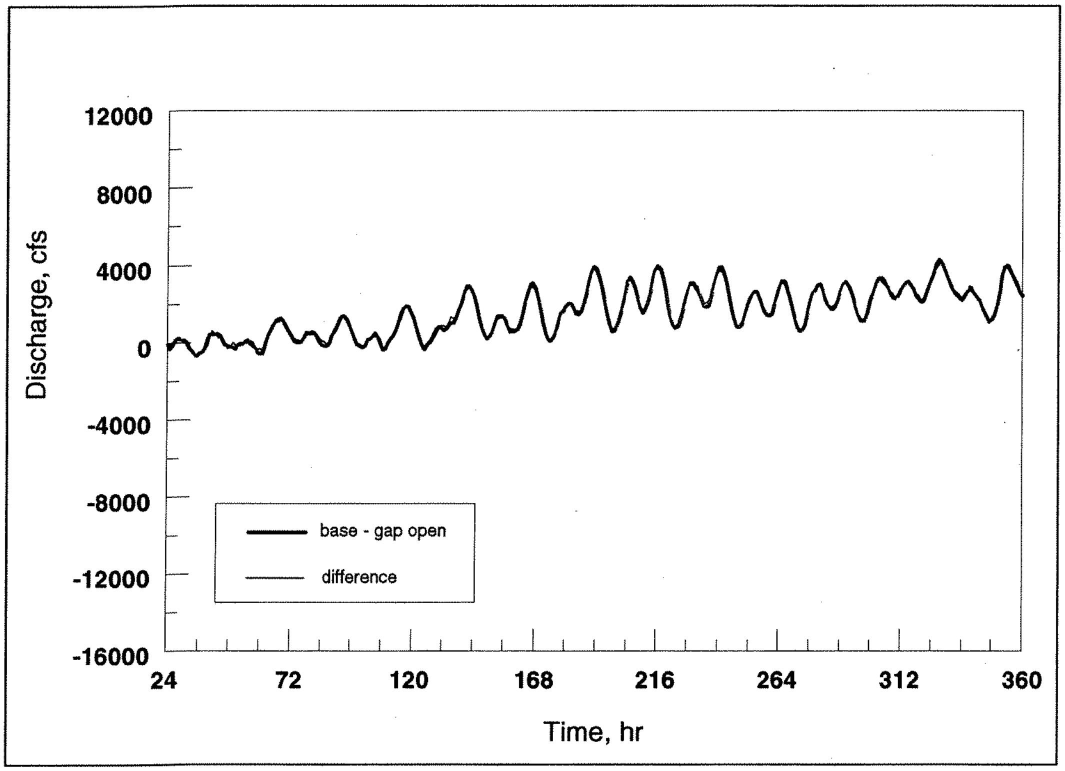

Figure 15. Comparison of discharge computed at transect 7 with difference in discharge computed at transect 2 (base-open vs. base-closed conditions).

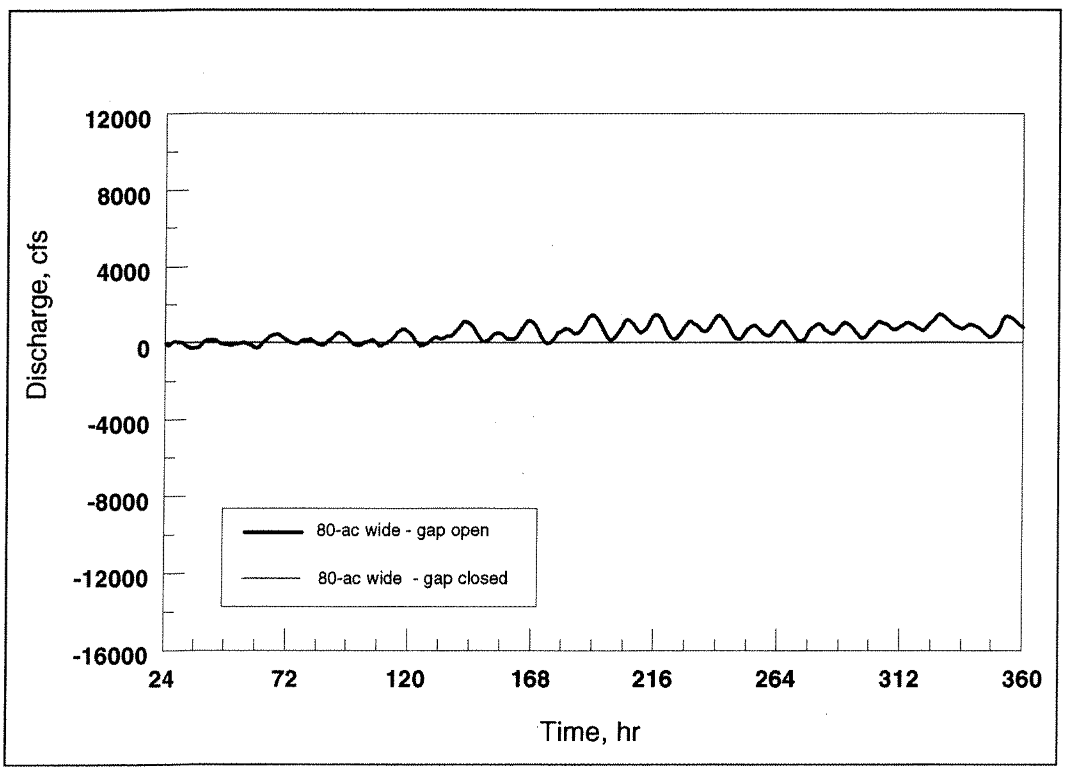

Figure 16. Comparison of discharge time-series for 80-ac wide expansion at transect 7.

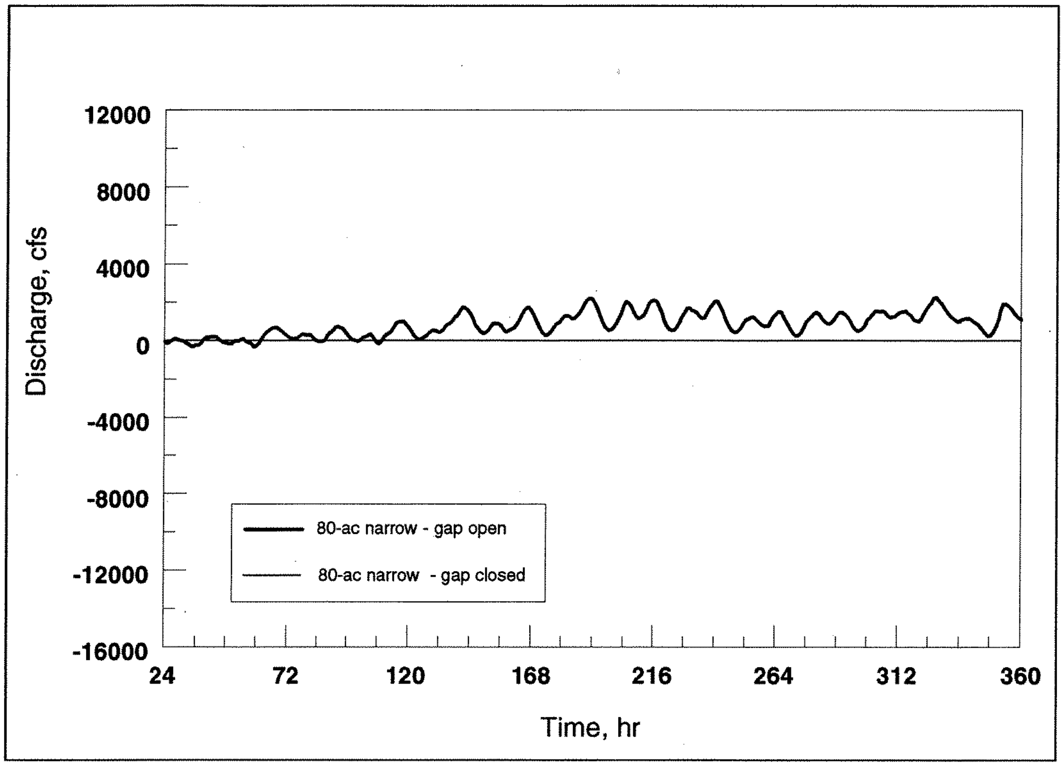

Figure 17. Comparison of discharge time-series for 80-ac narrow expansion at transect 7.

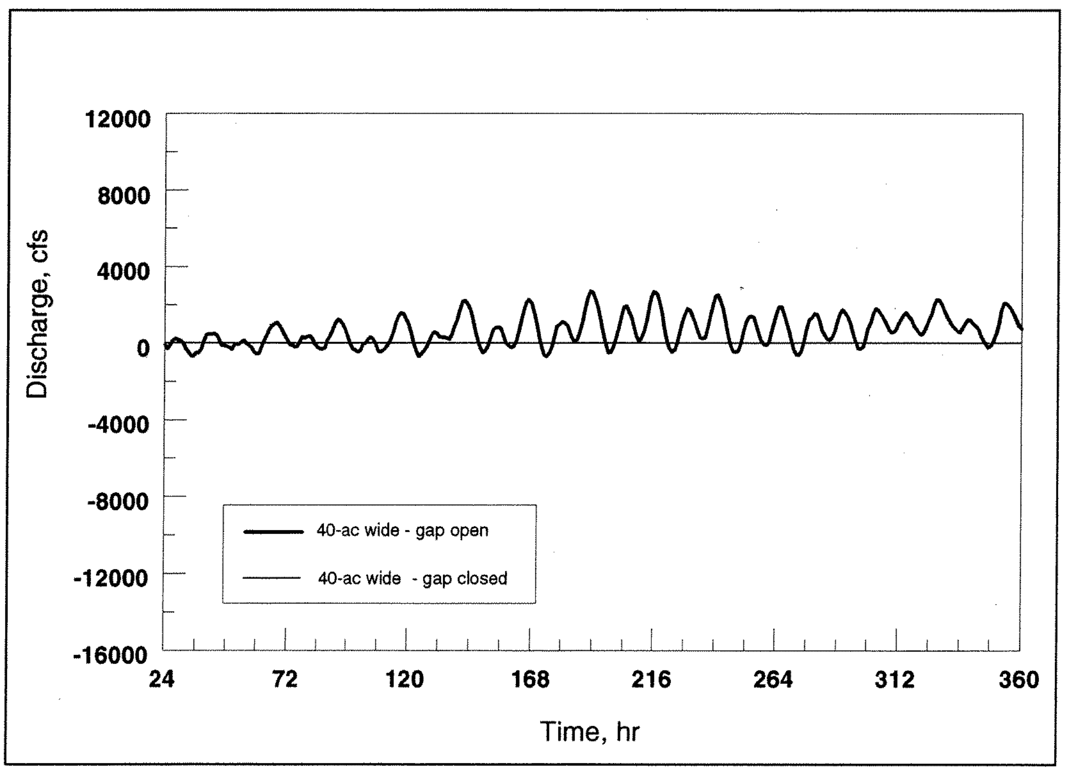

Figure 18. Comparison of discharge time-series for 40-ac wide expansion at transect 7.

Removal of Seaplane Lagoon Groin

Because each expansion configuration reduces the volume of water flowing into the shallow water habitat, concern exists that with less flow, the "age" of water contained in this basin and in seaplane lagoon will increase, raising the possibility that water quality will be degraded. Because the groin separating the shallow water habitat from seaplane lagoon could inhibit circulation between these basins, its removal may enhance the circulation and mixing of waters in these basins. Thus, the retention time of water contained in seaplane lagoon will decrease, thereby improving water quality. The base and the three expansion configurations were modeled with and without the groin present in the models. For these scenarios, the causeway gap was closed in the models.

Figures 19 through 22 present the discharges computed at transect 2 for the with- and without-groin scenarios for the base, 80-ac wide, 80-ac narrow, and 40-ac wide expansion configurations, respectively. For all expansion configurations, removing the groin did not change the discharge through transect 2. Water velocity vector plots (or snapshots) for the 40-ac wide expansion with and without groin configurations are presented in Figures 23 and 24. Comparing the circulation patterns displayed in these figures show a decreased current in the seaplane lagoon with the groin removed. However, a counter-clockwise circulation encompassing the combined basins is formed, suggesting that tidal flushing will decrease the residence time of water quality constituents residing in the seaplane lagoon.

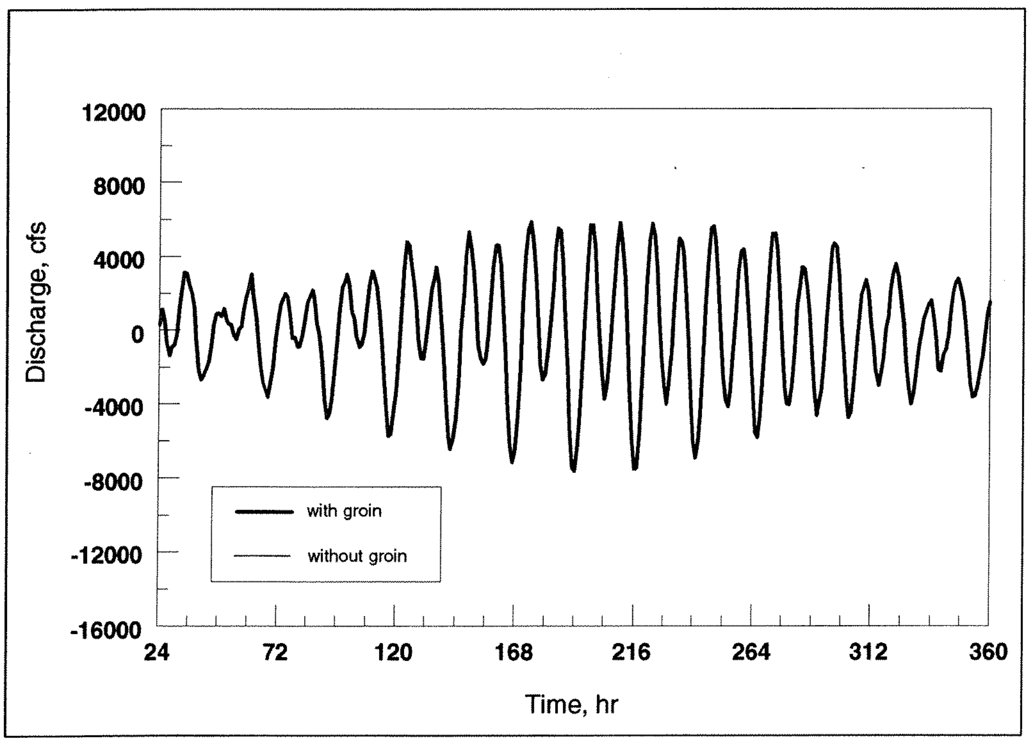

Figure 19. Comparison of discharge at transect 2 for base condition; with and without groin.

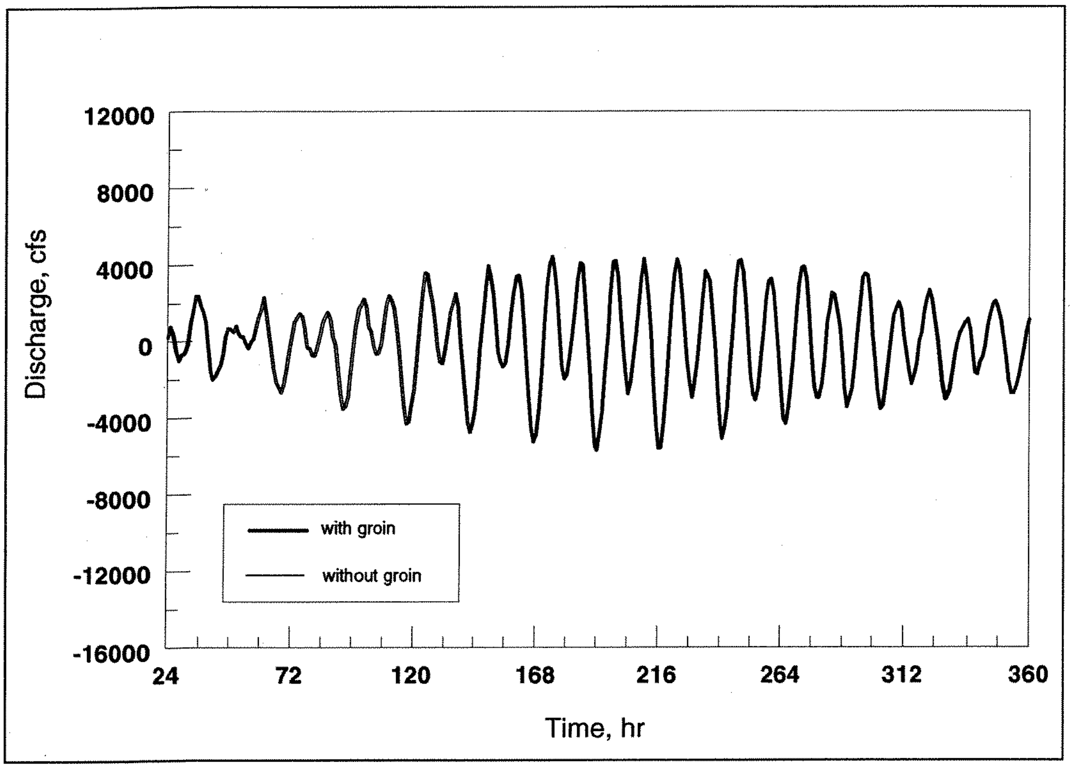

Figure 20. Comparison of discharge at transect 2 for 80-ac wide expansion; with and without groin.

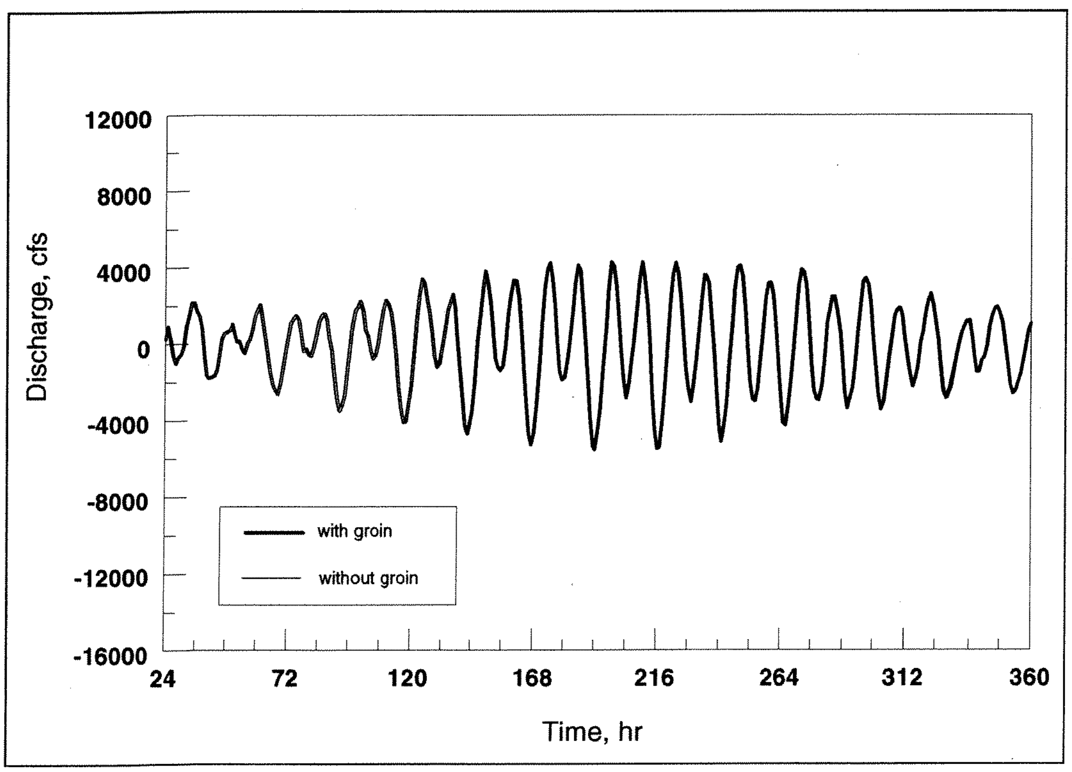

Figure 21. Comparison of discharge at transect 2 for 80-ac narrow expansion; with and without groin.

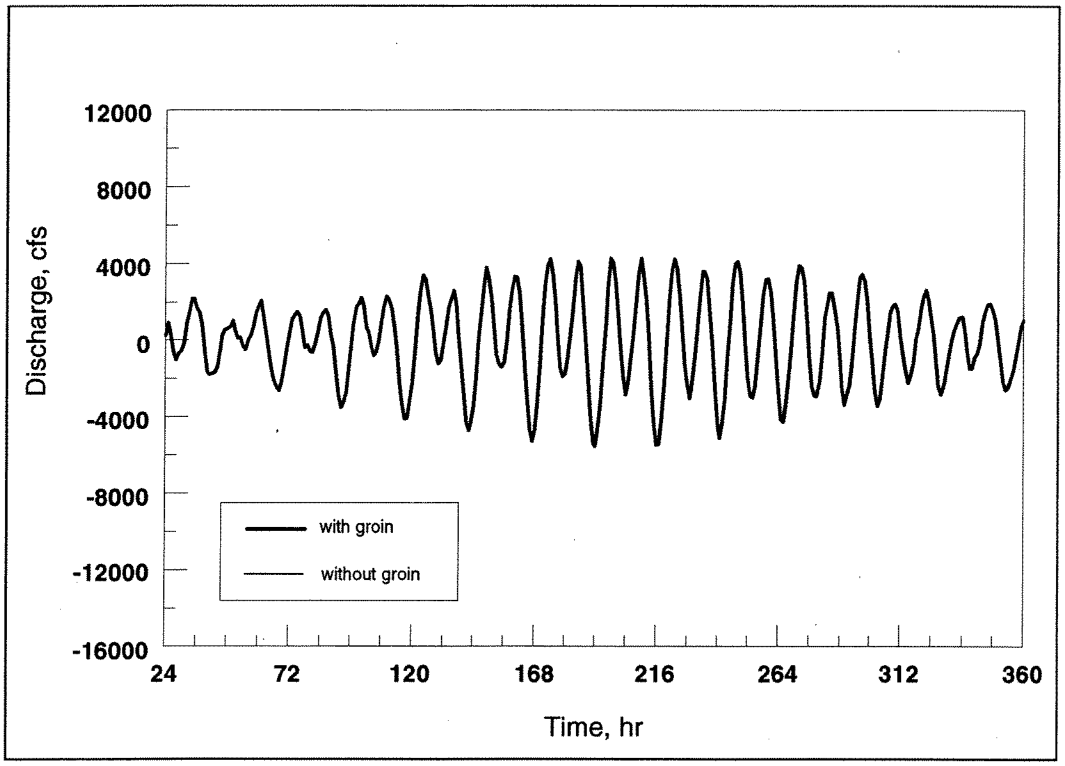

Figure 22. Comparison of discharge at transect 2 for 40-ac wide expansion; with and without groin.

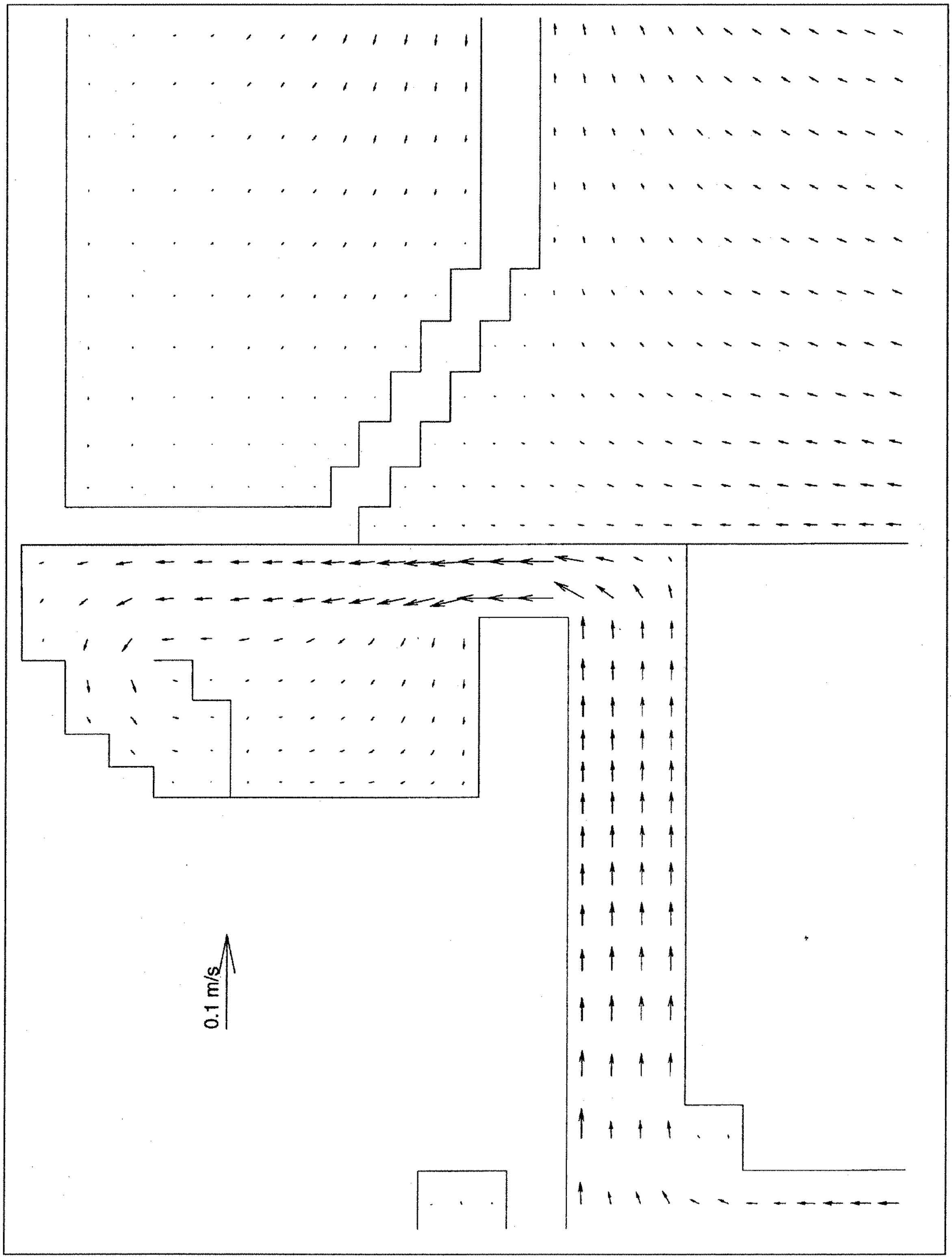

Figure 23. 40-ac wide expansion with causeway gap closed; surface velocity under neap flood tide.

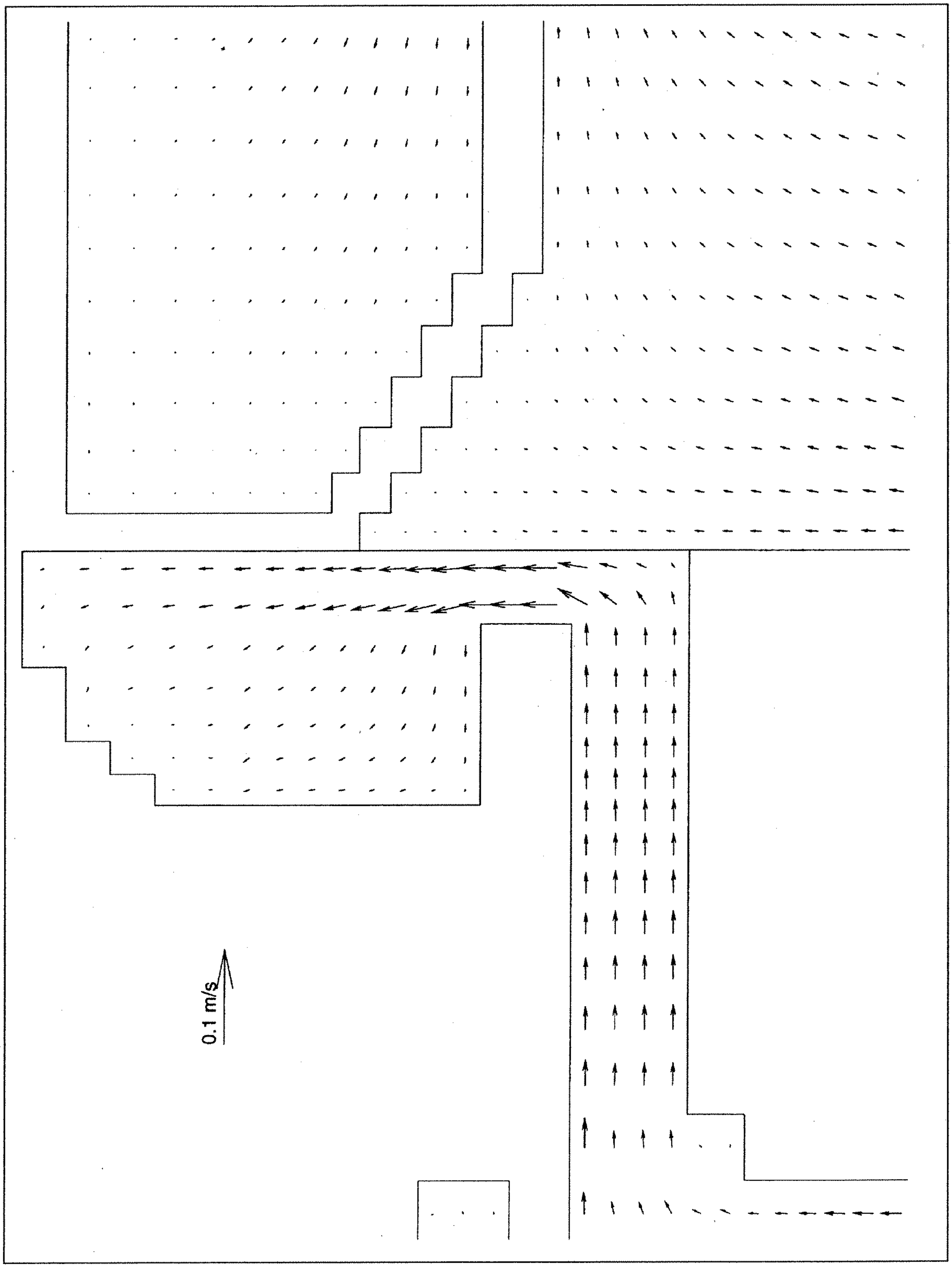

Figure 24. 40-ac wide expansion with causeway gap closed and groin removed; surface velocity under neap flood tide.

3 Overview of Water Quality Model

Previous modeling studies of this system (Hall 1990, 1995) have used CH3D and a water quality model similar to ICM. In these studies, the water quality model used a lower resolution grid than the hydrodynamic model, where each cell in the water quality grid encompassed several cells in the hydrodynamic grid. Whereas the lower resolution minimizes computer execution time, it can also introduce grid diffusion into the water quality solution and artificially increase transport beyond the level justified by the hydrodynamics of the system. For this study, the water quality model employed the identical grid as the hydrodynamic model, resulting in a one-to-one mapping of the two models (Figure WQ-1), thus minimizing grid diffusion within the solution.

Constituents simulated with the water quality model are presented in Table WQ-1. These constituents were selected based on the available observed data listed in Table WQ-2. Not all modeled constituents were monitored during the 1987 sampling study but are required because of the kinetic relationships formulated in ICM. Two of these constituents were dissolved organic carbon (DOC) and particulate organic carbon (POC). Concentrations for these particular constituents were needed because of the manner in which ICM routes algal metabolism, predation, and mortality by-products to organic carbon, organic nitrogen, and organic phosphorus. Measurements of Carbonaceous Biochemical Oxygen Demand (CBOD) were converted to equivalent estimates of DOC and POC concentrations and used as initial and boundary conditions because CBOD was not an ICM constituent. By doing this, the internal processes in ICM were left intact, and the model output for the fractions DOC and POC were summed and multiplied by the dissolved oxygen to carbon ratio to convert to equivalent CBOD. These computed equivalent CBOD values were then compared to observed CBOD data.

Table WQ-1
CEQUAL-ICM State Variables

Temperature	Ammonia	Dissolved Organic Phosphorus
Salinity	Nitrate	Particulate Organic Phosphorus
Algae	Dissolved Organic Nitrogen	Dissolved Oxygen
Dissolved Organic Carbon	Particulate Organic Nitrogen	Conservative Tracer
Particulate Organic Carbon	Dissolved Inorganic Phosphorus	

Table WQ-2
Water Quality Observations

Dissolved Oxygen	Ammonia
Temperature	Nitrite+Nitrate
Biochemical Oxygen Demand	Phosphate
Chlorophyll	

A complete description of ICM kinetics and processes is found in Cerco and Cole (1995) and in Appendix A.

4 Water Quality Calibration

Inputs

ICM calibration was required since previous water quality modeling studies used a different model and grid than were used in this study. As mentioned previously, the grid was a one-to-one overlay of the hydrodynamic model grid. For this study, a sigma grid having 5 layers was used and contained a total of 32035 cells with 6407 surface cells.

Calibration was accomplished through an iterative process that included running ICM, comparing model output to observed data, modifying kinetic rates and parameters based upon results, and running the model again. Calibration parameters from earlier studies (Hall 1995) provided an initial starting point for calibration rates. However, due to differences in model formulation between ICM and that of the model used previously, not all rates were applicable.

Hydrodynamic information for the calibration period was generated by CH3D. A 30-day period corresponding to 2 August 1987 to 31 August 1987 was simulated. (The hydrodynamic model was run, starting on 1 August, for 31 days, allowing a 1-day spin-up period prior to saving flow field information for the water quality model.) One-hour averages of the hydrodynamic data were used to drive ICM. The harbor configuration used for calibration is the same as that used in the first water quality modeling study (Hall 1990) which represents the harbor prior to the proposed expansion of Pier 300 or the construction of the causeway and Pier 400. As indicated earlier, a one-to-one overlay of the hydrodynamic model grid was used in the water quality computations. The only difference between the hydrodynamic and water quality model grids is that a row of cells was removed at the ocean boundary in the water quality grid. This was necessary due to differences in the way that the two models handled tidal boundaries.

Meteorological data measured at Long Beach Daugherty Airport for the calibration period was obtained from Earthinfo CD-ROM database. Daily average values for the parameters listed in Table WQ-3 were used in the heat exchange program (Eiker 1977) to compute heat exchange coefficients, solar illumination, fractional day length, and equilibrium temperature.

Table WQ-3
Meteorological Input Requirements

Cloud Cover	Dry Bulb Temperature
Average Daily Wind speed	Dew Point Temperature

Initial conditions for the water column were specified as uniform for all layers, Table WQ-4. Values used for initial conditions were extracted from earlier studies (Hall 1990, 1995). Boundary conditions specified along the ocean boundary were uniform for each layer but varied by depth, Table WQ-5. As with the initial conditions, these values were extracted from earlier studies (Hall 1990, 1995). A uniform SOD of 2.0 mg/l was specified over the entire study area (Hall 1990).

Only one point source load was applied during calibration. This load represented the Terminal Island Treatment Plant (TITP) discharge. TITP loads are shown in Table WQ-6. Loads were released into layer 5 of the water column at the discharge site located near station I-2 (Figure WQ-1).

Complete listings of kinetic rates are included in Appendix A with the kinetic process descriptions.

Table WQ-4
Initial Conditions

Constituent	Value
Temperature ($^{\circ}C$)	18.4
Salinity (ppt)	32.0
Algae (g C/m^3)	0.3
Dissolved Organic Carbon (g/m^3)	1.5
Particulate Organic Carbon (g/m^3)	0
Ammonium (g/m^3)	0.06
Nitrate (g/m^3)	0.06
Dissolved Organic Nitrogen (g/m^3)	0
Particulate Organic Nitrogen (g/m^3)	0
Dissolved Inorganic Phosphorus (g/m^3)	0.0825
Dissolved Organic Phosphorus (g/m^3)	0
Particulate Organic Phosphorus (g/m^3)	0
Dissolved Oxygen (g/m^3)	9.4

Table WQ-5
Boundary Conditions

Constituent	Layer 1 (Surface)	Layer 2	Layer 3 (Mid-depth)	Layer 4	Layer 5 (Bottom)
Temperature (°C)	18.4	17.8	17.2	16.6	16.1
Salinity (ppt)	32.0	32.0	32.0	32.0	32.0
Algae (g C/m^3)	0.348	0.322	0.296	0.303	0.303
Dissolved Organic Carbon (g/m^3)	0.22	0.22	0.22	0.22	0.22
Particulate Organic Carbon (g/m^3)	0.22	0.22	0.22	0.22	0.22
Ammonium (g/m^3)	0.03	0.03	0.02	0.02	0.02
Nitrate (g/m^3)	0.02	0.02	0.03	0.03	0.05
Dissolved Organic Nitrogen (g/m^3)	0.029	0.025	0.023	0.024	0.024
Particulate Organic Nitrogen (g/m^3)	0.029	0.025	0.023	0.024	0.024
Dissolved Inorganic Phosphorus (g/m^3)	0.0725	0.0725	0.0725	0.0725	0.0725
Dissolved Organic Phosphorus (g/m^3)	0.044	0.034	0.038	0.038	0.038
Particulate Organic Phosphorus (g/m^3)	0.044	0.034	0.038	0.038	0.038
Dissolved Oxygen (g/m^3)	9.5	9.5	8.5	7.5	9.5

Table WQ-6
TITP Calibration Loads

Constituent	Load kg/day
Dissolved Organic Carbon	956.0
Ammonia	78.0
Nitrate	1340.0
Dissolved Inorganic Phosphorus	430.0

Calibration Results

ICM performance was evaluated by comparing model output with observed data. Two forms of graphical comparison were used, time-series plots and scatter plots. Time-series plots of daily-averaged model output and observed data demonstrate model performance over time and provide indications of interactions between modeled parameters. Time-series plots were generated for the interior stations (denoted by "I") and boundary stations (denoted by "B") shown in Figure WQ-1. Scatter plots provide a synopsis of overall model performance, such as over/under predicting or missing high/low values.

ICM model output consisted of daily-averaged concentrations for all constituents computed in all cells. From the model output, constituent concentrations were selected that corresponded to the day and location at which the observed data were collected. Because model output represents daily-averaged concentrations, whereas the observed data are instantaneous measurements, some differences between model-generated and observed concentrations can be attributed to timing. Furthermore, parameters such as dissolved oxygen exhibit strong diurnal patterns. These patterns, which are not captured in daily-averaged outputs, give the appearance that the model is over- or under-predicting observed data.

Time series

Time-series calibration results are shown in Figure WQ-2. Results are presented for all stations for which observed data were available (Figure WQ-1). Circles represent observed data, whereas solid lines denote model output. Level designation on the plots indicates surface (1), mid (2), or bottom (3) location not layer number. Statistical comparisons of the previous calibration results (Hall 1990, 1995) to the new calibration results (Figure WQ-2) could not be made because of the unavailability of Hall's original output files containing model results. Thus, visual comparisons were made between the graphical plots in Hall (1995) and the new calibration plots (Figure WQ-2). For the most part, visual comparisons between the old and new calibration results showed very small differences at levels 1 (surface) and 3 (bottom) for all constituents modeled. Most differences that occurred were improvements to the old calibration. Results that were worse for the new calibration were most noticeable at stations I-2, I-4, and I-6. At station I-2 for level 1, nitrate has a spike at the beginning of the simulation; at level 3, nitrate concentrations are off the scale of the graph. This is attributed to the distribution of the TITP load in the new calibration run as compared to the old calibration. As discussed previously, this station was located near the cell where the TITP load was introduced into the grid cell. In the old calibration simulation it was distributed over four grid cells that were approximately four times larger than the new grid cells. At station I-4 for levels 1 and 3, ammonium and nitrate results for the new calibration were both slightly lower than concentrations for these constituents of the old calibration. The fact that chlorophyll results for the new calibration being slightly higher (comparing more favorably to the observed data) than the old calibration results suggests that more nutrients were in demand. This was attributed to the difference in algal kinetics between the two models. Also at stations I-4 and station I-6, DO concentrations for level 1 are slightly lower at the beginning of the simulation period than those observed in old calibration results. By day 10, DO concentrations are exhibiting values similar to old results. This could be the result of the difference in algal kinetics or possibly the difference in how initial conditions were set for the two calibration simulations.

Overall, model calibration for this study with the new grid is deemed satisfactory. As was the old calibration, the new calibration was hampered by limited and missing data at several stations. Results indicate the model is capturing major features in the area of interest and throughout the system with the exception of station I-7. This station, located at the mouth of the Los Angeles Flood Control Channel, undoubtedly receives flows and loadings that are not included in the model. Consequently, observed chlorophyll levels are higher at this location than at any other site. The high chlorophyll levels at this location also impact nutrient levels since algae are a source of organic nutrients and a sink for inorganic nutrients. Elevated chlorophyll levels also impact dissolved oxygen levels at this site, as some of the observations appear to indicate supersaturated conditions. Station I-7 was far removed from the Pier 300/400 study area in the initial study. Installation of Pier 400 and its causeway along with the installation of Pier J have further isolated station I-7 from the project area. Consequently, ICM's inability to capture conditions at station I-7 will not adversely impact results for the Pier 300/400 project area.

Results for stations located near the study area (i.e., I-1, I-2, and I-3) demonstrate that model results are representative of observed condition. Both level 1 and level 3 results for station I-1 (located at the mouth of Main Channel) indicate ICM captures conditions observed at this site. Station I-2 results demonstrate the impact of the TITP loading, as this station is located near the discharge site. As mentioned above, all TITP load is applied to one cell, resulting in elevated levels of nitrate and dissolved inorganic phosphorus. CBOD at this site remains less than 3 mg/l while dissolved oxygen never falls below 7 mg/l. Station I-3 results indicate that ICM is performing well at this site. Surface predictions and observed data agree well for all constituents. Overall, model performance is good at these three stations which are the ones closest to the Pier 300/400 project site.

Results for the remaining interior stations (I-4, I-5, I-6, I-8, and I-9) demonstrate that ICM is correctly capturing conditions at these stations. Dissolved oxygen and dissolved inorganic phosphorus results continually match observations at these stations. Chlorophyll, ammonium, and nitrate results are good, although slightly under-predicted. Overall, model calibration on the interior stations is deemed satisfactory for scenario testing.

Time series results for the three stations located outside of the breakwater (B-1, B-2, and B-3) indicate that the model is performing well over the duration of the calibration period.

Scatter plots

Scatter plots (Figure WQ-3) were generated for the six constituents for which observed data were available. In these plots, the observed data are plotted against the x-axis, whereas the corresponding model-generated concentrations are plotted against the y-axis. Perfect agreement between modeled and observed concentrations is denoted by a symbol lying along the diagonal line that passes through the origin; circles underneath the diagonal indicate that the model under-predicts the measured data, whereas circles above the diagonal indicate that the model over-predicts the measured data.

Scatter plots indicate the level of model performance over the entire grid for the duration of the simulation. For all parameters, the model performs adequately given the amount of observed data that was available. As was discussed above, ICM is unable to replicate the high chlorophyll concentrations observed at station I-7. Otherwise, the diagonal passing through the data cluster indicates that ICM chlorophyll results agree favorably with observed data at the remaining stations. ICM results for ammonium and nitrate indicate that the model, while performing satisfactorily, does under-predict observations in the 0.05 to 0.1 mg/l range. Apparently, algal uptake of nitrogen in the model is removing practically all ammonium, which in turn cannot be oxidized to nitrate. Dissolved inorganic phosphorus results indicate that the model tends to under-predict higher observed values. ICM's inability to replicate these higher values apparently results from missing or inaccurate loading/discharge information. All DIP outliers are associated with observations at either station I-2 or I-7. Both stations are located where external loads are entering the system.

The dissolved oxygen scatter plot indicates that the model performs well. Other than at station I-7, all observations in the surface and bottom layers were near or greater than 6 mg/l. Model predictions were continually above 6 mg/l and tend to agree well with the observed data. The model's inability to replicate high dissolved oxygen levels results from the model lacking a diurnal component in the algal kinetics combined with the gas-stripping effect of reaeration.

The scatter plot for CBOD demonstrates the paucity of observed data for this constituent. With the exception of the station I-7 data, all CBOD observations are less that 2 mg/l. Model agreement with these values is satisfactory. The available CBOD data indicate that there appears to be little oxygen demand present in the system.

In summary, calibration results indicate that the model is adequately calibrated for use in analyzing scenario conditions.

5 Water Quality Scenario Results

WQM Scenario Results

Description

In order to determine the impact upon circulation and water quality, the CESPL requested that scenario runs be performed for a base configuration and three possible configurations representing harbor expansion under consideration. Additionally, each harbor configuration was evaluated under three sets of conditions. These scenario runs were:

a. Base condition with causeway gap closed and groin present (Figure WQ-SC-1).
b. Base condition with causeway gap closed and groin removed (Figure WQ-SC-2).
c. Base condition with causeway gap open and groin present (Figure WQ-SC-3).
d. 40-acre wide fill condition with causeway gap closed and groin present (Figure WQ-SC-4).
e. 40-acre wide fill condition with causeway gap closed and groin removed (Figure WQ-SC-5).
f. 40-acre wide fill condition with causeway gap open and groin present (Figure WQ-SC-6).
g. 80-acre wide fill condition with causeway gap closed and groin present (Figure WQ-SC-7).
h. 80-acre wide fill condition with causeway gap closed and groin removed (Figure WQ-SC-8).
i. 80-acre wide fill condition with causeway gap open and groin present (Figure WQ-SC-9).
j. 80-acre narrow fill condition with causeway gap closed and groin present (Figure WQ-SC-10).
k. 80-acre narrow fill condition with causeway gap closed and groin removed (Figure WQ-SC-11).
l. 80-acre narrow fill condition with causeway gap open and groin present (Figure WQ-SC-12).

The base-condition hydrodynamic and water quality grids represented the POLA Pier 400 Stage 2 existing configuration. The 80-acre wide and narrow configurations represent the study area after the dredged material has been placed in the east-west or north-south direction, respectively, north of Pier 400. The 40-acre wide configuration represents the study area after placement of dredge material in the east-west direction north of Pier 400.

Two sets of scenario runs were made. The first set consisted of water quality simulations using the same constituents modeled during calibration. The second set consisted of simulations of a conservative tracer released in Seaplane Lagoon and computation of water age.

Water Quality Results (Set 1)

For this set of scenario runs, time-series comparison plots were made at selected locations throughout the LALB system for the same water quality constituents as used in calibrating the water quality model. Results are presented for all calibration stations except for I-2, I-3, and I-8. These stations are not in the scenario grids as a result of harbor expansions after 1987. Additional stations X-1 through X-9 were added to those plotted during calibration. Stations X-1 – X-9 are in the same locations as they were in earlier studies (Hall 1990 and1995).

Comparison plots are shown in Figures WQ-SC-13 through WQ-SC-16 for the base, 40-acre wide, 80-acre wide, and 80-acre narrow fill configurations, respectively. In each figure, results from causeway gap closed with Seaplane Lagoon groin present, causeway gap closed with Seaplane Lagoon groin removed, and causeway gap open with Seaplane Lagoon groin present conditions are shown for each scenario configuration. The relative impact of any set of conditions can be determined from these plots by observing the deviation of one line from another.

Base configuration results are shown in Figure WQ-SC-13. Base scenario results are identical at all calibration stations for the conditions of causeway gap closed with Seaplane Lagoon groin present and causeway gap closed with Seaplane Lagoon groin removed. Comparison of the base scenario results for the causeway gap open Seaplane Lagoon Groin present condition to the two causeway gap closed conditions at these stations also show very similar results. The most significant differences occur at station X-6 (Figure WQ_SC_1) which is located in Seaplane Lagoon behind the groin. Results for the three conditions are similar at this location but not identical. The causeway gap open condition results in slightly higher chlorophyll levels (2-3 ug/l) at the end of the simulation period when compared to the two causeway gap closed conditions. Dissolved oxygen is slightly higher and CBOD slightly lower in the causeway gap open case. However, the change in the concentrations of these two constituents is probably not significant as dissolved oxygen levels are high and CBOD values are low for all three conditions. Nutrient levels were consistent in all base scenario results for the three conditions.

The 40-acre wide scenario results are shown in Figure WQ-SC-14. As with the base configuration, results for the three conditions are similar throughout the system. No appreciable differences are discernable between the two causeway gap closed cases. Dissolved oxygen concentrations are slightly higher for the causeway gap open condition in the Main channel (station I-1 on Figure WQ-SC-1). Apparently these differences occur because of changes in flow through main channel resulting from the causeway gap being opened and closed. Similar to the base scenario, the station that indicated the most change for the three conditions was X-6. The most substantial changes occurred in chlorophyll, BOD, and dissolved oxygen, and again, nutrient levels were unchanged. Slight differences were evident in the causeway gap closed Seaplane Lagoon groin present and the causeway gap closed Seaplane Lagoon groin removed conditions. None of these differences appear to be significant. The causeway gap open case did indicate slightly higher chlorophyll and dissolved oxygen concentrations when compared to the two causeway gap closed condition results. CBOD for the causeway gap open case was also lower than the two causeway gap closed cases. The main differences among the 40-acre wide scenario results appear to be due to the opening and closing of the causeway gap. Removal of the Seaplane Lagoon groin had a slight but not substantial impact on water quality.

The 80-acre wide scenario results are shown in Figure WQ-SC-15. These results are very similar to those observed for the 40-acre wide configuration. Little or no difference in any constituent is discernable between the two causeway gap closed conditions outside of the Pier 300 area. Causeway gap open results indicate slightly higher chlorophyll and dissolved oxygen levels at the stations in Main channel (Figure WQ-SC-1) when compared to the causeway closed conditions. The magnitude of the concentration differences in causeway open and causeway closed conditions at these stations is so small that it is insignificant. The Seaplane Lagoon station, X-6, indicated the most change as noted previously for the other scenario configurations. Slight differences appear in the causeway closed Seaplane Lagoon groin present and the causeway closed Seaplane Lagoon groin removed conditions. The level of these differences is so small that they are insignificant. Chlorophyll, BOD and dissolved oxygen levels in the causeway open case differ slightly from the two causeway gap closed conditions at this station. However, as in the 40-acre wide scenario, these differences are minor and probably insignificant.

Scenario results for the 80-acre narrow configuration are shown in Figure WQ-SC-16. Results for these scenarios are similar to those of the 40-acre wide and 80-acre wide configurations. For the 80-acre narrow configuration, no differences in concentrations in Main channel were discernible between the two causeway gap closed conditions. Slight differences in some constituents between the causeway gap open and causeway gap closed conditions, notably dissolved oxygen, chlorophyll, and CBOD, were detected in Main channel. As with the other configurations, these differences were so small as to be insignificant. The station that indicated the most differences among the three conditions was X-6. Results for the two causeway gap closed conditions were identical. Causeway gap open results indicate higher surface and bottom chlorophyll levels (approximately 3 ug/l) for this condition. Dissolved oxygen levels were also increased by approximately 0.5 mg/l and CBOD levels decrease by over 1.0 mg/l in the causeway gap open condition.

Figures WQ-SC-17 through WQ-SC-19 group the results of the different configurations by condition (e.g., causeway open with Seaplane Lagoon groin in place). Figure WQ-SC-17 shows the results for all causeway gap open scenario configurations. As evident by the results, there is little if any difference at the sampling stations between the four configurations. Slight lags in phasing are evident in some of the graphs. However, the final concentrations at these stations are the same for all four configurations. Only at station X-6 are four distinct lines discernable. Even at this station, the final concentrations were the same. Figure WQ-SC-18 contains results for all configurations with causeway gap closed with the Seaplane Lagoon groin in place. As in the causeway open case, the results for the four scenario configurations were similar. Slight phasing shifts were observed in the 80-acre narrow configuration results at a few stations. However, these phasing shifts had no impact upon final concentrations at these stations. Station X-6 was the only station where there were discernible differences in the results of the four configurations. While these differences were discernible, they were insignificant. Figure WQ-SC-19 shows the results for the four scenarios run with the causeway gap closed and the Seaplane Lagoon groin removed. As with the previous two figures, little significant difference among the four configurations can be discerned.

Concerns for minimum DO concentrations in the Seaplane Lagoon area were expressed; thus, plots showing minimum DO at surface (level 1), mid (level 2), and bottom (level 3) versus daily averaged DO concentrations were generated and presented in Appendix B (Figures C-1 through C-12). In the figures it is evident that for all configurations and conditions modeled, low DO concentrations were not much lower than averaged DO concentrations plotted. In fact there is very little difference between the average daily DO concentrations and the minimum DO concentrations in all figures. The reason for this could be due to ICM not having a diurnal component in the algal model. However, with the low chlorophyll concentrations of the system, diurnal changes are not expected to be great. Additionally the system does not appear to have a high DO demand (e.g, low CBOD values), and with the high reaeration and mixing, there is not a strong DO stratification.

In summary, results for all scenarios were similar. For all scenario configurations, results indicate that having the causeway gap open had positive impacts on the Seaplane Lagoon region when compared to the causeway closed conditions. However, the significance of this is hard to discern as the increases in DO and decreases in CBOD were small. All conditions modeled for the four configurations indicated that the water quality in locations removed from Pier 300 would experience insignificant changes in water quality. No significant degradation of water quality was seen at any location in any scenario.

Water Age and Tracer Simulations Results (Set 2)

Additional simulations were run for each scenario configuration in which water age was computed and a tracer was followed; all other water quality constituents were turned off. These results are presented in Figures WQ-SC-20 through WQ-SC-43. Even numbered figures present water age while odd numbered figures present tracer results. Water age is the amount of time that the water at a location has been in the model domain. Water entering the domain through the boundaries has zero age. For example, if the water age at a location is five days at the end of a 30-day simulation, then the water has been flushed or replaced approximately six times. The scenario configuration results for water age are presented as the water age at the end of the 30-day simulation.

To conduct the tracer studies, a conservative tracer was released at the beginning of the simulation in Seaplane Lagoon. All cells in all layers in Seaplane Lagoon were given an initial concentration of 1.0 mg/l. All other locations in the grid had initial concentrations of 0.0 mg/l. The simulation was run for thirty days and daily-averaged concentrations for the conservative tracer recorded. Color shading plots were generated using this data for days 1.0, 10.0, 20.0, and 30.0. The scale used on these plots is a log base 10 scale. The value of 0 represents 1.0 mg/l. The value of –1 is equal to 0.1 mg/l, -2 equals 0.01 mg/l, and –3 equal 0.001 mg/l. Consequently, even though portions of the study area are shaded, the concentrations at that location can be several orders of magnitude less that the original concentration in Seaplane Lagoon.

In general, the results for water age for all scenario configurations were almost a replica of each other. Thus for simplification purposes, only the 40-acre wide configuration scenario results will be discussed for each condition simulated. Figures WQ-SC-26 and WQ-SC-28 show that for the causeway closed condition with and without groin present, water is replaced in the system at almost the same frequency. However, when results for causeway open groin present condition (Figure WQ-SC-30) are compared to the two closed condition results, water is replaced at about the same rate everywhere except in the Seaplane Lagoon area, where water is being replaced more frequently, and in some areas almost four times as fast. This result is simply attributed to the gap being open causing different flow circulation patterns in the study area.

Similar to results for water age, tracer results for all scenario configurations show almost identical concentration patterns. As with water age, only the 40-acre wide configuration scenario results will be discussed. Tracer results for both causeway closed condition simulations (Figure WQ-SC-27 and Figure WQ-SC-29) show almost identical patterns of tracer concentrations in the grid for each day presented. Major differences are clearly seen when comparing the 40-acre wide causeway open condition results (Figure WQ-SC-31) with the two 40-acre wide closed condition results. Tracer concentrations for the 40-acre wide causeway open condition are barely present in the Main channel while for the closed condition simulations, tracer concentrations can be seen spreading through the Main channel. Again this was the result of changes in flow patterns in the Seaplane Lagoon area caused by the causeway gap being open.

Further analysis of the volume in the Seaplane Lagoon area and total flows in the Seaplane Lagoon and main channel were examined to identify changes in flow patterns. Figure WQ-SC-44 shows locations of transects (denoted by red lines on figure) representing areas where total averaged flows were analyzed for each configuration and condition modeled. This information is listed in Tables WQ-7 through WQ-11. Positive and negative values in Tables WQ-7 through WQ-11 indicated a direction of flow in Figure WQ-SC-44. A positive flow is to the right and up and a negative flow is to the left and down. Figure WQ-SC-44 also shows areas (e.g., denoted vol 1 on figure) where volume changes were examined for each scenario and condition modeled, and Table WQ-12 lists the volumes for these areas.

Flow results for transect 1 (Table WQ-7) indicate that there is a net inflow into the Seaplane Lagoon habitat area at the surface for the conditions with the groin present. Correspondingly, there is a net outflow of water at the bottom when the Seaplane Lagoon groin is removed. The flow direction changes and there is a net outflow of water through this transect. This is due to a clockwise circulation pattern established throughout the Seaplane Lagoon vicinity as a result of the groin being removed. Surface flows under these conditions are lower than subsurface flows possibly due to wind. Flows for transect 2 indicate two-dimensional flow. Flows into the Seaplane Lagoon are in on the bottom and out on the top. Again, this is possibly due to wind effects in the hydrodynamic code. With the groin removed, flow is one-dimensional; out in all layers.

Flow results for transect 3 (between Pier 300 and Pier 400) are shown in Table WQ-8. Flows at this transect exhibit the same behavior for both closed causeway conditions modeled for all scenario configurations. Surface flows are into the project area, while subsurface flows exit the project area. The net flow is approximately zero. For the causeway open condition a small return flow remains in the bottom layers, but overall flow is into the project area. The largest flows are in the surface layer and are approximately 75% greater than the flows for the causeway closed conditions. The net flow increases to the 50 to 60 m^3/s range.

Causeway gap flows, Table WQ-9, indicate that a net flow exits the project area. Surface layer flows are approximately twice the bottom layer flows for all scenario configurations. These results, when consider with transect 3 results, indicate that the gap allows a clockwise circulation through the project area out to the waters off of the navy mole. This circulation facilitates an *exchange* of water inside the project area with outer bay waters.

Table WQ-10 contains results for the four transects in the main channel and Cerritos channel. Net flow is in a clockwise direction in all layers. Flows at all transects are identical for the two causeway gap closed conditions. Results for the causeway gap open condition is similar to those of the causeway gap closed conditions at all transects except there is a slight decrease in flows.

Time series results for tracer simulations at station X-6 representing the Seaplane Lagoon area are shown in Figures WQ-SC-45 through WQ-SC-51. In Figures WQ-SC-45 through WQ-SC-48 tracer results are presented for each configuration with the three conditions plotted together. From these figures the effect the groin has on the tracer concentration is very apparent. With the groin in place, the causeway closed and open conditions show very similar results. However, for the causeway closed with groin removed condition, water in this area mixes with water on the other side of the groin quicker resulting in faster dilution. Eventually by day 10, tracer concentrations for all conditions are similar. From Figures WQ-SC-49 through 51, it is noted that tracer results are very similar regardless of which configuration was modeled.

In summing up the tracer and water age simulation, all scenario configurations resulted in similar tracer concentration patterns and water-flushing times for all conditions modeled (Figures WQ-SC-20 to 43). The differences became noticeable when comparing the three conditions modeled (see odd numbered Figures WQ-SC-21 to 43) to each other for each configuration. For example, there were hardly any discernable differences when the results for the 40-acre wide scenario closed conditions (with and without groin present) were compared to each other. However, major differences were noted when results for the 40-acre wide scenario open condition with groin present were compared to both results for the 40-acre wide scenario closed conditions (with and without groin present). This same behavior was seen for all scenario configurations.

Table WQ-7
Flows (cms) by Layers for Transects 1 and 2 for all Scenario Configurations and Conditions

Scenario Configuration	Layer #	Closed w/groin		Closed w/o Groin		Open w/ groin	
		1	2	1	2	1	2
Base	1	1.147E-00	9.939E-01	-1.263E-00	3.414E-00	1.146E-00	9.938E-01
	2	3.077E-01	2.709E-01	-2.055E-00	2.641E-00	3.070E-01	2.709E-01
	3	-2.735E-01	-2.222E-01	-2.541E-00	2.048E-00	-2.737E-01	-2.221E-01
	4	-5.947E-01	-4.860E-01	-2.722E-00	1.636E-00	-5.942E-01	-4.859E-01
	5	-6.517E-01	-5.222E-01	-2.594E-00	1.405E-00	-6.503E-01	-5.222E-01
40 wide	1	1.131E-00	9.945E-01	-1.351E-00	3.489E-00	1.135E-00	9.944E-01
	2	2.960E-01	2.713E-01	-2.138E-00	2.714E-00	2.988E-01	2.714E-01
	3	-2.776E-01	-2.220E-01	-2.615E-00	2.118E-00	-2.765E-01	-2.219E-01
	4	-5.871E-01	-4.862E-01	-2.781E-00	1.702E-00	-5.887E-01	-4.863E-01
	5	-6.284E-01	-5.231E-01	-2.634E-00	1.464E-00	-6.337E-01	-5.233E-01
80 wide	1	1.124E-00	9.951E-01	-1.341E-00	3.475E-00	1.123E-00	9.950E-01
	2	2.905E-01	2.718E-01	-2.127E-00	2.700E-00	2.901E-01	2.718E-01
	3	-2.794E-01	-2.219E-01	-2.602E-00	2.104E-00	-2.794E-01	-2.218E-01
	4	-5.833E-01	-4.866E-01	-2.765E-00	1.687E-00	-5.830E-01	-4.866E-01
	5	-6.171E-01	-5.241E-01	-2.613E-00	1.449E-00	-6.163E-01	-5.242E-01
80 narrow	1	1.149E-00	9.972E-01	-6.728E-01	2.823E-00	1.148E-00	9.969E-01
	2	3.098E-01	2.728E-01	-1.475E-00	2.061E-00	3.095E-01	2.727E-01
	3	-2.714E-01	-2.228E-01	-1.984E-00	1.491E-00	-2.715E-01	-2.228E-01
	4	-5.931E-01	-4.901E-01	-2.199E-00	1.113E-00	-5.929E-01	-4.900E-01
	5	-6.519E-01	-5.302E-01	-2.117E-00	9.275E-01	-6.513E-01	-5.300E-01

Table WQ-8
Flow by Layers for Transect 3

layer #	Base			40 Wide			80 Wide			80 Narrow		
	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open
1	2.100E+01	2.100E+01	3.602E+01	2.104E+01	2.104E+01	3.366E+01	2.173E+01	2.173E+01	3.408E+01	2.110E+01	2.110E+01	3.608E+01
2	4.041E-00	4.041E-00	1.835E+01	4.076E-00	4.076E-00	1.609E+01	4.726E-00	4.727E-00	1.650E+01	4.122E-00	4.121E-00	1.840E+01
3	-6.506E-00	-6.506E-00	6.381E-00	-6.489E-00	-6.489E-00	4.330E-00	-5.914E-00	-5.913E-00	4.699E-00	-6.466E-00	-6.466E-00	6.421E-00
4	-1.063E+01	-1.063E+01	1.063E-01	-1.064E+01	-1.064E+01	-1.628E-00	-1.018E+01	-1.018E+01	-1.310E-00	-1.065E+01	-1.065E+01	1.313E-01
5	-8.269E-00	-8.269E-00	-4.378E-01	-8.324E-00	-8.324E-00	-1.759E-00	-8.023E-00	-8.023E-00	-1.508E-00	-8.394E-00	-8.394E-00	-4.453E-01

Table WQ-9
Flow (cms) by Layers at Causeway Gap for all Conditions and Configurations Modeled

layer #	Base			40 Wide			80 Wide			80 Narrow		
	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open	Closed	Closed w/o Groin	Open
1	0.000E+01	0.000E+01	1.597E+01	0.000E+01	0.000E+01	1.360E+01	0.000E+01	0.000E+01	1.330E+01	0.000E+01	0.000E+01	1.597E+01
2	0.000E+01	0.000E+01	1.418E+01	0.000E+01	0.000E+01	1.192E+01	0.000E+01	0.000E+01	1.162E+01	0.000E+01	0.000E+01	1.418E+01
3	0.000E+01	0.000E+01	1.228E+01	0.000E+01	0.000E+01	1.022E+01	0.000E+01	0.000E+01	9.965E-00	0.000E+01	0.000E+01	1.229E+01
4	0.000E+01	0.000E+01	1.026E+01	0.000E+01	0.000E+01	8.513E-00	0.000E+01	0.000E+01	8.311E-00	0.000E+01	0.000E+01	1.028E+01
5	0.000E+01	0.000E+01	8.109E-00	0.000E+01	0.000E+01	6.770E-00	0.000E+01	0.000E+01	6.653E-00	0.000E+01	0.000E+01	8.157E-00

Table WQ-10
Flows (cms) by Layers for all Transects along the Main Channel for all Scenario Configurations and Conditions

Scenario Configuration	Layer #	Closed				Closed w/o Groin				Open			
		7	8	9	10	7	8	9	10	7	8	9	10
Base	1	3.137E+01	2.588E+01	-1.287E+01	-5.874E-00	3.137E+01	2.588E+01	-1.287E+01	-5.878E-00	3.076E+01	2.526E+01	-1.223E+01	-5.306E-00
	2	1.980E+01	1.877E+01	-1.695E+01	-1.672E+01	1.980E+01	1.877E+01	-1.695E+01	-1.672E+01	1.921E+01	1.818E+01	-1.634E+01	-1.618E+01
	3	1.155E+01	1.334E+01	-1.804E+01	-2.158E+01	1.155E+01	1.334E+01	-1.804E+01	-2.158E+01	1.102E+01	1.281E+01	-1.750E+01	-2.110E+01
	4	6.561E-00	9.582E-00	-1.617E+01	-2.057E+01	6.561E-00	9.582E-00	-1.617E+01	-2.057E+01	6.109E-00	9.130E-00	-1.573E+01	-2.018E+01
	5	4.927E-00	7.444E-00	-1.123E+01	-1.340E+01	4.928E-00	7.444E-00	-1.123E+01	-1.340E+01	4.584E-00	7.101E-00	-1.092E+01	-1.312E+01
40 wide	1	3.140E+01	2.590E+01	-4.479E-00	-5.354E-00	3.140E+01	2.590E+01	-4.479E-00	-5.354E-00	3.091E+01	2.541E+01	-4.119E-00	-4.850E-00
	2	1.983E+01	1.879E+01	-1.110E+01	-1.626E+01	1.983E+01	1.879E+01	-1.110E+01	-1.626E+01	1.936E+01	1.833E+01	-1.076E+01	-1.578E+01
	3	1.158E+01	1.336E+01	-1.408E+01	-2.119E+01	1.158E+01	1.336E+01	-1.408E+01	-2.119E+01	1.115E+01	1.294E+01	-1.378E+01	-2.076E+01
	4	6.580E-00	9.601E-00	-1.349E+01	-2.023E+01	6.580E-00	9.601E-00	-1.349E+01	-2.023E+01	6.219E-00	9.240E-00	-1.324E+01	-1.988E+01
	5	4.940E-00	7.459E-00	-9.255E-00	-1.310E+01	4.940E-00	7.460E-00	-9.255E-00	-1.310E+01	4.666E-00	7.186E-00	-9.081E-00	-1.285E+01
80 wide	1	3.372E+01	2.500E+01	-1.195E+01	-6.435E-00	3.372E+01	2.500E+01	-1.195E+01	-6.437E-00	3.317E+01	2.445E+01	-1.139E+01	-6.026E-00
	2	1.950E+01	1.793E+01	-1.608E+01	-1.761E+01	1.950E+01	1.793E+01	-1.608E+01	-1.762E+01	1.898E+01	1.741E+01	-1.554E+01	-1.723E+01
	3	9.744E-00	1.258E+01	-1.726E+01	-2.265E+01	9.744E-00	1.258E+01	-1.726E+01	-2.265E+01	9.268E-00	1.210E+01	-1.678E+01	-2.230E+01
	4	4.327E-00	8.935E-00	-1.554E+01	-2.167E+01	4.327E-00	8.935E-00	-1.554E+01	-2.167E+01	3.924E-00	8.531E-00	-1.515E+01	-2.139E+01
	5	3.308E-00	6.952E-00	-1.080E+01	-1.447E+01	3.308E-00	6.953E-00	-1.080E+01	-1.447E+01	3.003E-00	6.644E-00	-1.052E+01	-1.427E+01
80 narrow	1	3.372E+01	2.500E+01	-1.196E+01	-4.422E-00	3.372E+01	2.500E+01	-1.196E+01	-4.423E-00	3.303E+01	2.431E+01	-1.124E+01	-3.700E-00
	2	1.951E+01	1.794E+01	-1.608E+01	-1.538E+01	1.951E+01	1.794E+01	-1.608E+01	-1.538E+01	1.884E+01	1.727E+01	-1.540E+01	-1.469E+01
	3	9.750E-00	1.259E+01	-1.727E+01	-2.040E+01	9.750E-00	1.259E+01	-1.727E+01	-2.040E+01	9.146E-00	1.198E+01	-1.666E+01	-1.979E+01
	4	4.332E-00	8.940E-00	-1.555E+01	-1.959E+01	4.332E-00	8.940E-00	-1.555E+01	-1.959E+01	3.821E-00	8.428E-00	-1.505E+01	-1.909E+01
	5	3.313E-00	6.957E-00	-1.080E+01	-1.265E+01	3.313E-00	6.957E-00	-1.080E+01	-1.265E+01	2.925E-00	6.566E-00	-1.045E+01	-1.230E+01

Table WQ-11
Total Average Flow (cms) for Transects inside Pier 300 Project Area

Scenario	1	2	3	Causeway
Base closed w/groin	-6.542E-02	3.435E-02	-3.655E-01	0.000E+01
Base closed wo/groin	-1.118E+01	1.114E+01	-3.654E-01	0.000E+01
Base open w/groin	-6.542E-02	3.435E-02	6.042E+01	6.079E+01
40 wide closed w/groin	-6.578E-02	3.454E-02	-3.345E-01	0.000E+01
40 wide closed wo/groin	-1.152E+01	1.149E+01	-3.342E-01	0.000E+01
40 wide open w/groin	-6.530E-02	3.428E-02	5.069E+01	5.103E+01
80 wide closed w/groin	-6.537E-02	3.432E-02	2.341E-00	0.000E+01
80 wide closed wo/groin	-1.145E+01	1.142E+01	2.344E-00	0.000E+01
80 wide open w/groin	-6.521E-02	3.422E-02	5.245E+01	4.985E+01
80 narrow closed w/groin	-5.776E-02	2.678E-02	-2.909E-01	0.000E+01
80 narrow closed wo/groin	-8.448E-00	8.417E-00	-2.910E-01	0.000E+01
80 narrow open w/groin	-5.790E-02	2.685E-02	6.059E+01	6.088E+01

Table WQ-12
Volumes (m^3) for all Scenario Configurations and Conditions

Scenario	Project_area_vol	region 1	region 2	region 3	region 4
Base closed w/groin	1.2363E+07	6.3592E+06	5.0553E+06	5.8065E+05	3.6842E+05
Base closed wo/groin	1.2363E+07	6.3591E+06	5.0553E+06	5.8067E+05	3.6842E+05
Base open w/groin	1.2363E+07	6.3591E+06	5.0552E+06	5.8063E+05	3.6841E+05
40 wide closed w/groin	1.1509E+07	6.3592E+06	4.2140E+06	5.6788E+05	3.6841E+05
40 wide closed wo/groin	1.1509E+07	6.3592E+06	4.2140E+06	5.6790E+05	3.6841E+05
40 wide open w/groin	1.1510E+07	6.3592E+06	4.2140E+06	5.6789E+05	3.6842E+05
80 wide closed w/groin	1.0627E+07	6.3592E+06	3.3191E+06	5.8065E+05	3.6841E+05
80 wide closed wo/groin	1.0627E+07	6.3592E+06	3.3191E+06	5.8067E+05	3.6842E+05
80 wide open w/groin	1.0627E+07	6.3592E+06	3.3191E+06	5.8065E+05	3.6842E+05
80 narrow closed w/groin	1.3193E+07	6.3591E+06	6.0639E+06	4.0107E+05	3.6841E+05
80 narrow closed wo/groin	1.3193E+07	6.3591E+06	6.0639E+06	4.0108E+05	3.6841E+05
80 narrow open w/groin	1.3192E+07	6.3591E+06	6.0638E+06	4.0104E+05	3.6838E+05

6 Summary and Conclusions

The U.S. Army Engineer Engineering Research and Development Center (ERDC) has conducted a water quality modeling study of Los Angeles and Long Beach Harbors to determine possible water quality impacts resulting from the proposed extension of Pier 300, the proposed deepening of the Main Channel, and the possible closing of the gap in the causeway leading to Pier 400, and the removal of the groin separating the shallow water habitat from seaplane lagoon. The proposed Pier 300 expansion will contain sediment dredged from the Main Channel, where the channel depth will be increased from approximately 45 ft MLW to 55 ft MLW. To address concerns that the expansion might degrade water quality in the shallow water habitat and in seaplane lagoon, two numerical models, one hydrodynamic and one water quality model were applied to portray water quality in the harbors after expansion.

Three proposed Pier 300 expansion configurations were investigated in this study. For each configuration, the pier is expanded directly east and into the water basin that is referred to as the shallow water habitat. Two proposed configurations will increase the surface area of the existing pier (and thereby decrease the size of the shallow water habitat) by 80 acres. One of the 80-ac expansions, referred to in this report as the 80-ac "wide" configuration, has the dimensions of 1870 ft by 1870 ft, and extends 1870 ft into the shallow water habitat. The second 80-acre expansion, referred to as the 80-ac "narrow" configuration, has the dimensions of 3443 ft by 1010 ft, and extends 1010 ft into the shallow water habitat. The third configuration will increase the size of the pier by 40 acres. The 40-ac configuration has the dimensions of 935 ft by 1870 ft, and extends 1870 ft into the shallow water habitat.

Two groins reside within the expansion area. The first or outer groin runs parallel to, and is aligned with, the southern edge of Pier 300, partially separating the northern channel (running between Piers 300 and 400) from the shallow water habitat. The second or inner groin separates the shallow water habitat from seaplane lagoon, which lies directly northward of the habitat. Given that the length of the first groin is shorter than the widths of all three expansion configurations, each expansion will decrease the conveyance area (or cross-sectional area) at the entrance to the shallow water habitat. A decrease in the conveyance area can be expected to reduce the volume of water flowing into and out of the shallow water habitat and seaplane lagoon basins, potentially increasing the residence time (resulting in lower dissolved oxygen concentrations) of water residing in these basins.

Four scenario configurations with three conditions applied to each were simulated for a total of 12 simulation runs. These runs were:

a. Base condition with causeway gap closed and groin present
b. Base condition with causeway gap closed and groin removed
c. Base condition with causeway gap open and groin present

d. 40-acre wide fill condition with deepened main channel and causeway gap closed and groin present

e. 40-acre wide fill condition with deepened main channel and causeway gap closed and groin removed

f. 40-acre wide fill condition with deepened main channel and causeway gap open and groin present

g. 80-acre wide fill condition with deepened main channel and causeway gap closed and groin present

h. 80-acre wide fill condition with deepened main channel and causeway gap closed and groin removed

i. 80-acre wide fill condition with deepened main channel and causeway gap open and groin present

j. 80-acre narrow fill condition with deepened main channel and causeway gap closed and groin present

k. 80-acre narrow fill condition with deepened main channel and causeway gap closed and groin removed

l. 80-acre narrow fill condition with deepened main channel and causeway gap open and groin present

The water quality model, CE-QUAL-ICM was calibrated using observed data and appropriate kinetic rates determined in previous studies of Los Angeles-Long Beach Harbors (Hall 1990,1995). Calibration results compared favorably to observed data and to model results presented in Hall (1995).

To briefly sum up the scenario results, all configurations showed very similar impacts to water quality. Results indicate positive impacts to the seaplane lagoon region when comparisons for all scenario configurations were made between results for the condition with causeway gap open groin present to results for conditions with causeway closed groin removed and causeway gap closed present. However, the significance of this is hard to discern as the increases in DO and decreases in CBOD were small. Results for all four configurations indicated that for locations removed from Pier 300, there would be insignificant differences in water quality. No significant degradation of water quality was seen at any location for any scenario run. This is especially true for DO since model results indicate that DO is well mixed in the water column. Predicted concentrations of DO were 6 mg/l or greater except at station I-7 which is far removed from the study area.

In summing up the tracer and water age simulations, all scenario configurations resulted in similar tracer concentration patterns and water flushing times for all conditions modeled. The differences became noticeable when comparing results for the three conditions modeled (gap open groin present, gap closed groin present, and gap closed groin removed). Examination of water age results for the condition, causeway gap open with groin present, for all configurations show that water age was usually less in the Seaplane Lagoon area, but similar in other areas when compared to results for the two conditions, causeway gap closed groin present and causeway gap closed groin removed. With the causeway gap open, a different flow circulation pattern resulted in the area of the seaplane lagoon and through the main channel with water being replaced more frequently in the seaplane lagoon area. This result is simply attributed to the gap being open causing different flow circulation patterns in the study area. Tracer results for the conditions, causeway gap closed with and without groin, for all scenarios show almost identical patterns of tracer concentrations in the grid for each day presented. Major differences are clearly seen when these results are compared to the results for the condition, causeway gap open groin present, for all scenarios configurations. Tracer concentrations for the causeway gap open condition are barely present in the main channel while both causeway gap closed conditions show tracer concentrations spreading through the Main channel. Like water age these differences were attributed to the gap being open causing different flow circulation patterns. These differences did not pose a detrimental effect to water quality in the study area.

Figures WQ-SC-45 through 48 show the effect the groin has on the tracer concentration in the seaplane lagoon region. With the groin in place, the causeway closed and open conditions show very similar results. However, for the causeway closed with groin removed condition, water in this area mixes with water on the other side of the groin quicker resulting in faster dilution. Again, these differences did not pose a detrimental effect to water quality in the study area.

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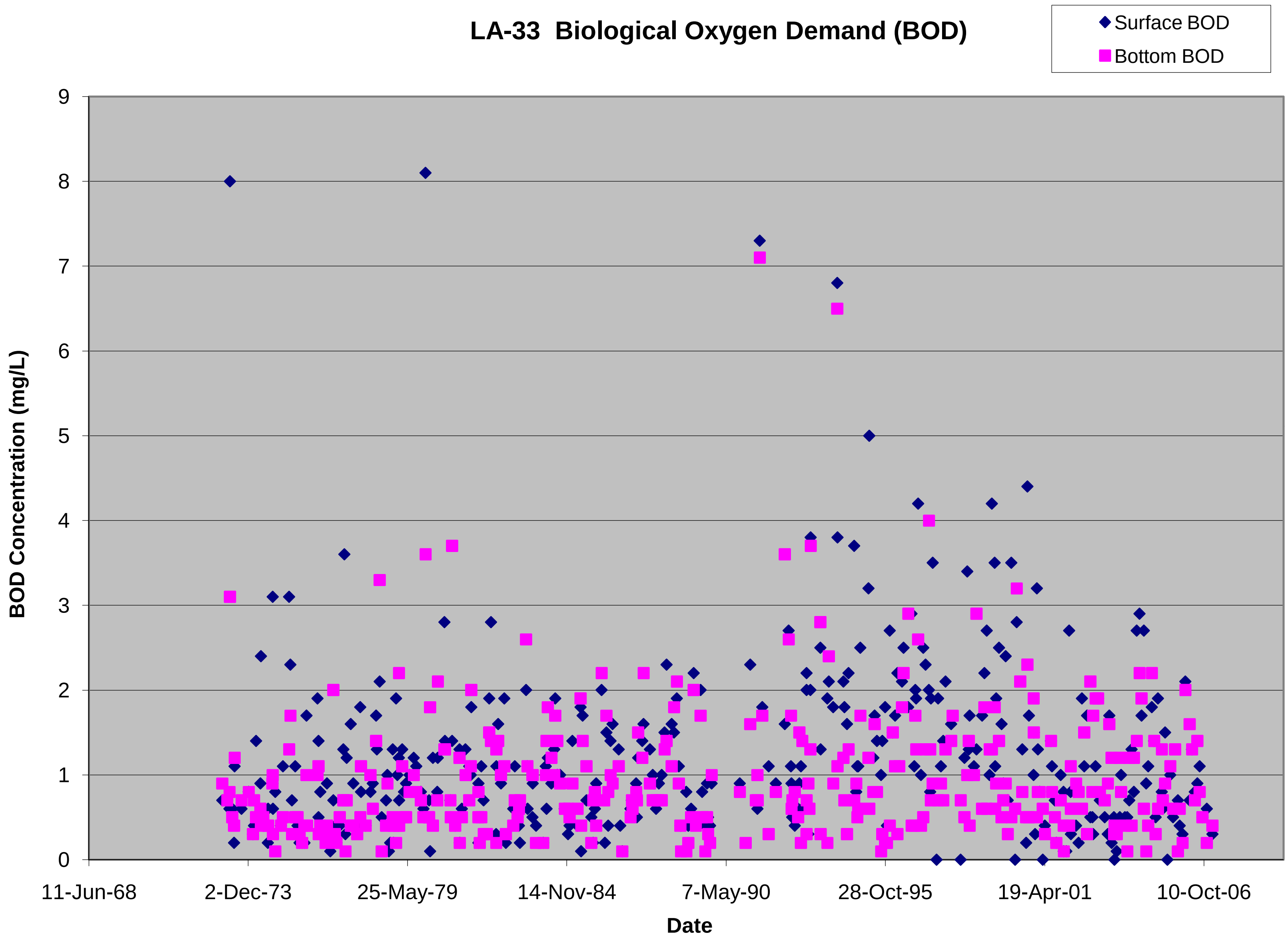
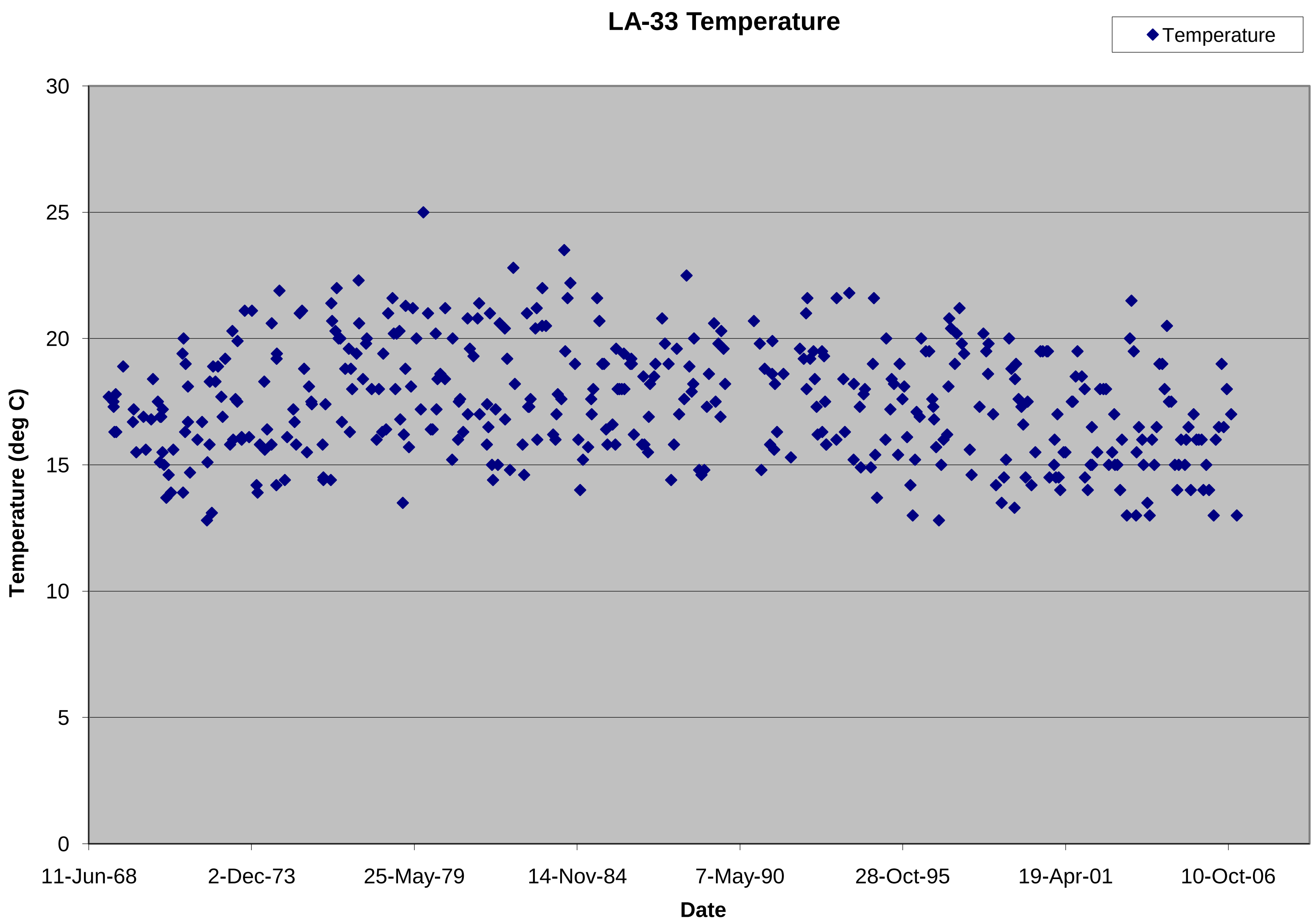
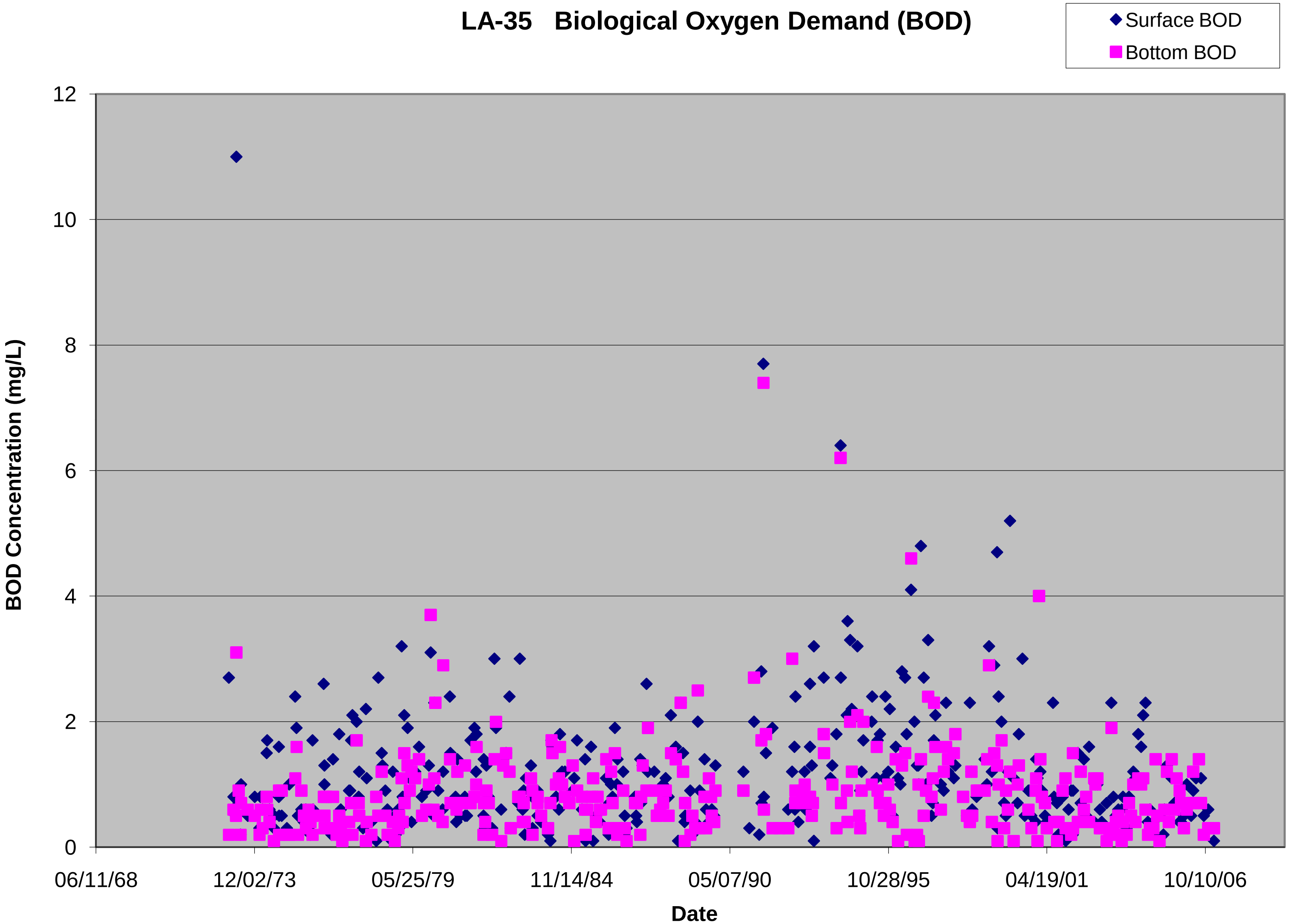
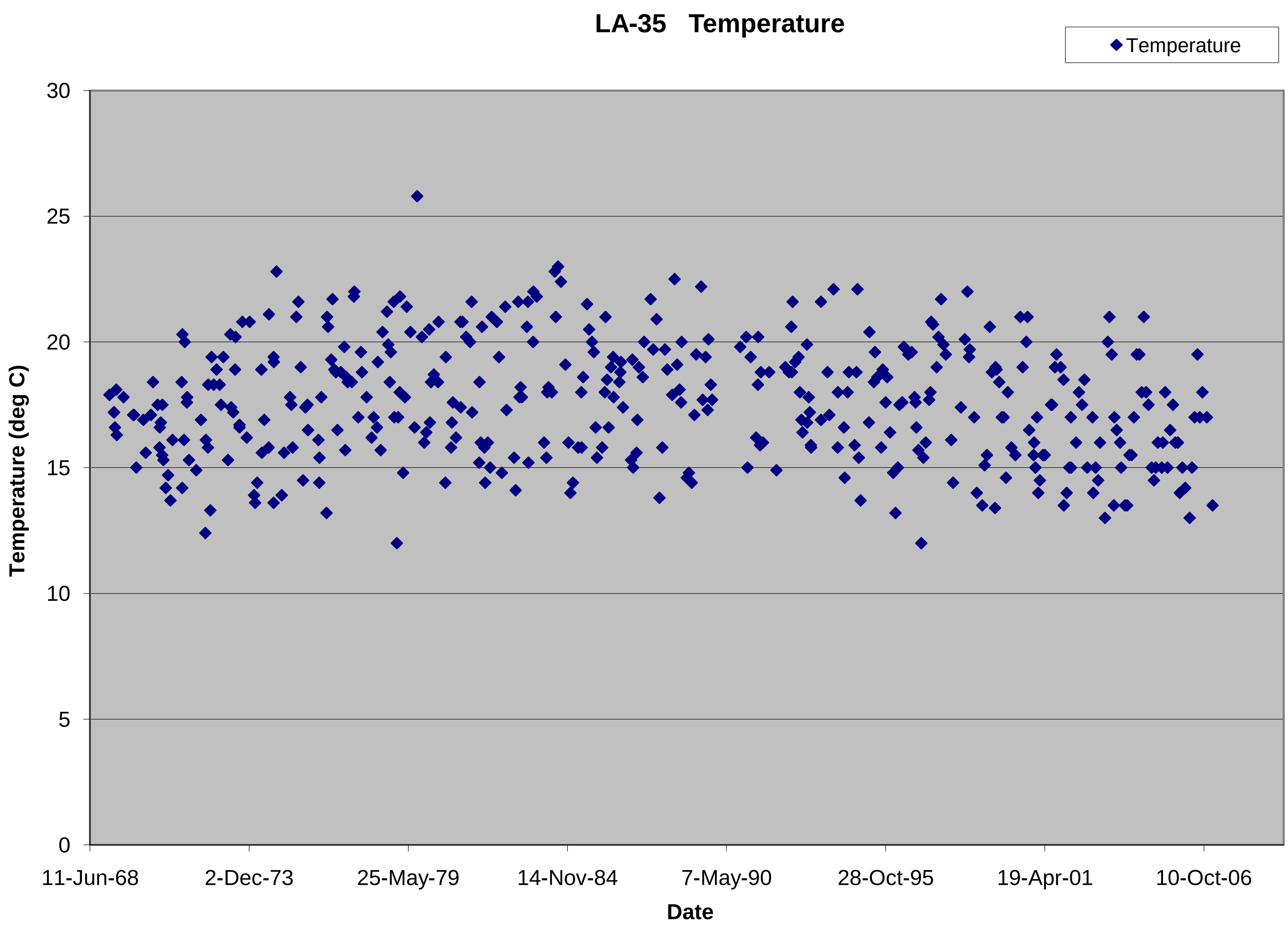

LA-33 Biological Oxygen Demand (BOD)
Surface BOD
Bottom BOD
BOD Concentration (mg/L)
9
8
7
6
5
4
3
2
1
0
11-Jun-68
2-Dec-73
25-May-79
14-Nov-84
7-May-90
28-Oct-95
19-Apr-01
10-Oct-06
Date


LA-33 Temperature
Temperature
30
25
20
15
10
5
0
Temperature (deg C)
11-Jun-68
2-Dec-73
25-May-79
14-Nov-84
7-May-90
28-Oct-95
19-Apr-01
10-Oct-06
Date



LA-35 Biological Oxygen Demand (BOD)
Surface BOD
Bottom BOD
BOD Concentration (mg/L)
0
2
4
6
8
10
12
06/11/68
12/02/73
05/25/79
11/14/84
05/07/90
10/28/95
04/19/01
10/10/06
Date


LA-35 Temperature
Temperature
30
25
20
15
10
5
0
Temperature (deg C)
11-Jun-68
2-Dec-73
25-May-79
14-Nov-84
7-May-90
28-Oct-95
19-Apr-01
10-Oct-06
Date