Appendix VII – Sediment Sampling and Analysis Plan

TC 16070-04

Maintenance Dredging

Sediment Sampling and Analysis Plan

Cerritos Bahia Marina

City of Long Beach, California

August 2006

Prepared For:
CITY OF LONG BEACH
Department of Parks, Recreation & Marine
2760 Studebaker Road
Long Beach, California 90815

Prepared By:
Tetra Tech, Inc.
401 East Ocean Blvd., Ste. 420
Long Beach, California

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CITY OF LONG BEACH, CALIFORNIA

1.0 Introduction

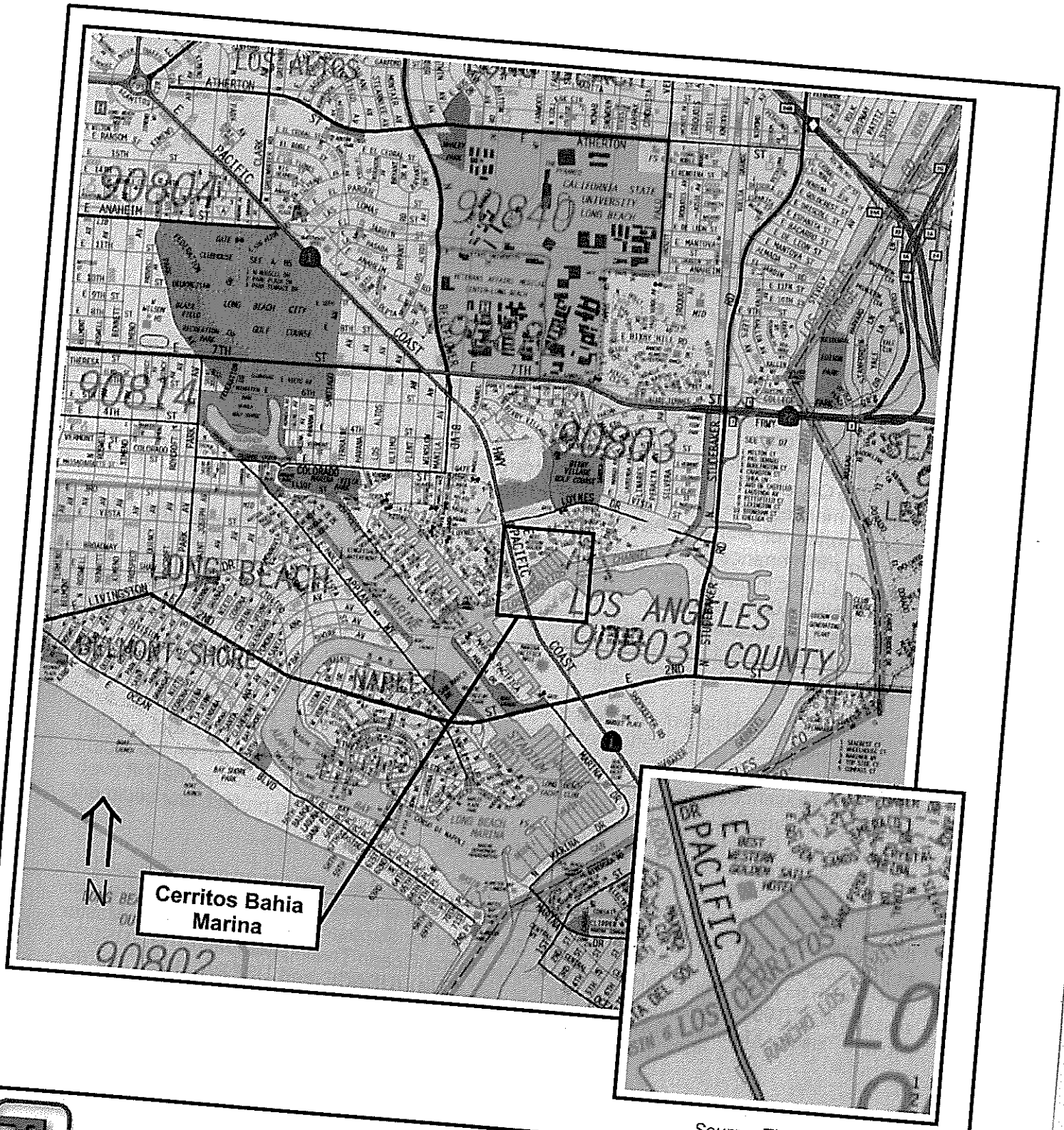
Pursuant to the U.S. Army Corps of Engineers Department of the Army Permit 199915256-JLB issued to the City of Long Beach for maintenance dredging, the City of Long Beach is proposing to conduct maintenance dredging of the Cerritos Bahia Marina. This site is located in the northeast portion of Alamitos Bay in Long Beach, California (Figure 1). The permit is for performing maintenance dredging of no more than 90,000 cubic yards per year from the locations specified in the approved Master SAP. The City is also proposing a dredge project of approximately 17,000 cubic yards at the Catalina Cruises Terminal Basin during the 2006-2007 dredge season. A separate SAP was prepared for that project. The approved Master Sediment Sampling and Analysis Plan was prepared by Tetra Tech in July 2005 and approved by the regulatory and resource agencies with jurisdiction.

The project design consists of dredging a total of approximately 37,064 cubic yards of material from the project site. This quantity of material includes 22,120 cubic yards of material to a design depth of -8 feet (-2.4 meters) Mean Lower-Low Water (MLLW) plus a -2 foot (-0.6m) over-depth allowance which results in an additional 14,944 cubic yards. Based on the recent bathymetric survey and design depth, the maximum dredge cut depth including the 2-ft over-depth is 7 feet. Based on the quantity and area of the proposed dredge project, four sediment samples will be collected within the dredge footprint.

The objective of this sampling and analysis program is to characterize the material proposed for dredging at the project site and its acceptability for potential beach nourishment and/or disposal at the ocean disposal site such as LA-2. Suitability for disposal will be based on the Master SAP which includes applicable criteria outlined in the Ocean Testing Manual (OTM) (USEPA and USACE 1991), the Inland Testing Manual (ITM) (USACE and USEPA 1998) and the Upland Testing Manual (USACE 2003).

2.0 Site Location & Description

Cerritos Bahia Marina is located at 6289 East Pacific Coast Highway in Long Beach, California (Figure 1). The site is in the northeastern part of Alamitos Bay. The marina is on the north side of the Los Cerritos Channel and east of Pacific Coast Highway. The project area is approximately 7.8 acres in size (Figure 2).



Source: Thomas Bros. Maps

Tetra Tech, Inc.
ENGINEERS ARCHITECTS SCIENTISTS

401 East Ocean Blvd., Suite 420
Long Beach, California 90802
Ph. (562) 495-0495 fax (562) 495-5029

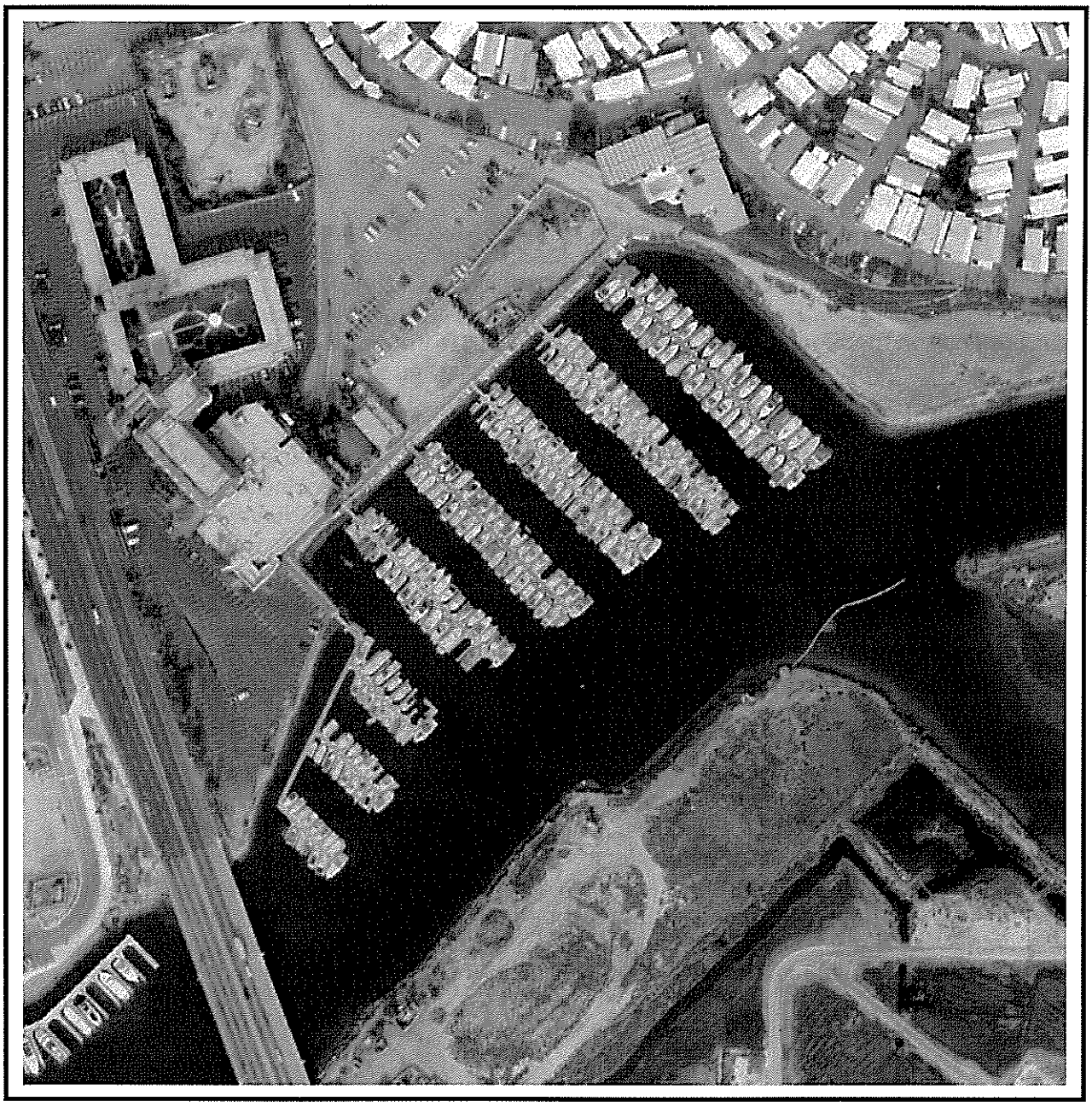
Site Vicinity Map

Cerritos Bahia Marina

Long Beach, California

FIGURE 1

July 2006



Source: USGS 2004

Tetra Tech, Inc.
ENGINEERS ARCHITECTS SCIENTISTS

401 East Ocean Blvd., Suite 420
Long Beach, California 90802
Ph. (562) 495-0495 fax (562) 495-5029

Aerial Photograph

Cerritos Bahia Marina
Long Beach, California

FIGURE 2

July 2006

2.1 Site History

Based on historical aerial photos a marina was not present in 1951 and was present in 1959. The project area appeared to be undeveloped in the 1951 photo. Cerritos Bahia Marina currently has approximately 248 slips for small recreational boats and is privately owned by Alamitos Bay Partners. The marina was last dredged in 1991.

3.0 Bathymetric Survey

A bathymetric survey of the project sites was conducted by Tetra Tech in June 2005. The survey was conducted from a boat. An integrated system of bathymetric equipment was used including a Trimble Ag122 Differential GPS (DGPS) receiver, a Meridata 100 digital fathometer and a laptop computer running Trimble HYDRO Pro software. This system records real-time DGPS position, depth and time at 1-second intervals as the boat traverses the survey area. Accuracies for the survey system are ± 3 feet horizontally and ± 0.5 feet vertically. In areas that are inaccessible by boat, surveyors used a lead line to take depth measurements.

In order to correct depth readings for tidal variation, tidal elevations are observed from a calibrated tide staff and recorded at frequent intervals. Observations of the tidal elevations from the tide staff(s) were used to adjust all depth data to the correct datum during post-processing. At the completion of the survey, the data was reviewed, edited for false readings, and tidal corrections applied. The DGPS coordinates were converted to California State Plane Coordinates based on the North American Datum 1983 (NAD83). Contour lines were constructed for the data set of adjusted depths and coordinates. The data set was imported in to AutoCAD® to create a drawing. In addition, an aerial photograph showing the area was geo-referenced to the AutoCAD® file and a bathymetric map produced (Figure 4).

3.1 Determination of Dredge Area and Volumes

A point file from the results of the bathymetric survey was imported into AutoCAD® Land Development Desktop. This x, y, z, information is processed to create a TIN (triangular irregular network) model of the existing bottom surface. This is analyzed to determine the areas that are candidates for dredging. Once these areas are determined, a dredge perimeter is set using the design dredging depth. A second surface is created in Land Development Desktop based on this dredge area and the design depth. A stratum is created using the existing and proposed surfaces. Dredge volume amounts are determined by the difference between the two surfaces.

4.0 Description of Previous Sediment Investigations

4.1 July 2004 Sediment Investigation

In anticipation of the need for dredging, the marina owner had sampling conducted in July 2004. Eight sediment samples (one from each of the eight docks) were collected and analyzed for that study.

Table 1 below summarizes the results for detected analytes. No volatile organic compounds or petroleum hydrocarbons were detected in any of the samples. Metals were detected at all eight stations. Cadmium and copper exceeded ER-L levels at all eight stations. No metals exceeded ER-M levels. One organochlorine pesticide (4-4'-DDE) exceeded the ER-L level at each of the eight samples and exceed the ER-M level at three of the eight stations. Concentrations of 4-4'-DDE ranged from 6.3 to 32 ug/kg. PCBs were detected at seven of the eight stations. Grain size data was not available. Figure 3 shows sampling station locations used in that study.

Table 1. Summary of sediment chemistry results for detected analytes, Cerritos Bahia Marina sampling, July 2004.

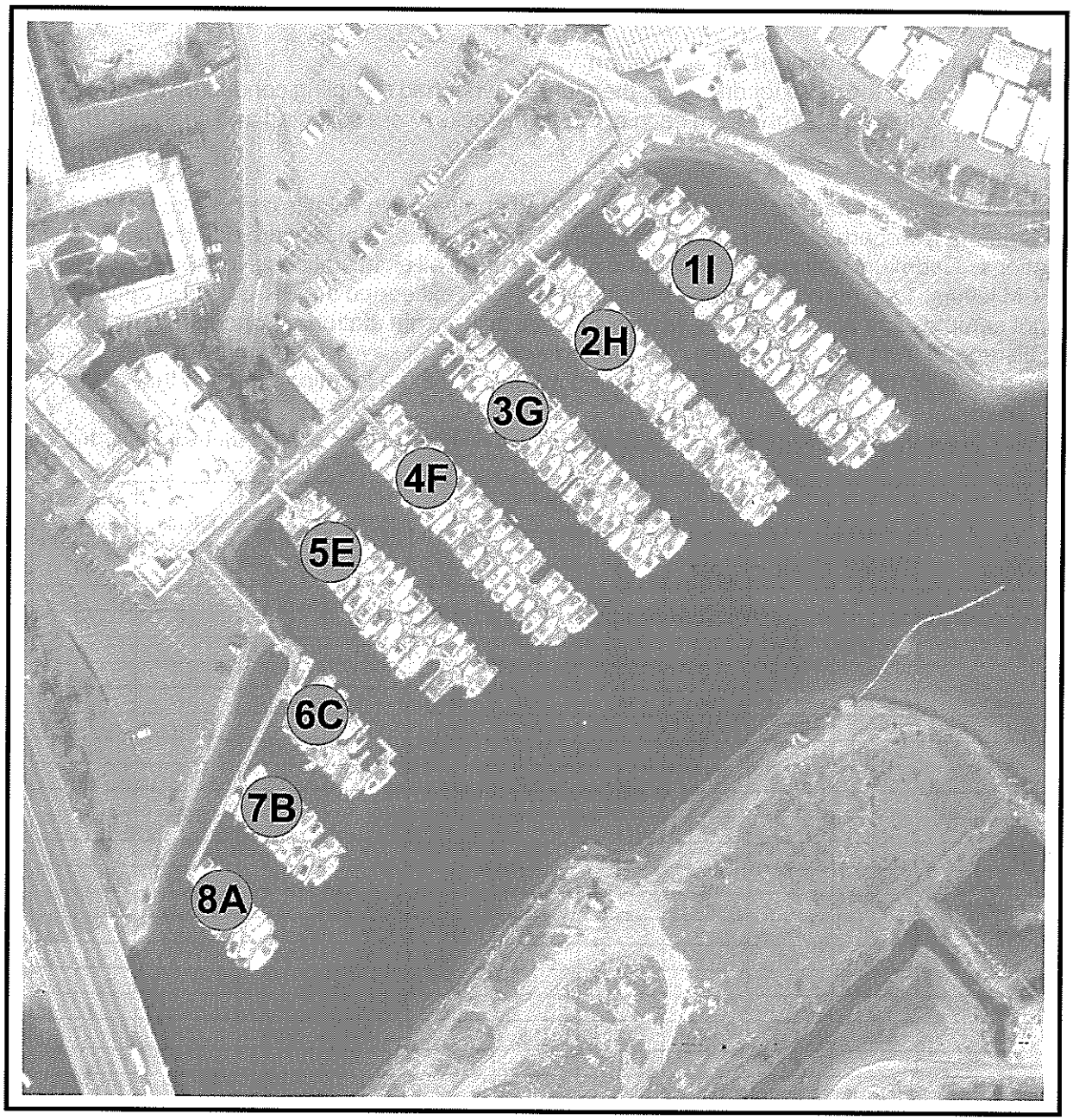
	Station								Effects Range-Low (ER-L)	Effects Range-Median (ER M)
Analyte	*1-I*	*2-H*	*3-G*	*4-F*	*5-E*	*6-C*	*7-B*	*8-A*		
Metals (mg/Kg)										
Arsenic	nd	2.3	3.1	1.6	2.7	2.0	1.7	2.0	8.2	70
Cadmium	**2.8**	**3.4**	**2.8**	**2.9**	**3.1**	**2.3**	**2.4**	**2.6**	1.2	9.6
Chromium	13.5	16.6	14.1	13.8	15.2	12.1	12.8	15.7	81	370
Copper	**37**	**39.3**	**60**	**34.7**	**37.6**	**41.5**	**42.4**	**43.7**	34	270
Lead	18.8	29.9	**47.2**	29.2	34.1	29.4	29.3	33.3	46.7	218
Mercury	nd	nd	0.15	0.15	**0.25**	0.10	0.10	0.10	0.15	0.71
Nickel	10.2	12.1	10.2	10.0	11.5	8.3	8.8	9.4	20.9	52.0
Zinc	78.2	89.5	95.8	82.3	111.0	88.7	90.7	89.0	150	410
PCBs										
Aroclor-1248	nd	nd	330	200	130	98	nd	77		
Aroclor-1254	nd	38	nd	nd	nd	nd	49	nd		
Aroclor-1260	nd	nd	nd	200	49	47	nd	41		
Aroclor-1262	nd	nd	130	nd	nd	nd	42	nd		
Pesticides (ug/Kg)										
4,4' -DDE	**6.3**	**7.4**	**29.0**	**32.0**	**31.0**	**27.0**	**16.0**	**22.0**	2.2	27

Bold ≥ ER-L (effects range-low reported by Long et al. 1995)

Bold & Underline ≥ ER-M (effects range-median reported by Long et al. 1995)

nd - not detected

All values presented as dry weight



Source: USGS 2004

Tetra Tech, Inc.
ENGINEERS ARCHITECTS SCIENTISTS
401 East Ocean Blvd., Suite 420
Long Beach, California 90802
Ph. (562) 495-0495 fax (562) 495-5029

Approximate Locations of Sediment Samples Collected in 2004

Cerritos Bahia Marina
Long Beach, California

FIGURE 3

July 2006

5.0 Proposed Sediment Sampling

Based on the Master SAP, a minimum of two discrete samples are analyzed at each dredging site (two samples per 10,000 cy and one sample for every additional 10,000 cy). The proposed quantity for this project is 37,064 cy which includes an overdredge quantity. As such the minimum number of samples for this dredge quantity would be five. For this project the environmental sampling and analysis program will include collection of continuous sediment cores at four locations within the project area (Table 2; Figure 4).

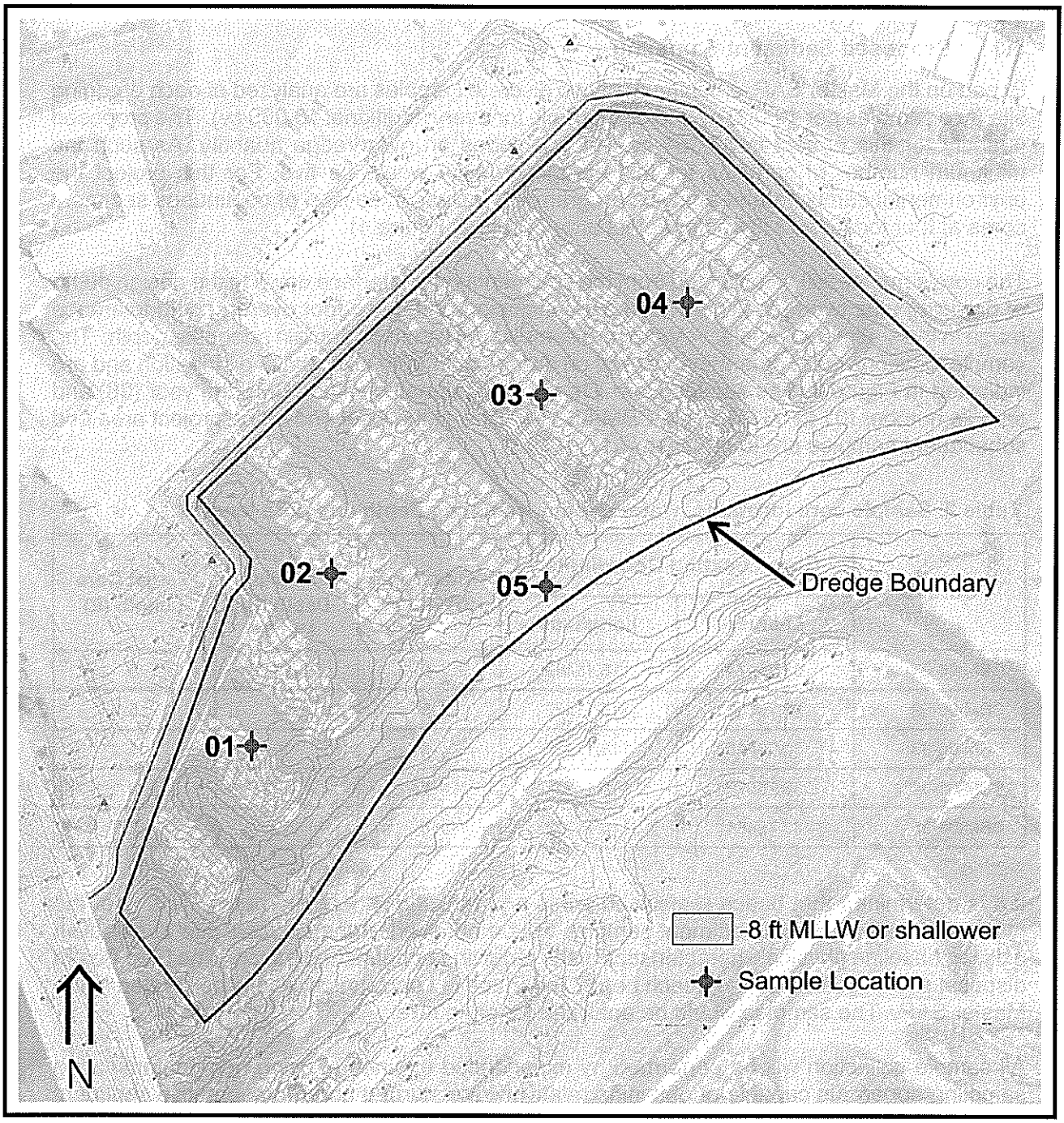
The core samples will be collected from the sediment/water interface down to the design depth of dredging plus two feet. This ensures the inclusion of the two-foot overdredging tolerance range in the sediment sample. A Vibracore sampler will be used to obtain adequate depth. The sample locations were determined based on dredge cut depth and spatial distribution and are indicated in Figure 4. The sample Core IDs will be designated with "CBM", the year (06) and sample number (01 to 05). Sample CBM-06-01 will be at the west end of the project area and subsequent samples are to the east.

Table 2. Sample core locations, water depths, sampling depth and core lengths.

Core ID	Core Location Coordinates		Water Depth (ft) MLLW	Target Sampling Depth (ft) MLLW	Target Core Length (ft)
	Latitude	Longitude			
CBM-06-01	33.76474	118.11462	-5	-10	5
CBM-06-02	33.76503	118.11422	-5	-10	5
CBM-06-03	33.76545	118.11375	-5	-10	5
CBM-06-04	33.76572	118.11328	-7	-10	3
CBM-06-05	33.76481	118.11383	-8	-10	2

If it is determined that beach replenishment is a potential disposal alternative for any of the material, three additional sediment samples will be obtained at the disposal site to establish existing baseline physical characteristics of the receiving or nourished beach. The East Beach disposal site is located on the beach near 72nd Place in Long Beach, and is delineated in the Master SAP. The samples would be analyzed for grain size.

All sample collection will be performed by experienced engineers, using non-contaminating sampling apparatus capable of obtaining relatively undisturbed and representative sediment samples.



Project Area with Proposed Sampling Locations

FIGURE 4

Tetra Tech, Inc.
ENGINEERS ARCHITECTS SCIENTISTS

401 East Ocean Blvd., Suite 420
Long Beach, California 90802
Ph. (562) 495-0495 fax (562) 495-5029

Cerritos Bahia Marina
Long Beach, California

August 2006

5.1 Physical and Chemical Sediment Characterization

As stipulated in the approved Master SAP for the City of Long Beach Maintenance Dredging, the collected discrete samples will be physically and chemically characterized following USEPA and USACE guidelines for open water disposal (USEPA and USACE 1998). The physical characterization will consist of grain size distribution. The chemical characterization will be comprised of metals, petroleum compounds, semi-volatile organic compounds, PCB's, Phenols, Polynuclear Aromatic Hydrocarbons, Phthalates, Organotin Compounds, and Hexaclorocyclohexane. These chemical analyses will be performed to satisfy the detection limits specified in Table 3 of the Master SAP (Included in Appendix A of this SAP), and will be reported in milligrams per kilogram (parts per million). The laboratory results will be analyzed, interpreted, and forwarded to the pertinent regulatory agencies prior to the commencement of dredging activities.

APPENDIX A

Table 3 (Sediment Analyses) and Figure 5 (East Beach) from City of Long Beach Master SAP 2005

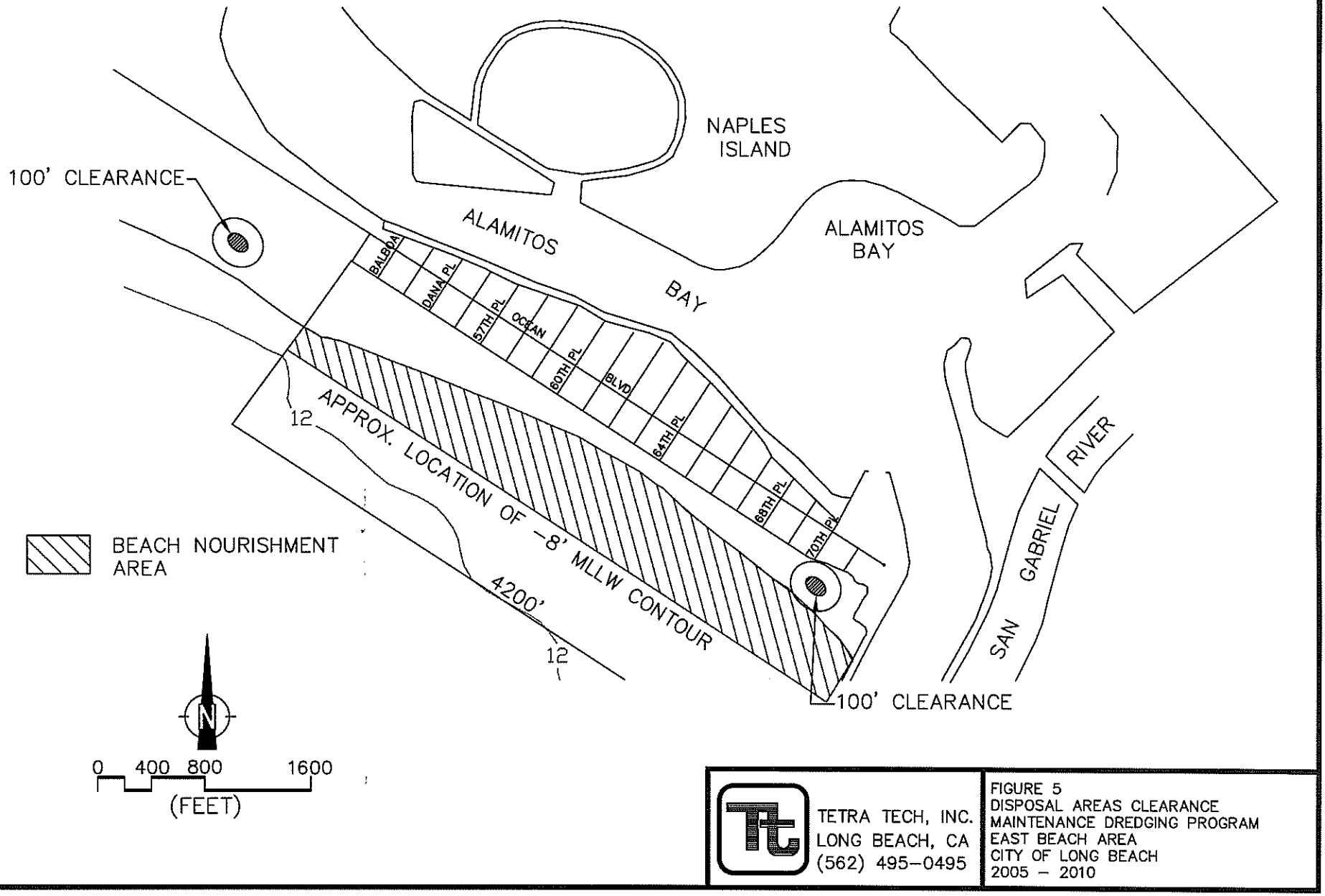
TABLE 3. CHEMICAL AND PHYSICAL ANALYSES, DETECTION LIMITS, AND METHODS

PHYSICAL CHARACTERIZATION ANALYSES		DETECTION LIMITS	METHODS
1)	**GRAIN SIZE ANALYSIS**	(0.1% Phi and mm)	ASTM 422, ASTM 1140
SEDIMENT CHEMISTRY TESTING		**DETECTION LIMITS**	**METHODS**
1)	**METALS (EPA PP-13)**		EPA 6010/7000 SERIES
a)	Arsenic	(0.1 mg/kg)	
b)	Cadmium	(0.1 mg/kg)	
c)	Chromium	(0.1 mg/kg)	
d)	Copper	(0.1 mg/kg)	
e)	Lead	(0.1 mg/kg)	
f)	Mercury	(0.02 mg/kg)	
g)	Nickel	(0.1 mg/kg)	
h)	Selenium	(0.1 mg/kg)	
i)	Silver	(0.1 mg/kg)	
j)	Zinc	(2.0 mg/kg)	
2)	**GENERAL CHEMISTRY AND MISCELLANEOUS**		
a)	Total Sulfides	(0.1 mg/kg)	EPA 376.2
b)	Total Organic Carbon	-0.10%	EPA 415.1
3)	**PETROLEUM COMPOUNDS**		
a)	Oil and Grease	[20.0 µg/kg (wet weight)]	EPA 413.2
b)	Total Recoverable Petroleum Hydrocarbons	(20.0 µg/kg)	EPA 418.1
4)	**SEMI-VOLATILE ORGANICS**		
a)	PESTICIDES		EPA 8080
	Aldrin	(0.5-2.0 µg/kg)	
	alpha-Chlordane	(5.0-25.0 µg/kg)	
	gamma-Chlordane	(5.0-25.0 µg/kg)	
	Technical Chlordane	(5.0-25.0 µg/kg)	
	Dieldrin	(0.5-2.0 µg/kg)	
	4,4'-DDD	(0.5-2.0 µg/kg)	
	4,4'-DDE	(0.5-2.0 µg/kg)	
	4,4'-DDT	(0.5-2.0 µg/kg)	
	Endrin	(0.5-2.0 µg/kg)	
	Endrin Aldehyde	(0.5-2.0 µg/kg)	
	Endrin Ketone	(0.5-2.0 µg/kg)	
	Endosulfan I	(2.0-10.0 µg/kg)	
	Endosulfan II	(0.5-2.0 µg/kg)	
	Endosulfan Sulfate	(10.0-25.0 µg/kg)	
	Toxaphene	(30.0 µg/kg)	

TABLE 3. Continued

SEDIMENT CHEMISTRY TESTING		DETECTION LIMITS	METHODS
b)	POLYCHLORINATED BIPHENYLS		EPA 8080
	Total PCBs	(20.0 µg/kg)	
	Aroclor 1242	(20.0 µg/kg)	
	Aroclor 1248	(20.0 µg/kg)	
	Aroclor 1254	(20.0 µg/kg)	
	Aroclor 1260	(20.0 µg/kg)	
	Individual PCB Congeners*	(20.0 µg/kg)	
c)	PHENOLS	(20.0-100.0 µg/kg)	EPA 8270
d)	POLYNUCLEAR AROMATIC HYDROCARBONS*		EPA 8270
	For each PAH	(20.0 µg/kg)	
	Acenaphthene		
	Acenaphthylene		
	Anthracene		
	Benzo(a)anthracene		
	Benzo(a,e)pyrene		
	Benzo(b)fluoranthene		
	Benzo(g,h,i)perylene		
	Benzo(k)fluoranthene		
	Chrysene		
	Dibenzo(a,h)anthracene		
	Fluoranthene		
	Fluorene		
	Indeno(1,2,3,-c,d)pyrene		
	Naphthalene		
	Phenanthrene		
	Pyrene		
	Low molecular weight PAHs (reporting)		
	High molecular weight PAHs (reporting)		
e)	PHTHALATES	(10.0 µg/kg)	EPA 8270
f)	ORGANOTIN COMPOUNDS		PENTYL DERIVATIZATION
	Mono-, Di-, and Tributyltin	(1.0 µg/kg)	reported individually
g)	HEXACHLOROCYCLOHEXANE (HCH) AND DERIVATIVES	(0.5-2.0 µg/kg)	EPA 8080

* PCB Congener specific analyses to be performed for samples in areas where elevated PCB levels are found either in historical information or in sediment sampling results.



TETRA TECH, INC.
LONG BEACH, CA
(562) 495-0495

FIGURE 5
DISPOSAL AREAS CLEARANCE
MAINTENANCE DREDGING PROGRAM
EAST BEACH AREA
CITY OF LONG BEACH
2005 – 2010