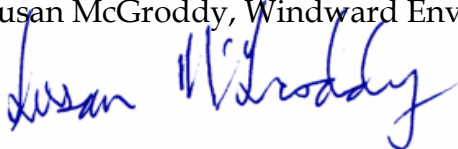




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MEMORANDUM

To: Ravi Sanga, USEPA
From: Susan McGroddy, Windward Environmental on behalf of the Port of Seattle

cc: Doug Hotchkiss, Port of Seattle, Pete Rude, City of Seattle, Jeff Stern and Debra Williston, King County
Subject: Additional PAH analysis for intertidal surface sediment samples from EW
Date: September 10, 2010

The polycyclic aromatic hydrocarbon (PAH) concentrations in the East Waterway (EW) intertidal MIS samples were highly variable (Table 1). Of the three area-wide MIS replicate samples, EW09-ITSED-AWMIS-03 contained substantially higher concentrations of PAHs than the other two area-wide MIS samples and were higher than the PAH concentrations in the single public access area intertidal sediment sample. The PAH concentrations reported for this MIS replicate sample were sufficiently high to result in a preliminary estimate of excess cancer risk greater than 1×10^{-6} for direct contact associated with tribal clamming in the HHRA. This variance suggests that one or more sediment grab samples within the MIS sample (AWMIS-03) contained elevated PAH concentrations relative to the grab samples that went into the other replicate MIS samples. In order to identify the area with elevated PAH concentrations additional PAH analyses are proposed. The results of these analyses will be used in the nature and extent evaluation in the Remedial Investigation and the Feasibility Study and will not be used in the risk assessments.

Table 1. PAH results for MIS intertidal surface sediment samples

Chemical	Concentration ($\mu\text{g}/\text{kg dw}$)			
	Area-Wide MIS Samples			Public Access Area Sample
	EW09-ITSED-AWMIS-01	EW09-ITSED-AWMIS-02	EW09-ITSED-AWMIS-03	EW09-ITSED-PAMIS-01
1-Methylnaphthalene	35	57	640	690
2-Chloronaphthalene	20 U	19 U	20 U	20 U
2-Methylnaphthalene	35	61	740	11 J

Chemical	Concentration (µg/kg dw)			
	Area-Wide MIS Samples			Public Access Area Sample
	EW09-ITSED-AWMIS-01	EW09-ITSED-AWMIS-02	EW09-ITSED-AWMIS-03	EW09-ITSED-PAMIS-01
Acenaphthene	44	74	820	29
Acenaphthylene	62	40	20 U	19 J
Anthracene	240	170 J	1,100	140
Benzo(a)anthracene	480	320	1,500	290
Benzo(a)pyrene	550	320	1,400	270
Benzo(b)fluoranthene	550	300	1,000	310
Benzo(g,h,i)perylene	170	110	440	58
Benzo(k)fluoranthene	550	300	1,000	310
Total benzofluoranthenes	1,100	600	2,000	620
Chrysene	740	450 J	1,500	440
Dibenzo(a,h)anthracene	110	60	260	45
Dibenzofuran	27	44	340	10 J
Fluoranthene	790	850 J	3,700	580
Fluorene	74	100	940	20
Indeno(1,2,3-cd)pyrene	200	120	480	71
Naphthalene	28	85 J	850	14 J
Phenanthrene	560	800 J	5,100	180
Pyrene	690	720	3,900	510
Total HPAHs	4,830	3,550 J	15,200	2,880
Total LPAHs	1,010	1,270 J	8,800	400 J
Total cPAHs	780	450 J	1,900	390
Total PAHs	5,840	4,820 J	24,000	3,290 J

DL – detection limit

dw – dry weight

cPAH – carcinogenic polycyclic aromatic hydrocarbon

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon

J – estimated concentration

LPAH – low-molecular-weight polycyclic aromatic hydrocarbon

MIS – multi-increment sampling

PAH – polycyclic aromatic hydrocarbon

U – not detected at reporting limit shown

Composite samples will be created for each of the eleven sampling areas (Maps 1-3). Areas 1 and 3 will be divided by subarea because of the size of these sampling area. Subarea 3D will be combined with Subarea 3C because only two samples are available for Subarea 3D.

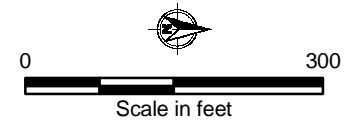
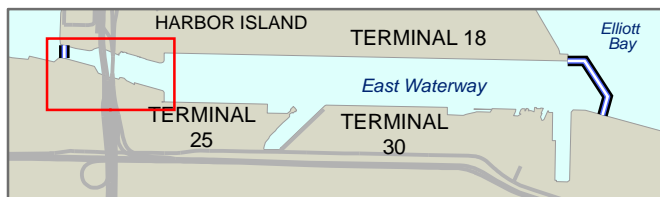
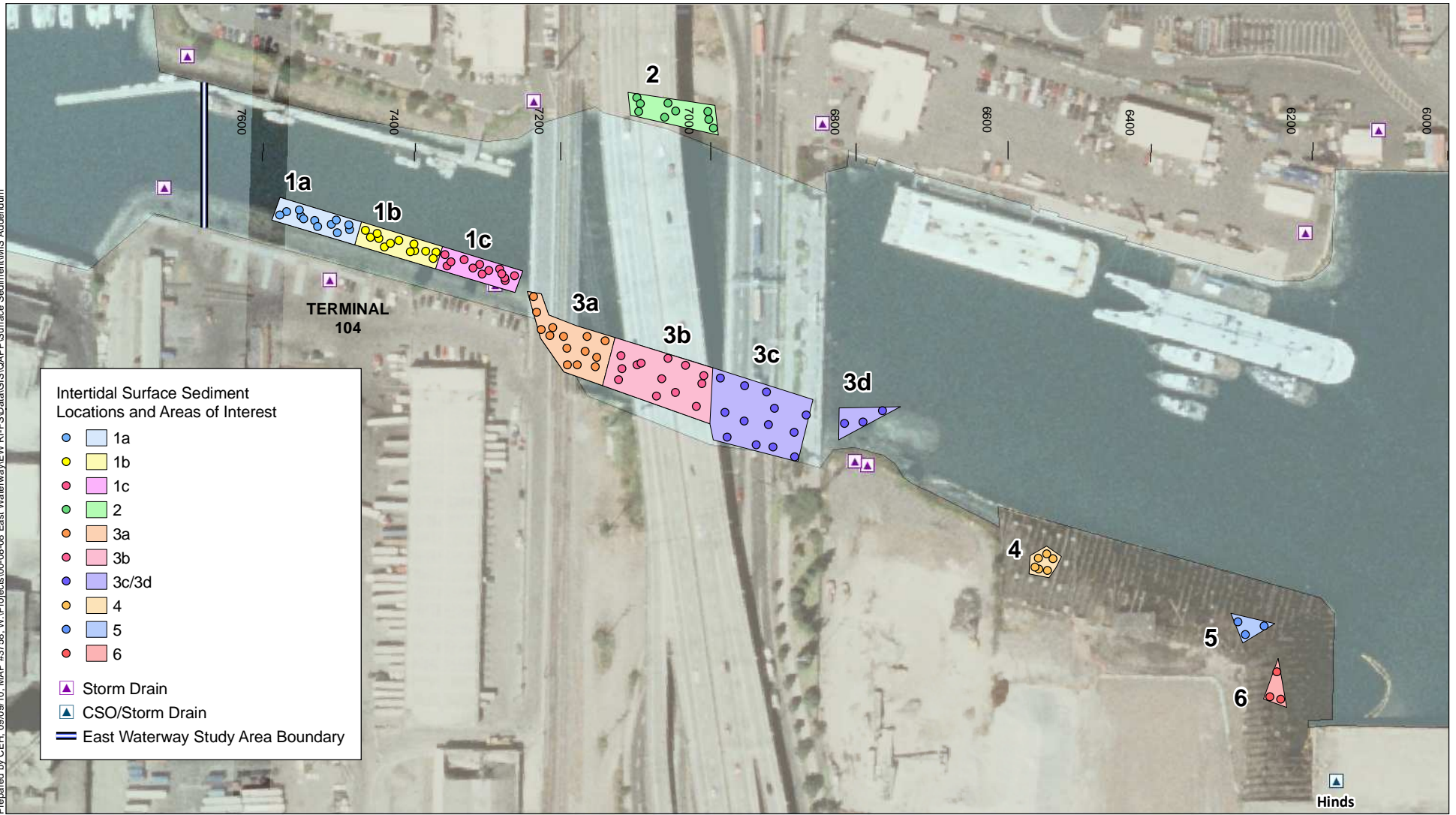
The frozen archive jars for each location will be defrosted and homogenized. Then, an equal mass of sediment (10g) will be taken from the archive jar for each sampling location. The samples that will be included in each of the intertidal area composites are identified in Table 2.

Each composite sample will be analyzed for PAHs by EPA 8270-SIM and total organic carbon following the protocols described in the Surface Sediment QAPP. The data will be used to support the nature and extent evaluation of PAHs in the SRI and for development of remedial alternatives in the FS.

Table 2. Intertidal area composite ID and individual samples for each composite

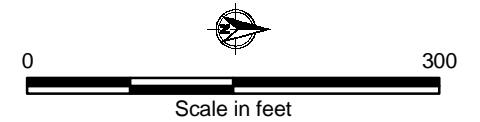
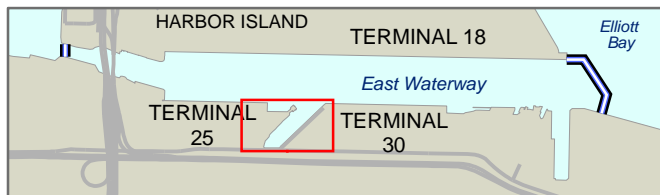
Intertidal Area Composite ID	Individual Sample IDs	
EW10-01A-COMP	EW09-1A-ITSD01 EW09-1A-ITSD02 EW09-1A-ITSD03 EW09-1A-ITSD04 EW09-1A-ITSD05 EW09-1A-ITSD06 EW09-1A-ITSD07	EW09-1A-ITSD08 EW09-1A-ITSD09 EW09-1A-ITSD10 EW09-1A-ITSD11 EW09-1A-ITSD12 EW09-1A-ITSD13
EW10-01B-COMP	EW09-1B-ITSD01 EW09-1B-ITSD02 EW09-1B-ITSD03 EW09-1B-ITSD04 EW09-1B-ITSD05 EW09-1B-ITSD06 EW09-1B-ITSD07	EW09-1B-ITSD08 EW09-1B-ITSD09 EW09-1B-ITSD10 EW09-1B-ITSD11 EW09-1B-ITSD12 EW09-1B-ITSD13
EW10-01C-COMP	EW09-1C-ITSD01 EW09-1C-ITSD02 EW09-1C-ITSD03 EW09-1C-ITSD04 EW09-1C-ITSD05 EW09-1C-ITSD06	EW09-1C-ITSD07 EW09-1C-ITSD08 EW09-1C-ITSD09 EW09-1C-ITSD10 EW09-1C-ITSD11 EW09-1C-ITSD12
EW10-02-COMP	EW09-2-ITSD01 EW09-2-ITSD02 EW09-2-ITSD03 EW09-2-ITSD04 EW09-2-ITSD05	EW09-2-ITSD06 EW09-2-ITSD07 EW09-2-ITSD08 EW09-2-ITSD09
EW10-03A-COMP	EW09-3A-ITSD01 EW09-3A-ITSD02 EW09-3A-ITSD03 EW09-3A-ITSD04 EW09-3A-ITSD05 EW09-3A-ITSD06 EW09-3A-ITSD07	EW09-3A-ITSD08 EW09-3A-ITSD09 EW09-3A-ITSD10 EW09-3A-ITSD11 EW09-3A-ITSD12 EW09-3A-ITSD13
EW10-03B-COMP	EW09-3B-ITSD01 EW09-3B-ITSD02 EW09-3B-ITSD03 EW09-3B-ITSD04 EW09-3B-ITSD05 EW09-3B-ITSD06 EW09-3B-ITSD07	EW09-3B-ITSD08 EW09-3B-ITSD09 EW09-3B-ITSD10 EW09-3B-ITSD11 EW09-3B-ITSD12 EW09-3B-ITSD13

Intertidal Area Composite ID	Individual Sample IDs	
EW10-03C-COMP	EW09-3C-ITSD01 EW09-3C-ITSD02 EW09-3C-ITSD03 EW09-3C-ITSD04 EW09-3C-ITSD05 EW09-3C-ITSD06 EW09-3C-ITSD07 EW09-3C-ITSD08 EW09-3C-ITSD09	EW09-3C-ITSD10 EW09-3C-ITSD11 EW09-3C-ITSD12 EW09-3C-ITSD13 EW09-3C-ITSD14 EW09-3D-ITSD01 EW09-3D-ITSD02
EW10-04-COMP	EW09-4-ITSD01 EW09-4-ITSD02 EW09-4-ITSD03	EW09-4-ITSD04 EW09-4-ITSD05 EW09-4-ITSD06
EW10-05-COMP	EW09-5-ITSD01 EW09-5-ITSD02 EW09-5-ITSD03	
EW10-06-COMP	EW09-6-ITSD01 EW09-6-ITSD02 EW09-6-ITSD03	
EW10-07-COMP	EW09-7-ITSD01 EW09-7-ITSD02 EW09-7-ITSD03	EW09-7-ITSD04 EW09-7-ITSD05 EW09-7-ITSD06
EW10-08-COMP	EW09-8-ITSD01 EW09-8-ITSD02 EW09-8-ITSD03	EW09-8-ITSD04 EW09-8-ITSD05 EW09-8-ITSD06
EW10-09-COMP	EW09-9-ITSD01 EW09-9-ITSD02 EW09-9-ITSD03	EW09-9-ITSD04 EW09-9-ITSD05 EW09-9-ITSD06
EW10-11-COMP	EW09-11-ITSD01 EW09-11-ITSD02 EW09-11-ITSD03 EW09-11-ITSD04 EW09-11-ITSD05 EW09-11-ITSD06 EW09-11-ITSD07	EW09-11-ITSD08 EW09-11-ITSD09 EW09-11-ITSD10 EW09-11-ITSD11 EW09-11-ITSD12 EW09-11-ITSD13 EW09-11-ITSD14

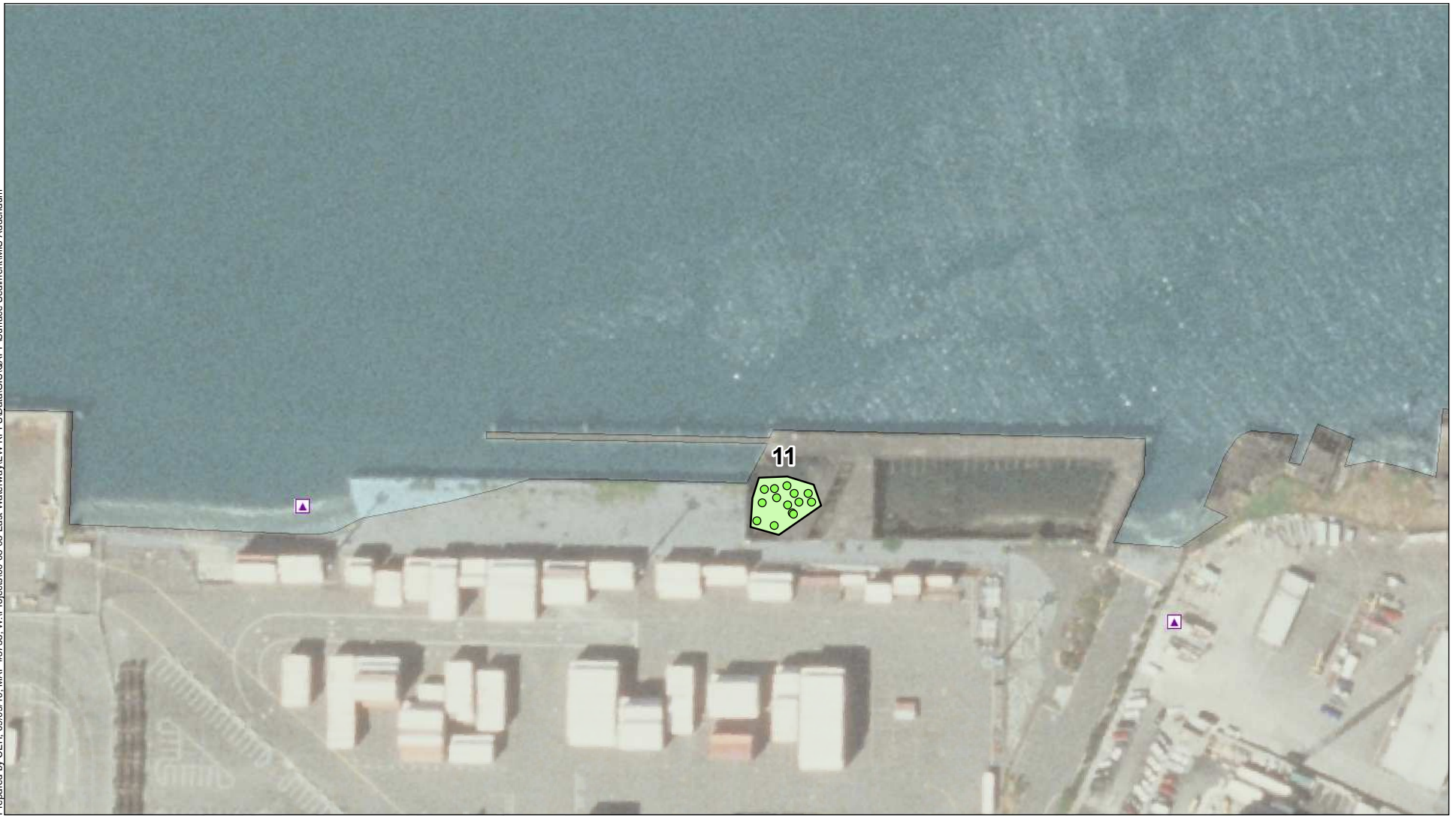






Map 1
Intertidal Surface Sediment Sampling Areas
East Waterway Study Area

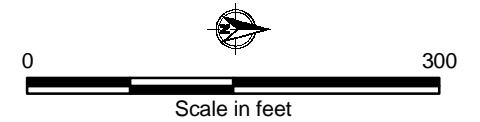
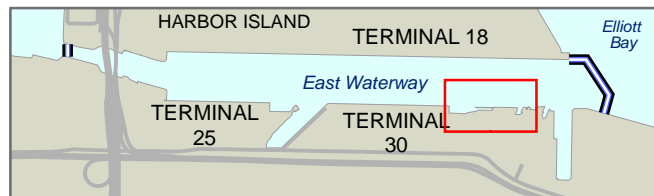
Prepared by CEH, 09/09/10; MAP #3758; W:\Projects\00-08-08 East Waterway\EW RI-FSD\GIS\CAPP\Surface Sediment\MIS Addendum



Map 2
Intertidal Surface Sediment Sampling Areas
East Waterway Study Area



-  Intertidal Surface Sediment Sampling Location
-  Intertidal Surface Sediment Areas of Interest
-  Storm Drain
-  East Waterway Study Area Boundary



Map 3
Intertidal Surface Sediment Sampling Areas
East Waterway Study Area