

Letter of Transmittal

To: Ms. Piper Peterson Lee – EPA, Region 10
1200 Sixth Avenue, Suite 900, ECL-111
Seattle, Washington 98101 -3140

Date: August 26, 2008

From: Joanna Florer – Windward Environmental
Roy Kuroiwa – Port of Seattle

Project reference: **Terminal 117 Early Action Area**

Hardcopy:	Electronic ^a :	Description:
1	X	Cover letter for transmittal of the final sediment QAPP addendum
2	X	Final T-117 QAPP Addendum – Sediment Sampling for PCB Sediment Removal Boundary Delineation in the Revised EE/CA, dated August 26, 2008

cc:

Hardcopy:	Electronic ^a :	Name:	Company:
1	X	Kym Takasaki	U.S. Army Corps of Engineers
	X	Kris Flint	EPA, Region 10
1	X	Rick Thomas	Dept of Ecology
	X	Brad Helland	Dept of Ecology
1	X	Marla Steinhoff	NOAA
1	X	Glen St. Amant	Muckleshoot Tribe
1	X	B.J. Cummings	Duwamish River Cleanup Coalition
	X	Heather Trim	People for Puget Sound
1	X	Tom Meyer	City of Seattle
	X	T-117 Technical Team	Windward, DOF, ENSR, Integral

^a Electronic version is also available online at <http://www.windwardenv.com/t117docs/default.htm>



Signature

August 26, 2008

Ms. Piper Peterson Lee
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Ms. Peterson Lee:

I am pleased to provide to you the *T-117 QAPP Addendum for Sediment Sampling for PCB Sediment Removal Boundary Delineation in the Revised EE/CA*. All of the comments provided on August 25th have been addressed. As mentioned in your comment cover letter, this QAPP only pertains to the sampling necessary to delineate a final PCB sediment removal boundary. We would like to conduct field sampling this Friday, August 29th upon EPA's approval. Additional sediment sampling for dioxin and furans will be conducted depending on the results of the upcoming dioxin investigation results of the T-117 Adjacent Streets, Upland Area, and neighborhood yards. We look forward to meeting with EPA and the Stakeholders on September 4th from 1-3pm to discuss the objectives and design of the Phase 2 sediment investigation.

Hard copies of the enclosed QAPP will be distributed to the individuals indicated on the letter of transmittal, unless requested otherwise.

Please feel free to contact me at 206.728.3814 (Kuroiwa.R@portseattle.org) if you have any questions.

Sincerely,

A handwritten signature in blue ink, appearing to read "Roy Kuroiwa".

Roy Kuroiwa
Project Coordinator

Lower Duwamish Waterway Superfund Site
Terminal 117 Early Action Area

**T-117 QUALITY ASSURANCE PROJECT PLAN
ADDENDUM – SEDIMENT SAMPLING FOR PCB
SEDIMENT REMOVAL BOUNDARY DELINEATION IN
THE REVISED EE/CA**

Prepared for:

The Port of Seattle
and
The City of Seattle

For submittal to:

US Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, WA 98101

August 26, 2008

Prepared by:



200 West Mercer Street, Suite 401
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Acronyms

Acronym	Definition
ARI	Analytical Resources, Inc.
ASAOC	Agreement and Order on Consent
DQI	data quality indicator
EAA	early action area
EE/CA	Engineering Evaluation/Cost Analysis
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
HHRA	Human Health Risk Assessment
LDW	Lower Duwamish Waterway
Marina	South Park Marina
PCB	polychlorinated biphenyl
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	Remedial Investigation
SQS	Washington State Sediment Quality Standard
T-117	Terminal 117
TOC	total organic carbon
Windward	Windward Environmental LLC

**Title and Approval Page:
Terminal 117 Early Action Area
Quality Assurance Project Plan**

Windward Project Manager _____
Joanna Florer _____ Date

Windward QA Manager _____
Marina Mitchell _____ Date

EPA Project Manager _____
Piper Peterson Lee _____ Date

EPA QA Manager _____
Ginna Grep-Grove _____ Date

1 Introduction

The purpose of this quality assurance project plan (QAPP) addendum is to present sampling design means and methods to field and laboratory personnel in order to perform the field collection and laboratory analysis of sediment samples within the Sediment Study Area of the Terminal 117 (T-117) Early Action Area (EAA). This work is being performed to delineate a final T-117 PCB removal area boundary in the revised Engineering Evaluation/Cost Analysis (EE/CA) for the Non-Time Critical Removal Action (Windward et al. 2008a). Based on the upcoming results of the Adjacent Streets and T-117 Upland dioxin sampling and analysis efforts, we intend to design and implement a supplemental and complimentary dioxin sediment sampling effort within the Sediment Study Area. The sampling objectives and design of the supplemental dioxin sediment sampling plan will be established through EPA and project stakeholders input.

This T-117 QAPP addendum addresses details that are specific to this supplemental PCB sediment sampling investigation. The Lower Duwamish Waterway Superfund Site Terminal 117 Early Action Area: Quality Assurance Project Plan (Windward et al. 2003a) is referenced, as appropriate, for details that remain unchanged from the original sediment sampling investigation.

2 Project Management

2.1 PROJECT ORGANIZATION AND TEAM MEMBER RESPONSIBILITIES

Sediment sampling will be performed by Windward Environmental LLC (Windward) with assistance from Mullins Guide Service, which will provide the sampling vessel and operator. Analytical Resources, Inc. (ARI) will perform chemical analyses of the samples. Additional details on project organization and team member responsibilities can be found in the original QAPP (Windward et al. 2003a).

2.2 PCB SEDIMENT REMOVAL BOUNDARY BACKGROUND

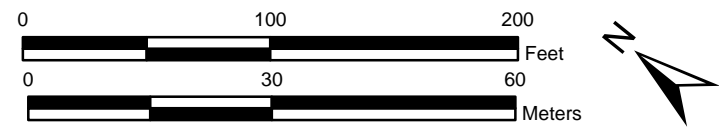
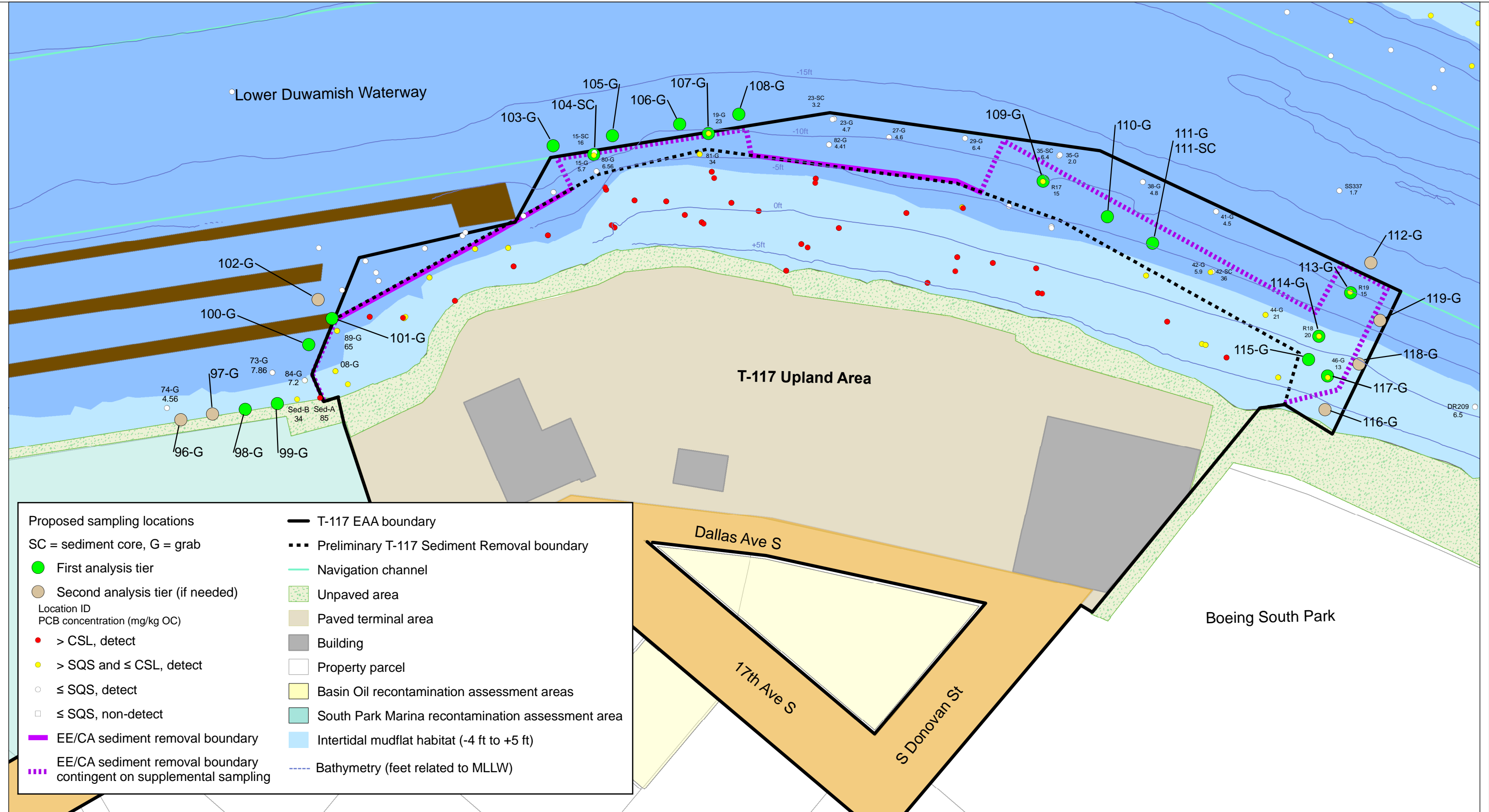
The Sediment Study Area was originally determined in the summary of existing information and data gaps analysis report for the T-117 EAA (Windward et al. 2003b). The original Sediment Study Area boundary was based on the incorporation of the sediment in the aquatic portion of the T-117 EAA offshore of the T-117 Upland Area out to the navigation channel, except for the portion of the Marina that extends into the T-117 aquatic portion. The northern and southern limits of the original Sediment Study Area boundary were expanded in the EE/CA Work Plan (Windward et al. 2008b) to include sample locations where concentrations of COCs in the sediment may potentially be associated with the T-117 EAA. The Sediment Study Area Boundary is presented as the solid black line on Map 2-1.

The original PCB sediment removal boundary (as indicated by a dashed black line within the Sediment Study Area) from the 2005 EE/CA (Windward et al. 2005) was established using a weight-of-evidence approach, consisting of both a comparison of site sediment chemistry data to Washington Sediment Management Standards and consideration of risk reduction for exposure scenarios identified in the Lower Duwamish Waterway (LDW) Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) that were underway at that time. Since that time, the LDW HHRA and ERA have been approved by EPA (Windward 2007a, 2007b) and a draft of the Remedial Investigation (RI) report (Windward 2007c) has been reviewed by EPA. Although these documents do not specify any sediment cleanup standards, some preliminary risk based cleanup decisions can be determined, such as those based on direct sediment contact. Final cleanup standards will be set in a Record of Decision after public input and consideration of all supporting documents, including a final RI and final Feasibility Study (FS) (EPA 2008). However, since cleanup decisions at T-117 are occurring prior to the final RI and FS for the LDW, EPA has determined that the Washington State Sediment Quality Standard (SQS) for PCBs (12 mg/kg OC - based on a point-by-point cleanup action level) is an appropriate standard on which to base the PCB sediment removal boundary for the limited purpose of establishing EAA boundaries (EPA 2008).

By establishing PCB sediment removal boundary based on the SQS for PCBs, there is now some uncertainty along the western portion of the sediment removal boundary (adjacent to navigation channel) as to the extent of PCB contamination above the SQS from T-117 into the navigation channel. Based on bathymetry, selected samples were located at the toe of the steep slope extending into the navigation channel. These samples will represent sediment quality that has sloughed from the top of the navigation slope (i.e., within the T-117 Sediment Study Area) to its toe.

The sediment removal boundary shown on Map 2-1 identifies where supplemental sampling will be performed to confirm the limits of PCB contamination in order to finalize the PCB sediment removal boundary (as indicated by a dashed purple line on). The solid purple line indicates where portions the original PCB sediment removal boundary are sufficient to finalize the PCB sediment removal boundary.

Prepared by CEI, 05/15/08, updated 07/15/2008, 07/24/2009, MAP #3282-VI-Projects\03-08-12-T-117_Maize\env\GIS\2008_EECA\Sediment_boudary\3282_revised_EECA_boudary.mxd



Map 2-1. T-117 sediment boundaries and proposed supplemental sediment sample locations

2.3 PROJECT OBJECTIVES AND SCHEDULE

The purpose and objectives of this PCB sediment sampling effort is to supplement existing data in order to finalize the PCB sediment removal boundary in the following three locations (see Map 2-1, dashed sections of the PCB sediment removal boundary)):

1. At historically older sediment sample locations (i.e., approximately 10 years old) along the southern and western portions of the removal boundary;
2. The northern, southern and western portions of the sediment removal boundary that have not been completely delineated to the SQS for PCBs; and,
3. Recent sediment data collected by Ecology from within the rip-rap bank of the South Park Marina (SAIC 2008). Their data indicate some PCB contamination within the interstitial areas of the bank's rip rap above the SQS, but are not bounded to the north.

Field sampling will be performed immediately following the EPA's approval of this QAPP addendum, followed by chemical analysis (4 weeks) and validating data packages (3 weeks) from the laboratory. Tier two analyses, if necessary, will be initiated immediately after receipt of the tier one laboratory data packages. The selection of samples for two analyses is already determined based on the rationale presented in Table 3-1. Prior to initiation of tier two analyses, EPA and the stakeholders will be notified as to the samples selected. We expect to present results and propose a final PCB sediment removal boundary to EPA before the EE/CA Public Comment period begins.

2.4 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Training requirements for personnel participating in sample collection can be found in the original QAPP (Windward et al. 2003a). The site health and safety plan remains in effect for this sampling effort.

2.5 DOCUMENTATION AND RECORDS

The results of this field effort, including the data validation report, will be included in a data report. Procedures for documenting field observations, laboratory records and data reduction can be found in the original QAPP (Windward et al. 2003a).

3 Data Generation and Acquisition

This section presents sampling design and methods. Details regarding decontamination procedures, field-generated waste disposal, sample handling and custody, analytical methods requirements, quality assurance/quality control, instrument/equipment testing, inspection and maintenance requirements,

instrument calibration and frequency, inspection/acceptance requirements for supplies and consumables, and data management can be found in the original QAPP (Windward et al. 2003a).

3.1 SAMPLING DESIGN

3.1.1 Design rationale

The primary focus of this supplemental investigation is to generate additional PCB data points within or adjacent to the preliminary (i.e., 2005 EE/CA) sediment removal boundary to establish the removal boundary's final extent. As shown on Map 2-1, portions of the preliminary sediment removal boundary have not been finalized (e.g., are not completely delineated to the SQS for PCBs). This sample and analysis QAPP is intended to locate supplemental PCB sediment samples to meet the objectives stated in Section 2.3, as described below.

Re-occupy Historical Sediment Sample Locations. Re-occupies historical sampling locations that were marginally above SQS for PCBs. Sediment sampling conducted as part of the LDW RI, in which most of the historical (i.e., approximately 10 yrs old) sediment sampling locations that were re-occupied had lower PCB concentrations compared to the original sampling effort, suggests that new sediment sampling may be justified in order to determine current conditions and help to refine the T-117 sediment removal boundary. Historical sediment samples within the T-117 Sediment Study Area near the extent of the preliminary sediment removal boundary will be re-sampled since it is possible that the PCB concentrations inside the edge of the preliminary removal boundary may currently be below the SQS of 12 mg/kg OC.

Fill Spatial Data Gaps. There are also some spatial data gaps that will be filled with this investigation. Three areas at the edge of the sediment removal boundary, as shown on Map 2-1, do not have samples with PCB concentrations less than the SQS to define them. Supplemental sediment sampling will be conducted in these areas to aid in the determination of a final sediment removal boundary.

Supplement South Park Marina Sediment Data. Recent sediment chemistry data collected by the Washington Department of Ecology (Ecology) at the Marina contain PCBs above the SQS. These sediment samples were collected within the interstitial areas of the riprap bank at the Marina. Supplemental sediment sampling will be conducted along this riprap bank from four locations to delineate the lateral extent (along the bank and to the north) of the sediment removal boundary.

Additional Ecology Requested Data. In addition, Ecology has expressed concerns regarding the recontamination potential of dieldrin and mercury from Marina groundwater to the sediment (Ecology 2008). Based on a limited data set (i.e., results from two sediment samples: Sed-A and Sed-B), it appears unlikely that dieldrin and mercury are impacting the sediment. Dieldrin was not detected in either sample and mercury was detected in both samples (0.303 and 0.154 mg/kg dw), but below the

SQS (0.41 mg/kg dw). Furthermore, the sample collected from sediment location 08-G, located along the bank at the north end of T-117, had a mercury concentration (0.070 mg/kg dw) well below the SQS. However, to further evaluate the contamination potential of these chemicals the four samples collected along the Marina shoreline will also include the analysis of dieldrin and mercury.

3.1.2 Design process

Twenty-three surface sediment samples (0 – 10 cm), and two subsurface sediment samples (up to 2 ft deep) as shown in Map 2-1, will be collected. A tiered analysis plan, as presented in Table 3-1, will be used. The first tier consists of samples from six previously sampled locations plus twelve samples to fill spatial data gaps within and just outside of the sediment removal boundary (Table 3-1). The second tier of seven samples are from locations further outside the sediment removal boundary. One or more of the second tier samples would be analyzed only if the preliminary (i.e., pre-validated) PCB results from the analysis of tier one samples are greater than the PCB SQS of 12 mg/kg-OC.

Tier one samples will be analyzed for PCBs as Aroclors, total solids, and total organic carbon (TOC). Tier two samples will be archived frozen until the results of the tier one samples are available. Tier two samples will be selected for analyses based on the rationale set forth in Table 3-1, and will also be analyzed for PCBs, total solids, and total organic carbon. In addition, the four samples (2-tier one and 2-tier two) collected along the toe of the bank at the Marina will include the analyses of dieldrin and mercury. Tier one and two samples with PCB concentrations greater than the SQS will be included in the sediment removal boundary. However, if PCB concentrations greater than the SQS are found in the navigation channel then additional evaluation will be necessary with input from the Lower Duwamish Waterway Group.

Finally, at all sample locations an additional archived sediment sample will be collected for dioxin analyses, depending of the upcoming dioxin investigation results of the of the Adjacent Streets and neighborhood yards (Integral 2008) and T-117 Upland Area (Windward 2008). In addition to the analyses of the archived samples, a supplemental and complimentary dioxin sediment sampling effort within the Sediment Study Area will also be conducted. The sampling objectives and design of this supplemental dioxin sediment sampling plan will be established through EPA and project stakeholders input.

After the conclusion of this field study and analyses, a data report will be provided to EPA. Any revisions to the sediment removal boundary will be documented in the revised EE/CA.

Table 3-1. Supplemental sediment location, analysis and rationale

MAP ID	LOCATION ID	EASTING	NORTHING	ANALYSIS TIER	ANALYSIS	RATIONALE
96-G	T117-SE96-G	1275033	195870	2	Archive -PCBs, dieldrin, mercury TOC, total solids	Will be analyzed only if PCB concentrations in 98-G are greater than PCB SQS Determine the extent of PCB contamination along the toe of the Marina bank Evaluate the re-contamination potential of dieldrin and mercury to the sediment
97-G	T117-SE97-G	1275053	195852	2	Archive - PCBs, dieldrin, mercury TOC, total solids	Will be analyzed only if PCB concentrations in 98-G are greater than PCB SQS Determine the extent of PCB contamination along the toe of the Marina bank Evaluate the re-contamination potential of dieldrin and mercury to the sediment
98-G	T117-SE98-G	1275073	195833	1	PCBs, dieldrin, mercury TOC, total solids	Determine the extent of PCB contamination along the toe of the Marina bank Evaluate the re-contamination potential of dieldrin and mercury to the sediment
99-G	T117-SE99-G	1275094	195816	1	PCBs, dieldrin, mercury TOC, total solids	Determine the extent of PCB contamination along the toe of the Marina bank Evaluate the re-contamination potential of dieldrin and mercury to the sediment
100-G	T117-SE101-G	1275148	195826	1	PCBs, TOC, total solids	Determine the extent of PCB contamination in the Marina beyond location 89-G (65 mg/kg-OC)
101-G	T117-SE102-G	1275177	195825	1	PCBs, TOC, total solids	Determine the extent of PCB contamination in the Marina beyond location 89-G (65 mg/kg-OC)
102-G	T117-SE100-G	1275148	195826	2	Archive - PCBs, dieldrin, mercury TOC, total solids	Will be analyzed only if PCB concentrations in 101-G are greater than PCB SQS Determine the extent of PCB contamination in the Marina beyond location 89-G (65 mg/kg-OC)
103-G	T117-SE103-G	1275405	195772	2	PCBs, TOC, total solids	Determine the extent of PCB contamination into the navigation channel
104-SC	T117-SE104-SC	1275420	195741	1	PCBs, TOC, total solids	Re-occupies location from 2003 cleanup study with marginal SQS exceedance at depth (16 mg/kg-OC at 0-1ft and 17-mg/kg-OC at 1-2ft)

MAP ID	LOCATION ID	EASTING	NORTHING	ANALYSIS TIER	ANALYSIS	RATIONALE
105-G	T117-SE105-G	1275442	195738	2	PCBs, TOC, total solids	Determine the extent of PCB contamination into the navigation channel
106-G	T117-SE106-G	1275485	195701	1	PCBs, TOC, total solids	Determine the extent of PCB contamination into the navigation channel
107-G	T117-SE107-G	1275494	195677	1	PCBs, TOC, total solids	Re-occupies locations from 2003 cleanup study with marginal SQS exceedance (23 mg/kg OC)
108-G	T117-SE108-G	1275522	195667	1	PCBs, TOC, total solids	Determine the extent of PCB contamination into the navigation channel
109-G	T117-SE109-G	1275638	195435	1	PCBs, TOC, total solids	Re-occupies historical (1997) location (R17) with SQS exceedance for PCBs (15 mg/kg OC)
110-G	T117-SE110-G	1275649	195375	1	PCBs, TOC, total solids	Fill spatial data gap in the area between preliminary and current sediment removal boundary
111-G	T117-SE111-G	1275655	195332	1	PCBs, TOC, total solids	Fill spatial data gap in the area between preliminary and current sediment removal boundary
111-SC	T117-SE111-SC	1275655	195332	1	PCBs, TOC, total solids	Fill spatial data gap in the area between preliminary and current sediment removal boundary at depth,0-2ft
112-G	T117-SE112-G	1275757	195180	2	Archive-PCBs, TOC, total solids	Will be analyzed only if PCB concentrations in 113-G are greater than PCB SQS. Determine the extent of PCB contamination in the navigation channel
113-G	T117-SE113-G	1275682	195175	1	PCBs, TOC, total solids	Re-occupies historical (1997) location (R18) with SQS exceedance for PCBs (20 mg/kg OC)
114-G	T117-SE114-G	1275727	195177	1	PCBs, TOC, total solids	Re-occupies historical (1997) location (R19) with SQS exceedance for PCBs (15 mg/kg OC)
115-G	T117-SE115-G	1275661	195170	1	PCBs, TOC, total solids	Fill spatial data gap in the area between preliminary and current sediment removal boundary
116-G	T117-SE116-G	1275637	195133	2	Archive- PCBs, TOC, total solids	Will be analyzed only if PCB concentrations in 117-G are greater than PCB SQS
117-G	T117-SE117-G	1275661	195149	1	PCBs, TOC, total solids	Re-occupies locations from 2003 cleanup study with marginal SQS exceedance (13 mg/kg OC)
118-G	T117-SE118-G	1275685	195135	2	Archive- PCBs, TOC, total solids	Will be analyzed only if PCB concentrations in 114-G or 117-G are greater than PCB SQS
119-G	T117-SE119-G	1275724	195144	2	Archive- PCBs, TOC, total solids	Will be analyzed only if PCB concentrations in 113-G or 114-G are greater than PCB SQS



Horizontal datum = Washington State Plane North, NAD83, US survey ft

G - grab sample

Marina – South Park Marina

PCBs – polychlorinated biphenyls

SC - sediment core sample

SE - sediment

SQS – Washington State Sediment Quality Standard

TOC – total organic carbon

3.2 SAMPLING METHODS

3.2.1 Field collection methods

All field activities will be performed under the direction of the field coordinator, Joanna Florer of Windward, or other oversight personnel and EPA oversight as appropriate. Sediment sampling will be accomplished under the direction of Windward. Surface sediment sampling will be conducted from a boat with an Ekman grab sampler at all locations with a "G" designation, except at 96-G to 99-G. At these four locations, surface samples will be collected from the toe of the rip-rap bank by hand with a stainless steel spoon during a negative tide. Refer to the original QAPP (Windward et al. 2003a) for field operations, collection equipment and sample handling procedures. At locations 104-SC and 111-SC, a gravity corer will be used to collect a shallow core up to 2 ft deep. The gravity corer consists of 3-inch (outer diameter) 2.5 ft long butyl acetate core-tube. Because inertia will be utilized as the primary driving force to achieve the desired penetration depth, the degree of penetration will be altered by either adjusting the number of weights at the top of the tube or by changing the vertical distance from which the core tube is allowed to free-fall. The corer will be advanced into the sediment to refusal or a maximum depth of 2.5 ft using enough weight to achieve the minimum target penetration depth of 1.5 ft. If the core cannot penetrate to the minimum depth, then no material will be collected since the sample would not be considered representative of sediment at depth, but considered more like a surface sample. A surface grab (15-G) has already been obtained from location 104-SC and had PCBs below the SQS for PCBs at 5.7 mg/kg and a surface grab (111-G) will be co-located at location 111-SC, as shown on Map 2-1.

3.2.2 Location and sample IDs

Each location shown on Map 2-1 has been assigned a map ID to facilitate viewing the overall sample design on a single map. However, the location IDs shown in Table 3-1 differs from the map IDs used on Map 2-1, in which only the unique number followed by G (grab) or SC (subsurface core) is shown. For example, T117-SE96-G is shown as 96-G on the map.

The location and sample ID naming convention is described below. The location and sample ID naming convention begins with the first four characters T117, to designate the T-117 area. The next two characters are SE (sediment), to indicate the medium being sampled. The 24 new sediment sampling location IDs begin at T117-SE96-G and are numbered consecutively to T117-SE117-G, including the only core sample T-117-SE103-SC, as shown on Table 3-1. Sample IDs are similar to location IDs, but are different so that each ID is unique. For example, the surface sediment sample collected at location T117-SE96-G would be designated T117-SE96-SG (SG=surface grab). The subsurface core sample collected from T117-SE103-SC will be followed by

numbers indicating the upper and lower collection depths. For example, if the core sample is collected from 0-2ft then the sample ID would be T117-SE103-SC-02.

3.2.3 Field quality assurance/ quality control and sample volumes

Field quality assurance/quality control (QA/QC) will follow the project QAPP and will include one field duplicate sample and one rinsate blank sample. The field duplicate sample will be analyzed for PCBs, dieldrin, mercury, TOC, and total solids. The rinsate blank sample will be analyzed for PCBs only. Field QA/QC samples will be assigned modified sample identifiers as described below:

- ◆ Field duplicates will be assigned the next available number at the end of the sequence. For example, the field duplicate sample collected from location T117-SE96-G would be T117-SE120-SG
- ◆ Rinsate blanks will be assigned the same characters as the station identifier, followed by the identifier "RB." For example, the rinsate blank collected from T117-SE96-G would be T117-SE96-RB

Table 3-2. Sample containers for chemical analyses

PARAMETER	CONTAINER
PCBs as Aroclors ^a	8-oz glass jar
Dieldrin	
Mercury	4-oz glass jar
TOC and total solids	
Archive –PCBs and dieldrin	8-oz glass jar
Archive – mercury, TOC, and total solids	4-oz glass jar
Archive – additional analytes	8-oz glass jar
Rinsate blank for PCBs	2 500-mL glass amber jars

^a Duplicate sample volume should be collected at a rate of one per 20 samples for MS/MSD.

PCB – polychlorinated biphenyl

TOC – total organic carbon

3.3 ANALYTICAL METHODS

Analytical methods and data quality indicators (DQIs) for this sampling effort are summarized in Table 3-3 and are discussed in greater detail in the original QAPP (Windward et al. 2003a). Tier two samples will be archived frozen at ARI. Analyses of the archived samples will be determined depending on the results of the tier one samples based on the rationale presented in Table 3-1. Archived samples selected for tier two analyses will be analyzed for the parameters in Table 3-3 and adhere to the same DQIs.

Table 3-3. Data quality indicators for sediment analyses

PARAMETER	UNITS	METHOD	REFERENCE	SENSITIVITY		PRECISION	ACCURACY	COMPLETENESS	MAXIMUM SAMPLE HOLDING TIME	PRESERVATIVE
				RL	MDL					
PCBs as Aroclors	µg/kg dw	GC/ECD	EPA 8082	20	4.1	±50%	50 – 150%	95%	14 days to extract, 40 days to analyze ^{a,b}	cool/0 – 6°C
Dieldrin	µg/kg dw	GC/ECD	EPA 8081A	2.0	0.84	±50%	50 – 150%	95%	14 days to extract, 40 days to analyze ^{a,b}	cool/0 – 6°C
Mercury	mg/kg dw	CVAAS	EPA 7471A	0.05	0.005	±30%	70 – 130%	95%	28 days ^c	cool/0 – 6°C
TOC	% dw	combustion	Plumb (1981)	0.02	0.01	±30%	70 – 130%	95%	14 days ^c	cool/0 – 6°C
Total solids	% ww	oven-dried	EPA 160.3	0.1	na	±20%	na	95%	7 days ^c	cool/0 – 6°C

^a Sediment may be frozen, with a maximum holding time of 1 year.

^b Aqueous rinsate blanks have a maximum holding time of 7 days to extract and 40 days to analyze, and will be stored at 4°C.

^c Sediment may be frozen, with a maximum holding time of 6 months.

CVAAS – cold vapor atomic absorption spectroscopy

dw – dry weight

EPA – US Environmental Protection Agency

HRGC/HRMS – high resolution gas chromatography/high resolution mass spectrometry

GC/ECD – gas chromatography/electron capture detection

MDL – method detection limit

na – not applicable

PCB – polychlorinated biphenyl

RL – reporting limit

TOC – total organic carbon

4 Assessment and Oversight

Details of project assessment and oversight are presented in the original QAPP (Windward et al. 2003a).

5 Data validation and Usability

All results will undergo a summary data validation as described in the original QAPP (Windward et al. 2003a) by EcoChem, Inc.

6 References

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- EPA. 2008. Letter dated July 21, 2008 from P. Lee to R. Kuroiwa, Port of Seattle, and T. Meyer, City of Seattle, regarding modified removal boundary approach - T-117 Early Action Area, Lower Duwamish Waterway Superfund Site, Seattle, Washington. Remedial Project Manager, US Environmental Protection Agency Region 10, Seattle, WA.
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