East Waterway Operable Unit
Quality Assurance Project Plan
Intertidal MIS Sediment Sampling

For submittal to:

The US Environmental Protection Agency
Region 10
Seattle, WA

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Prepared by:

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East Waterway Intertidal MIS Sediment Sampling and Chemical Analysis
QUALITY ASSURANCE PROJECT PLAN

APPROVALS

Windward Project Manager	Name	2·8·10 Date
Windward QA/QC Manager	Name	2.8·10 Date
EPA Project Manager	Name	2/9/10 Date
EPA QA Officer	Name	2/9/10 Date

Distribution List

This list identifies all individuals who will receive a copy of the approved quality assurance project plan, either in hard copy or electronic format, as well as any subsequent revisions.

- Ravi Sanga, EPA Project Manager
- Susan McGroddy, Windward Project Manager
- Thai Do, Windward Task Manager and Field Coordinator
- Ginna Grepo-Grove, EPA QA/QC Manager
- Marina Mitchell, Windward QA/QC Manager

Chemistry Project Managers:

- Sue Dunnihoo (Analytical Resources, Inc.)
- Todd Vilen (Analytical Perspectives)
- Greg Salata (Columbia Analytical Services, Inc.)

East Waterway Group:

- Doug Hotchkiss, Port of Seattle
- Debra Williston, King County
- Jeff Stern, King County
- Peter Rude, City of Seattle

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Acronyms

Acronym	Definition
%RSD	percent relative standard deviation
ASTM	American Society for Testing and Materials
COC	chain of custody
DMM	Data Management Manual
DQO	data quality objective
DQI	data quality indicator
EPA	US Environmental Protection Agency
ERA	Ecological risk assessment
FC	field coordinator
GPS	global positioning system
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MIS	Multi-Increment Sampling
MDL	Method detection limit
MLLW	mean lower low water
PCB	polychlorinated biphenyl
PM	Project manager
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	Remedial Investigation
RM	river mile
RPD	relative percent difference
SDG	sample delivery group

1 Introduction

This quality assurance project plan (QAPP) addendum describes the sampling design and quality assurance (QA) for collecting and analyzing intertidal surface sediment (i.e. 0-10cm) throughout the East Waterway (EW) using a multi-increment sampling (MIS) approach consistent with US Environmental Protection Agency (EPA) guidance (EPA 2006) for the EW Supplemental Remedial Investigation (SRI) and Feasibility Study (FS). Details about project organization and management, field data collection methods, sample handling, laboratory analytical protocol, and data management and documentation are provided. Additional details are provided in the surface sediment QAPP (Windward 2009), of which this addendum relates to. This QAPP addendum was prepared in accordance with guidance for preparing QAPPs from the US Environmental Protection Agency (EPA; 2002).

Data from this study will be used to support the human health risk assessment (HHRA) and the ecological risk assessment (ERA) for the EW SRI/FS. This document is organized as follows:

- Section 2 – Project management
- Section 3 – Data generation and acquisition
- Section 4 – Assessment and oversight
- Section 5 – Data validation and usability
- Section 6 – References

Field collection forms, health and safety plan (HSP), data management procedures, and risk based analytical concentration goals are attached to the surface sediment QAPP (Windward 2009).

2 Project Management

This section describes the overall management structure of the project, identifies key personnel, and describes their responsibilities, including field coordination, quality assurance and quality control (QA/QC), laboratory management, and data management. The East Waterway Group (EWG) and the US Environmental Protection Agency (EPA) will be involved in all aspects of this project, including discussion, review, and approval of the QAPP, and interpretation of the results of the investigation.

2.1 Project Organization

This sampling effort will be performed by Windward. The overall project organization and the individuals responsible for the various tasks required for sediment sample collection and analysis are presented in Figure 2-1. Responsibilities of project team members, as well as the laboratory project manager (PMs), are described in the following subsections.

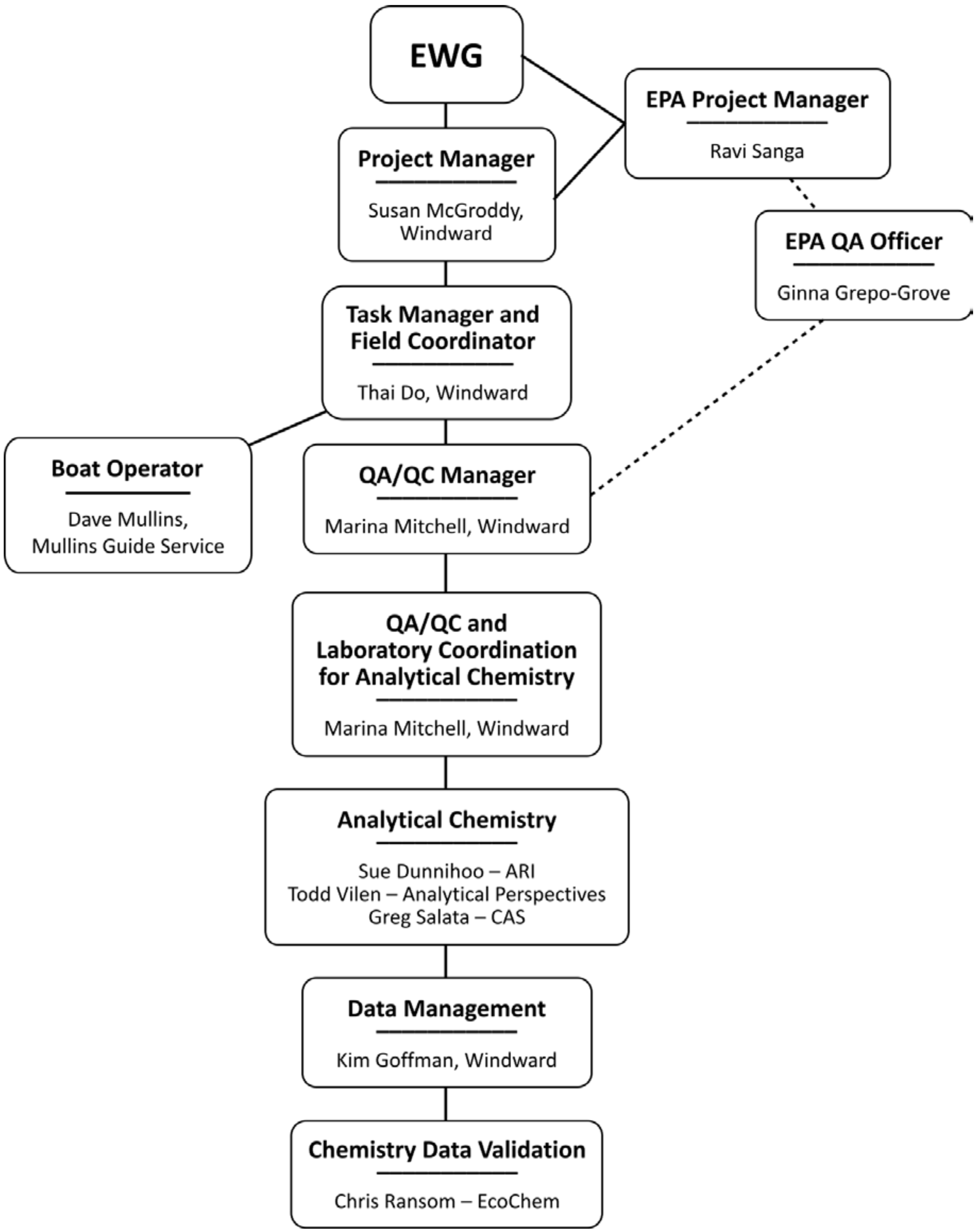

Figure 2-1. Project organization and team responsibilities

2.1.1 Project management

EPA will be represented by its PM, Ravi Sanga. Mr. Sanga can be reached as follows:

Mr. Ravi Sanga
US Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900
ECL-111
Seattle, WA 98101-3140
Telephone: 206.553.4092
Facsimile: 206.553.0124
E-mail: Sanga.Ravi@epamail.epa.gov

Susan McGroddy will serve as the Windward PM and will be responsible for overall project coordination and providing oversight on planning and coordination, work plans, all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. She will also be responsible for coordinating with EWG and EPA on schedule, deliverables, and other administrative details. Dr. McGroddy can be reached as follows:

Dr. Susan McGroddy
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.577.1292
Facsimile: 206.217.0089
E-mail: susanm@windwardenv.com

Thai Do will serve as the Windward task manager (TM). The TM is responsible for project planning and coordination, production of work plans, production of project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. The TM is responsible for communicating with the Windward PM on progress of project tasks and any deviations from the QAPP. Significant deviations from the QAPP will be further reported to EWG and EPA. Mr. Do can be reached as follows:

Mr Thai Do
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.812.5407
Facsimile: 206.217.0089
Email: thaid@windwardenv.com

2.1.2 Field coordination

Thai Do will also serve as the Windward FC. The FC is responsible for managing the field sampling activities and general field and QA/QC oversight. He will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will oversee delivery of environmental samples to the designated laboratories for chemical analysis. Deviations from this QAPP will be reported to the PM for consultation. Significant deviations from the QAPP will be further reported to representatives of EWG and EPA.

2.1.3 Quality assurance/quality control

Marina Mitchell of Windward will oversee QA/QC for the project. As the QA/QC manager, she will oversee coordination of the field sampling and laboratory programs and supervise data validation and project QA coordination, including coordination with the EPA QA officer, Ginna Grepo-Grove.

Ms. Mitchell can be reached as follows:

Ms. Marina Mitchell
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.812.5424
Facsimile: 206.217.0089
Email: marinam@windwardenv.com

Ms. Grepo-Grove can be reached as follows:

Ms. Ginna Grepo-Grove
US Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900 (OEA-095)
Seattle, WA 98101
Telephone: 206.553.1632
Email: grepo-grove.gina@epa.gov

EcoChem Inc., will provide independent third-party review and validation of analytical chemistry data. Chris Ransom will act as the data validation PM and can be reached as follows:

Ms. Chris Ransom
EcoChem Inc.
Dexter Horton Building
710 Second Avenue, Suite 600
Seattle WA 98104
Telephone: 206.233.9332
Email: cransom@ecochem.net

2.1.4 Laboratory project management

Marina Mitchell of Windward will also serve as the laboratory coordinator for the analytical chemistry laboratory. Analytical Resources, Inc. (ARI), Analytical Perspectives, and Columbia Analytical Services, Inc. (CAS) will perform chemical analyses. Sue Dunnihoo will serve as the laboratory PM for ARI, Todd Vilen will serve as the laboratory manager for Analytical Perspectives, and Greg Salata (or other qualified personnel) will serve as the laboratory PM for CAS. The laboratory PMs can be reached as follows:

Ms. Susan Dunnihoo
Analytical Resources, Inc.
4611 S 134th Place, Suite 100
Tukwila, WA 98168
Telephone: 206.695.6207
Email: sue@arilabs.com

Mr. Todd Vilen
Analytical Perspectives
2714 Exchange Drive
Wilmington, NC 28405
Telephone: 910.260.1119
Facsimile: 910.794.3919
Email: tvilen@ultratrace.com

Mr. Greg Salata
Columbia Analytical Services, Inc.
1317 S 13th Avenue
Kelso, WA 98626
Telephone: 360.577.7222
Facsimile: 360. 636.1068
E-mail: gsalata@kelso.caslab.com

The laboratories will do the following:

- Adhere to the methods outlined in this QAPP, including those methods referenced for each procedure
- Adhere to documentation, custody, and sample logbook procedures
- Implement QA/QC procedures defined in this QAPP
- Meet all reporting requirements
- Deliver electronic data files as specified in this QAPP
- Meet turnaround times for deliverables as described in this QAPP

- Allow EPA and the QA/QC manager, or a representative, to perform laboratory and data audits

2.1.5 Data management

Ms. Kim Goffman will oversee data management to ensure that analytical data are incorporated into the EW database with appropriate qualifiers following acceptance of the data validation. QA/QC of the database entries will ensure accuracy for use in the ERA and HHRA.

2.2 Problem Definition/Background

Intertidal surface sediments need to be characterized for use in the HHRA and the ERA of the SRI/FS. The intertidal surface sediment data will be used in the assessment of risk to humans due to direct contact resulting from clamming (tribal and 7-days per year scenarios) and habitat restoration work. The direct contact exposure for intertidal sediment is assumed to be an average exposure throughout the entire waterway for the tribal clamming scenario and the habitat restoration worker scenario. The 7-days per year clamming scenario requires an average exposure over a smaller area because this scenario only includes clamming areas accessible by the public that are not on private or secure property. The average of data from a small number of intertidal grab samples would likely provide a more uncertain estimate of the area-wide average. The MIS approach integrates a large number of grab samples into a smaller number of composite samples for analysis. Combining a large number of grab samples into composite samples for analysis will minimize the uncertainty associated with the estimate of the area-wide average. Discrete intertidal surface sediment samples were collected and analyzed as part of the Round 2 Surface sediment sampling effort. These samples will be used to assess the exposure of the benthic community to intertidal sediments and also to provide information regarding the spatial distribution of chemicals in intertidal sediments.

2.3 Project/Task Description and Schedule

The MIS sampling of intertidal sediments is currently scheduled for the week of August 17, 2009, timed with the daytime low tides of approximately -2.0 ft (mean lower low water[MLLW]), when the intertidal areas will be exposed and readily accessible for sampling. A detailed sampling design is presented in Section 3.1.

Intertidal MIS samples will be analyzed for metals, mercury, SVOCs and PCBs (as Aroclors) and organochlorine pesticides as well as dioxins and furans and PCB congeners. Chemical analysis of the samples is described further in Section 3.4 and will be completed approximately 6 weeks after sample compositing and homogenization has been completed in the analytical laboratory. Data validation will be completed approximately 3 weeks after receipt of the chemistry data. A draft data report will be completed approximately 45 days following receipt of the validated data.

2.4 DATA QUALITY OBJECTIVES AND CRITERIA FOR CHEMICAL MEASUREMENTS

The overall data quality objective (DQO) for this project is to develop and implement procedures that will ensure the collection of representative data of known, acceptable, and defensible quality. Parameters used to assess data quality are precision, accuracy, representativeness, comparability, completeness, and sensitivity. These parameters are discussed, and specific data quality indicators (DQIs) for sediment laboratory analysis are presented in Section 3.4 and in the surface sediment QAPP (Windward 2009).

2.5 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

The Superfund Amendments and Reauthorization Act of 1986 requires the Secretary of Labor to issue regulations through the Occupational Safety and Health Administration (OSHA) to provide health and safety standards and guidelines for workers engaged in hazardous waste operations. Federal regulation 29CFR1910.120 requires training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA regulations.

2.6 DOCUMENTATION AND RECORDS

Documentation and records including field operations records, laboratory records, data reduction, and data report are as reported in the surface sediment QAPP (Windward 2009).

3 Data Generation and Acquisition

This section describes the methods that will be used to collect, process, and analyze intertidal sediment MIS samples from the EW. Elements include sampling design and methods; sample handling and custody requirements; analytical chemistry methods; QA/QC; instrument and equipment testing, inspection, and maintenance; instrument calibration; supply inspection and acceptance; non-direct measurements; and data management.

3.1 SAMPLING DESIGN

Given the frequency assumed for the reasonably maximally exposed tribal clamming scenarios (120 days per year for 70 years) and habitat restoration worker (15 days per year for 20 years) and the limited size of EW intertidal areas, direct contact exposure for tribal clamming and habitat restoration will be evaluated on a site-wide (e.g., EW-wide) basis. This is consistent with the decision to evaluate tribal clamming exposure on a site-wide basis for the LDW (EPA 2006a), which has much more extensive intertidal areas than the EW.

The MIS methodology has been developed by EPA in the context of soil screening guidance(EPA 2006b). Simply, it is a method for pooling individual (i.e., discrete) samples within a decision unit to create a multi-incremental (composite) sample, which provides an estimate of the average concentration of the chemical of interest. In order to assess the variability around the average value, three composite samples should be evaluated (EPA 2006b).

For the EW, each MIS sample will be created from individual samples collected from at least 30 discrete locations. There will be two different types of MIS samples collected; area-wide samples will be created for tribal clamming and habitat restoration worker scenarios and one sample will be created to characterize the public access areas for 7-days-per-year clamming scenario. Three replicate samples will be created for the area-wide samples and one sample will be created for the public access areas. Use of the variance from the triplicate total intertidal results, in calculating the EPC, will be determined upon further discussion with EPA. Each sample will be composed of at least 30 discrete samples to create the MIS sample with the difference being what intertidal areas are included in each MIS sample.

For the tribal clamming and habitat restoration worker exposures, three MIS composites are proposed for the site-wide intertidal sediments. The variance calculated from the three samples can be used to calculate a confidence interval around the mean result. This will require a minimum total of 90 locations throughout the EW intertidal sediments based on a systematic random sampling design. For the 7-days-per-year clamming scenario, one MIS composite will be created to characterize the intertidal area, which will include only areas of the intertidal zone which are accessible to the public either from upland areas or boat access (Windward 2008a). Many intertidal areas such as Slip 27 are not accessible to the general public due to security restrictions associated with Port operations.

A reconnaissance survey was conducted on April 13 and 14th, 2009, during the daytime low tides (-0.4 to -0.9 ft MLLW), to measure all the accessible intertidal areas in EW, and 11 intertidal areas were identified in the EW (Maps 2-1a, b and c).The intertidal areas calculated for each exposed area are presented in Table 3-1. The two largest areas are Areas 1 and 3 with areas of over a 1,000 m^2 each. These two areas represent 50% of the total intertidal area in EW.

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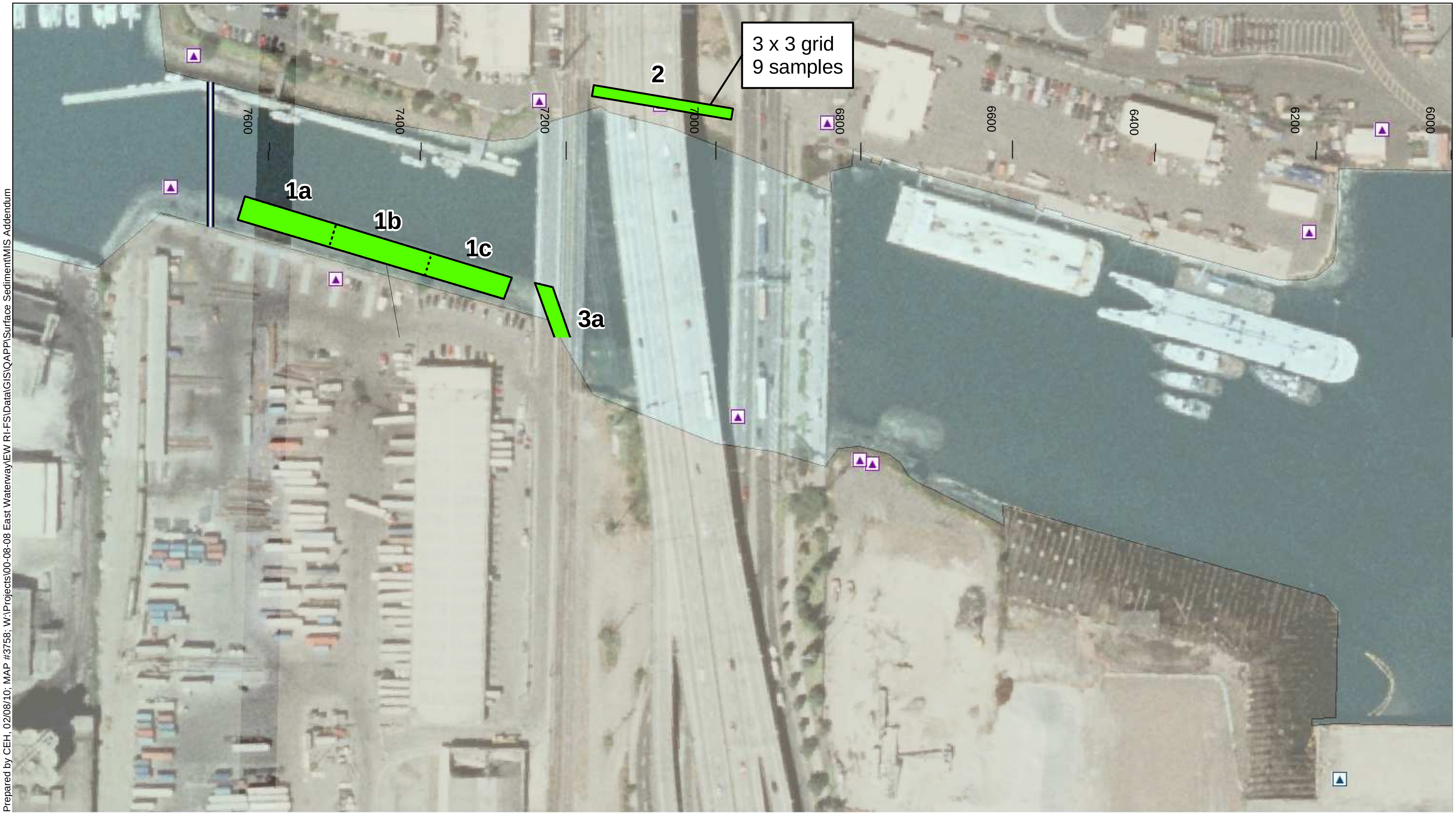

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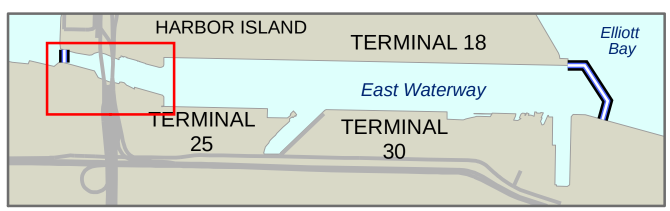
Scale in feet

Intertidal Surface Sediment Areas of Interest
Subarea Segments
Storm Drain
CSO/Storm Drain
East Waterway Study Area Boundary



Map 3-1a
Intertidal Surface Sediment Sampling Areas
Surface Sediment QAPP - MIS Addendum
East Waterway Study Area

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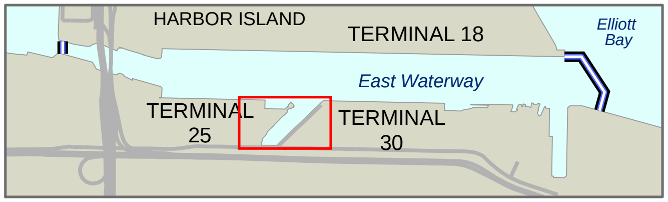
Intertidal Surface Sediment Areas of Interest
Intertidal Surface Sediment Areas of Interest - Subareas
CSO
Storm Drain
Slip 27 Bridge
East Waterway Study Area Boundary



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Map 3-1b
Intertidal Surface Sediment Sampling Areas
Surface Sediment QAPP - MIS Addendum
East Waterway Study Area

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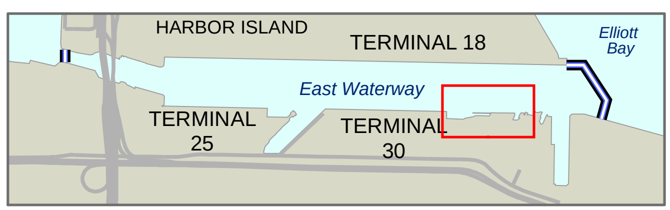
Intertidal Surface Sediment Areas of Interest - Subareas
Storm Drain
East Waterway Study Area Boundary



Map 3-1c
Intertidal Surface Sediment Sampling Areas
Surface Sediment QAPP - MIS Addendum
East Waterway Study Area

Table 3-1. EW intertidal areas proposed for MIS sampling

EW Intertidal Area	Area (m^2)	% of Combined Intertidal Area (EW-wide)	% of Combined Intertidal Area (Public Access)	Number of Discrete Samples for EW-wide MIS[a]	Number of Discrete Samples for Public Access MIS[a]
1	1,100	23	35	27[b]	11
2	262	5	8	6	3
3	1,313	27	42	27[b]	13
4	237	5	na	6	na
5	47	1	na	3	na
6	52	1	na	3	na
7	259	5	na	6	na
8	280	6	na	6	na
9	339	7	na	6	na
10	475	10	na	9	na
11	480	10	15	9	5
Total	4,844	100	100	108	32

na- not applicable areas are not accessible to the public
[a] number of discrete samples was calculated based on the percent total area for each area
[b] number of increments has been adjusted to a multiple of nine to allow for sampling 3 subareas within the area.

3.1.1 EW-wide MIS Composite Samples

As stated above, a minimum of 90 discrete samples will be collected so that three EW-wide MIS composite samples can be created. In order to ensure that the sampling density is proportional to the area of each intertidal area, the fraction of the total intertidal area represented by each sampling area was calculated (Table 3-1). The number of discrete samples for each area was then calculated by multiplying the percentage of the total intertidal area by 90 samples (Table 3-1). In order to ensure that each intertidal area is equally represented in each of the three replicate EW-wide MIS samples, the number of samples per area was adjusted to a multiple of three to ensure that all intertidal areas are equally represented in the three replicates. In addition, the two largest areas (Areas 1 and 3) will be divided into three subareas to ensure an even distribution of discrete samples. The number of discrete samples for these areas was adjusted to a multiple of nine to ensure that each subarea is equally represented in the three replicate samples. A total of 108 samples are proposed to be collected that will result in creating three MIS composite samples, each comprised of 36 discrete samples.

3.1.2 Public Access Area MIS Composite Sample

The Public Access areas are a subset of the EW-wide intertidal areas including Areas 1, 2, 3 and 11 (Map 2-1a and c). Only one MIS composite sample, made up of 32 discrete samples, is proposed for this exposure area (Table 3-1).

As stated above, a minimum of 30 discrete samples is recommended for each MIS composite sample. Because the intertidal public access areas differ in size, the number of discrete samples proposed per intertidal area was calculated by multiplying the percentage of the intertidal public access area in the EW by 30 samples. A total of 32 discrete samples are proposed to be collected that will result in creating one MIS composite sample.

3.2 SAMPLE COLLECTION METHODS

3.2.1 Location positioning

Within each of the sampling areas, the field crew will randomly identify locations to be sampled that include all exposed intertidal sediment as defined in Section 3.2.4. Sampling will begin an hour before the low tide in order to conduct sampling at the point of the lowest tide. The details of the sampling procedure are provided in Section 3.2.4.

A handheld global positioning system receiver unit will be used to record coordinates of each of the discrete sampling locations when possible. If it is not possible to obtain coordinates of the sample locations because of signal interference by structures then the sample locations will be mapped relative to an identifiable landmark or a position for which coordinates can be obtained. The GPS unit will receive radio broadcasts of GPS signals from satellites to produce positioning accuracy to within 3 m. Washington State Plane coordinates North (NAD 83) will be used for the horizontal datum.

3.2.2 Identification scheme

Unique alphanumeric sample numbers will be assigned to each discrete sediment sample and each MIS composite sample. The first four characters are "EW09" to identify the East Waterway project area and that the sample was collected in 2009. The next characters will identify the intertidal area. The next 5 characters identify the sample as intertidal sediment "ITSED". The final identifier is a consecutive sample number. For example, the sample identifier EW09-01-ITSED01 would represent the first discrete sediment sample collected in intertidal location 1.

Once samples are composited in the lab, a unique sample number will be assigned to the MIS composite sample. Each sample will be numbered sequentially following the letters "MIS." The area–wide (e.g., EW-wide) samples will be identified as AWMIS samples and the public access sample will be identified as PAMIS. The AWMIS samples will include a consecutive sample number. For example, the first MIS composite sample for the EW-wide intertidal areas would be identified as EW09-ITSED-AWMIS- 01.

3.2.3 Field equipment

The following items will be needed in the field for sediment collection:

- QAPP
- Field collection forms
- Study area maps
- Field notebooks and pens/pencils/Sharpies®
- Cellular phone
- Digital camera
- GPS
- Batteries
- Stainless steel bowls and spoons
- Stainless steel ruler
- Alconox® detergent
- Scrub brushes
- Distilled water
- Spray bottles for distilled water
- Coolers
- Powder-free nitrile exam gloves and rubber work gloves
- Boots or waders
- Duct tape
- Zip-lock bags
- Aluminum foil
- Paper towels
- First aid kit
- Hand corer
- Wet ice or frozen gel packs
- Personal flotation devices
- Hard hats
- Safety glasses
- Foul weather gear (rain jacket/pants)
- Waterproof labels
- Clear packing tape
- Box cutters
- Bubble wrap
- COC forms
- Flashlights and temporary work lights
- Sample jars
- Custody seals

Prior to mobilization, these lists will be consulted to ensure all equipment is available and pre-cleaned. As part of the mobilization process, each item will be double-checked by the FC.

3.2.4 Sediment sampling

The two largest sampling areas (Areas 1 and 3) will be divided into three subareas of approximately equal area in the field. The coordinates for the subarea boundaries will be collected if possible. Alternately the length of each subarea will be measured.

In all areas and subareas, the field crew will measure the extent of the exposed intertidal area with sediment that can be sampled. This area will not include intertidal areas containing only riprap or cobble. The area will then be divided into a grid based on the number of samples required for the area (Table 3-1). Individual samples will be taken from each grid cell. The required grids for each area are presented in Figure 2-1. The grids established in the field will be specific to the intertidal area on the day of sampling so the precise location and dimensions of the grid cells may vary from those presented in Map 2-1. Sampling will begin an hour prior to the lowest tide on the high water transect and the low water transect will be sampled at the lowest possible tide.

The target sediment depth for the discrete samples is 12 inches in all areas except the southernmost subarea in Area 1. In the southern portion of Area 1 the target depth will be 18 inches. The sediment depths are consistent with potential sediment depths for clams and are therefore representative of potential clamming exposure. The southern portion of Area 1 is the only area where *Mya arenaria* were collected in the clam survey. This species can be found at greater depths than the other clam species so the target depth in that area is 18 inches rather than 12 inches. The sediment samples will be collected from the perimeter of a hole dug to the target depth by shovel. The sample will be collected using a stainless steel spoon and every effort will be made to sample an equal volume throughout the depth of the sample. If the target depth cannot be achieved then, another attempt will be made within the sample grid. If the target depth is not achieved after two attempts then, the sample will be collected from the deepest available sediment depth.

The coordinates of the sampling location will be recorded. At each discrete sampling location the sediment sample will be homogenized following protocols in the surface sediment QAPP (Windward 2009) and two 8-oz jars will be filled. Large rocks and shell debris will be excluded from the homogenized sample to the extent practicable. One jar will be used to create the MIS composite sample at ARI and the other jar will be archived for potential future analysis.

3.3 Sample Handling and Custody Requirements

This section describes how individual samples will be processed. Sample tracking and custody procedures, and shipping requirements are described in the surface sediment QAPP (Windward 2008b).

3.3.1 Sample handling and compositing procedures

Following the collection of the discrete sediment samples, a memo will be prepared to identify the individual samples for each MIS sample. The number of discrete sediment samples collected for each sampling area and subarea was set to a multiple of three so that each area and subarea can be equally represented in each of the area-wide replicates. In addition, samples will be selected which represent the full spatial extent of each sampling area for each replicate. Following consultation with EPA and stakeholders and approval of the memo by EPA, the compositing and homogenization to create the MIS composite samples will be conducted at ARI. The MIS composite samples will be created by combining 32 (public access sample) or 36 (area-wide replicates) discrete sediment samples will be combined in stainless steel bowls. Homogenization of the MIS composite samples will be done at ARI. Following homogenization, the homogenized sediment will be distributed in a shallow rectangular stainless steel container. The analytical composite samples will be created using a stainless steel spoon randomly sampling across the area of the container. For each MIS composite sample, three spoonfuls will be collected for each jar used to create the sample (i.e. a sample created from 30 jars will require 90 spoonfuls). These MIS composite samples will be placed in pre-cleaned, labeled, wide-mouth jars and capped with Teflon®-lined lids (Table 3-2). All sediment sample containers will be filled leaving a minimum of 1 cm of headspace to prevent breakage during shipping and storage. There will be a total of four jars per MIS composite sample to cover all the analytical analyses.

Table 3-2. Sample containers and laboratories conducting chemical analyses

Parameter	Container	Laboratory
Sediment Samples		
PCB congeners and dioxins/furans	8-oz glass jar	Analytical Perspectives
PCBs (as Aroclors), organochlorine pesticides, and SVOCs	16-oz glass jar	ARI
Metals, including mercury, butyltins, TOC, and total solids	16-oz glass jar	ARI
Aqueous Samples (rinsate blanks)		
PCBs (as Aroclors), SVOCs, organochlorine pesticides, and butyltins	eight 500-mL amber glass jars	ARI
Metals, including mercury	500-mL HDPE jar (preserved with nitric acid)	ARI

ARI – Analytical Resources, Inc.
HDPE – high-density polyethylene
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
TOC – total organic carbon

Sample labels will be waterproof and self-adhering. Each sample label will contain the project name, sample ID, preservation technique, type of analysis, date and time of collection, and initials of the person(s) preparing the sample. A completed sample label will be affixed to each sample container. The labels will be covered with clear tape immediately after they have been completed to protect them from being stained or spoiled from water and sediment.

3.4 Analytical Methods

This section provides a brief summary of the analytical methods for the MIS composite samples. Data quality indicators (DQIs), quality assurance/quality control, instrument/equipment testing, instrument inspection and maintenance, instrument calibration, and inspection/acceptance of supplies and consumables, and data management are discussed in the surface sediment QAPP (Windward 2008b)

The analysis of SMS chemicals (e.g., PCB Aroclors, SVOCs, metals, mercury, organochlorine pesticides, and butyltins) will be conducted at ARI following the methods described in the surface sediment QAPP (Windward 2009). MIS composite samples jars for the analysis of PCB congeners and dioxins and furans will be shipped from ARI to Analytical Perspectives. The pesticide data will be reviewed to determine if high-resolution pesticide analysis is required. If required, sample jars will be shipped from ARI to CAS for the high-resolution pesticide analysis. A summary of the procedures to be conducted at each analytical laboratory is provided in Table 3-3.

Table 3-3. Procedures to be conducted at each analytical laboratory

ARI	Analytical Perspectives	CAS
PCB Aroclors SVOCs (including PAHs and low level SVOCs by SIM) Metals including mercury TOC, total solids, grain size Organochlorine pesticides Butyltins	PCB congeners Dioxins and furans	Potential GC/MS/MS confirmation analysis of pesticides[a]

[a] GC/MS/MS pesticide analysis may be conducted on samples at CAS if pesticides are detected in the analyses conducted at ARI.

ARI – Analytical Resources, Inc.
CAS – Columbia Analytical Services, Inc.
GC/MS/MS – gas chromatography/mass spectrometry/mass spectrometry
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
TOC – total organic carbon

The laboratories will store the archive sediment samples frozen. Analytical methods and laboratory sample handling requirements are presented in Table 3-4.

Table 3-4. Laboratory chemistry analytical methods and sample handling requirements

Parameter	Method	Reference	Sample Holding Time[a]	Preservative
Sediment Samples				
PCBs as Aroclors	GC/ECD	EPA 8082	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C
PCB congeners[c]	HRGC/HRMS	EPA 1668	1 year to extract, 40 days to analyze	freeze/-20 °C
Dioxins and furans	HRGC/HRMS	EPA 1613B	1 year to extract, 40 days to analyze	freeze/-20 °C
Organochlorine pesticides[d]	GC/ECD	EPA 8081A	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C
Organochlorine pesticides[d]	GC/MS/MS	EPA 1699 (modified)	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C
SVOCs (including PAHs)[e]	GC/MS	EPA 8270D	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C

Parameter	Method	Reference	Sample Holding Time[a]	Preservative
Selected SVOCs[f]	GC/MS-SIM	EPA 8270D-SIM	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C
Mercury	CVAA	EPA 7471A	28 days[g]	cool/0 – 6 °C
Other metals[h]	ICP-AES and ICP-MS	EPA 6010B and EPA 6020	6 months	cool/0 – 6 °C
Tributyltin, dibutyltin, monobutyltin (as ions)	GC/FPD	Krone et al. (1989)	14 days to extract, 40 days to analyze[b]	cool/0 – 6 °C
TOC	combustion	Plumb (1981)	14 days[g]	cool/0 – 6 °C
Total solids	oven-dried	PSEP (1986)	7 days[g]	cool/0 – 6 °C
Aqueous Samples (rinsate blanks)				
PCBs as Aroclors	GC/ECD	EPA 8082	7 days to extract, 40 days to analyze	cool/0 – 6 °C
Organochlorine pesticides[d]	GC/ECD	EPA 8081A	7 days to extract, 40 days to analyze	cool/0 – 6 °C
SVOCs (including PAHs)[e]	GC/MS	EPA 8270D	7 days to extract, 40 days to analyze	cool/0 – 6 °C
Selected SVOCs[f]	GC/MS-SIM	EPA 8270D-SIM	7 days to extract, 40 days to analyze	cool/0 – 6 °C
Mercury	CVAA	EPA 7471A	28 days	cool/0 – 6 °C
Other metals[h]	ICP-AES and ICP-MS	EPA 6010B and EPA 6020	6 months	cool/0 – 6 °C
Tributyltin, dibutyltin, monobutyltin (as ions)	GC/FPD	Krone et al. (1989)	7 days to extract, 40 days to analyze	cool/0 – 6 °C

a All samples will be archived frozen at the laboratory until the Windward PM authorizes their disposal.

b Sediment can also be frozen to increase the holding time to 1 year extraction. Aqueous rinsate blanks have a maximum holding time of 7 days to extract and 40 days to analyze and will be stored at 0 to 6 °C.

c Complete list of 209 congeners.

d Target pesticides include: 4,4′-DDT, 4,4′-DDE, 4,4′-DDD, 2,4′-DDT, 2,4′-DDE, 2,4′-DDD, aldrin, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC, oxychlordane, alpha- and gamma-chlordane, cis- and trans-nonachlor, dieldrin, endosulfan, endosulfan sulfate, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxychlor, mirex, and toxaphene. Detected pesticides may be confirmed by EPA 1699 (modified) using GC/MS/MS.

e Target PAHs include: anthracene, pyrene, dibenzofuran, benzo(g,h,i)perylene, benzo(e)pyrene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene, fluoranthene, benzo(k)fluoranthene, acenaphthylene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benz(a)anthracene, acenaphthene, phenanthrene, fluorene, 1-methylnaphthalene, naphthalene, and 2-methylnaphthalene.

f Selected SVOCs include: 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 2-methylphenol, benzyl alcohol, butyl benzyl phthalate, di-ethyl phthalate, di-methyl phthalate, hexachlorobenzene, hexachlorobutadiene, n-nitrosodimethylamine, n-nitrosodiphenylamine, n-nitrosodi-n-propylamine, and pentachlorophenol.

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

h Sediment may be frozen, with a maximum holding time of 1 year. Aqueous rinsate blanks will be preserved with nitric acid. Metals include arsenic, antimony, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

4 Assessment/Oversight

4.1 Compliance Assessments and Response Actions

EPA or other management agencies may observe field activities during each sampling event, as needed. If situations arise where there is an inability to follow QAPP methods precisely, the Windward PM will determine the appropriate actions or consult EPA if the issue is significant. Procedures for compliance assessments, response for field sampling, corrective action for laboratory analysis, and reports to management are presented in the surface sediment QAPP (Windward 2009).

5 Data Validation and Usability

5.1 Data Validation

The data validation guidelines for the MIS composite sample data are the same as those presented in the surface sediment QAPP (Windward 2009).

5.2 Reconciliation with Data Quality Objectives

Data quality assessment will be conducted by the project QA/QC coordinator in consultation with EPA guidelines. The results of the third-party independent review and validation will be reviewed, and cases where the projects DQOs were not met will be identified. The usability of the data will be determined in terms of the magnitude of the DQO exceedance.

6 References

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