SAMPLING AND ANALYSIS PLAN

RIVER MILE 6 EAST FOCUSED SEDIMENT CHARACTERIZATION

WILLAMETTE RIVER
Portland, Oregon

Prepared for

City of Portland
Bureau of Environmental Services (BES)

March 29, 2012

Prepared by

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PORTLAND, OREGON

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Date: March 29, 2012

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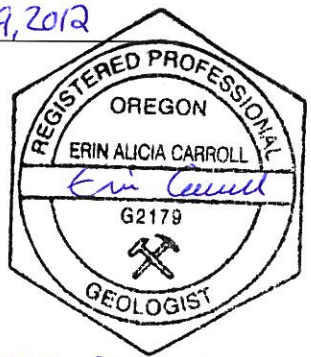
Date: March 29, 2012



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ASTM	American Society for Testing and Materials
AOPC	area of potential concern
As	arsenic
BES	Bureau of Environmental Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Portland
cm	centimeter
COC	chain-of-custody
COI	contaminants of interest
Cr	chromium
Cu	copper
DEQ	Oregon Department of Environmental Quality
DM	Data Manager
DSL	Oregon Department of State Lands
ECSI	Environmental Cleanup Site Information
EDD	electronic data deliverables
EPA	U.S. Environmental Protection Agency
FD	Field Director
FO	Field Operations
FS	feasibility study
GPS	global positioning system
GSI	GSI Water Solutions, Inc.
HSP	health and safety plan
IDW	investigation-derived waste
IMS	Investigation and Monitoring Services
LCS	laboratory control sample
LWG	Lower Willamette Group
m^2	square meter
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
NAD	North American Datum
NGVD	North American Vertical Datum
Ni	nickel
OF	outfall
OHW	ordinary high water
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PM	Project Manager
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance and quality control

QAPP	quality assurance project plan
RA	risk assessment
RI/FS	remedial investigation and feasibility study
RM	river mile
RM6E	RM 5.5 to 6.2
RSS	Research Support Services
SAC	Sampling and Analysis Coordinator
SAP	sampling and analysis plan
SCRA	Site Characterization and Risk Assessment
SM	Standard Method
SMA	sediment management area
SOP	standard operating procedure
µg/kg	micrograms per kilogram
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC	volatile organic compound
WPCL	Water Pollution Control Laboratory
Zn	zinc

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1.0 INTRODUCTION

This sampling and analysis plan (SAP) presents the approach and procedures for conducting a focused sediment characterization along the east side of the Willamette River between River Mile (RM) 5.5 and 6.2 (referred to as RM6E). The focused sediment characterization is initiated by the City of Portland (City), Bureau of Environmental Services (BES), to investigate environmental contaminants in the vicinity of a potential restoration area adjacent to City property (see Figure 1-1). Because the proposed sampling locations are in the Portland Harbor Superfund Study Area, regulatory oversight will be provided by the U.S. Environmental Protection Agency (EPA).

A portion of the RM6E area was investigated by the Lower Willamette Group (LWG) as part of its remedial investigation and feasibility study (RI/FS) of the Portland Harbor Superfund Site (Portland Harbor). The draft final RI report, submitted to EPA in August 2011, describes the nature and extent of contaminants of interest (COI) and the potential human health and ecological risks for this area and throughout Portland Harbor (Integral, 2011). The draft FS report, submitted to EPA in March 2012, describes the development and evaluation of remedial alternatives and identifies areas of potential concern (AOPC) and sediment management areas (SMA) (Anchor QEA et al., 2012). As described in the draft FS, AOPCs represent a general indicator of the areas of interest while SMAs define areas of active remediation for the various remedial alternatives. Two AOPCs, 11 and 12, have been identified in the RM6E area (see Figure 1-2). Numerous COIs, including metals, are present within these AOPCs; however, the SMAs are delineated only on the basis of the presence of polychlorinated biphenyls (PCB).

The focused sediment characterization will provide a better understanding of the extent of PCBs and metals in surface sediment in the RM6E area for restoration planning at Cathedral Park and to assess the upstream sediment conditions. These data also may support remedy selection decisions by the EPA.

Planned sampling activities include the collection of approximately 35 surface (upper 30 centimeters [cm]) sediment samples. All samples will be analyzed for total solids, 32 samples will be analyzed for PCB Aroclors, and seven samples will be analyzed for the following metals: arsenic [As], chromium [Cr], copper [Cu], lead [Pb], nickel [Ni], and zinc [Zn].[1] Additional sample volume will be collected from each location and preserved and archived for potential future analysis. Field observations and analytical results will be documented in a field and data report.

Field work is scheduled to begin in mid-April 2012 and anticipated to be completed in 1 week. Chemical analysis will be conducted at the City's Water Pollution Control Laboratory (WPCL) and the analytical results are anticipated within 2 weeks of sample submission. A field and data report will be submitted to the City and EPA in late June 2012.

[1] These metals have been previously observed above Joint Source Control Screening Level Values in the vicinity of City Outfall 50 and were collected within a year of bank and shoreline removal at the upstream Crawford Street property.

This SAP was prepared by GSI Water Solutions Inc. (GSI), under contract to BES.

1.1 DOCUMENT ORGANIZATION

This SAP is organized into eight sections in addition to the introduction (Section 1). Section 2 provides an overview of the project location, setting, and existing environmental data. Section 3 describes the general approach for sediment sampling. Section 4 describes the project organization, key personnel and roles, and the anticipated schedule. Section 5 details the field sampling procedures, including sampling methodology and field quality assurance/quality control (QA/QC) protocols and documentation. Section 6 describes the laboratory analysis program, including laboratory QA/QC protocols and data validation procedures. Data management is described in Section 7 and data reporting is addressed in Section 8. Cited references are listed in Section 9. Planned sampling locations and analytical parameters are provided in a series of figures and tables. Existing figures and other supporting documentation are provided in multiple appendices (A through C).

1.2 PURPOSE AND OBJECTIVES

The purpose of the focused sediment characterization is to gain a better understanding of the extent of PCBs and metals in the vicinity of Cathedral Park and the WPCL that are adjacent to portions of AOPCs 11 and 12. This study focuses solely on surface sediment and is designed to meet the following objectives:

- Better refine the nature and extent of PCBs and metals that are identified in the RI as being relatively elevated adjacent to and upstream of a potential restoration site (Cathedral Park).

- Better delineate the SMAs identified in the Portland Harbor draft FS for Alternatives E and F to understand the potential for active remediation in this area, depending on the alternative that EPA selects. The other alternatives evaluated in the draft FS did not result in SMAs at RM6E.

- Collect data of suitable quality to support an FS-level refinement and analysis of remedial alternatives associated with this area.

2.0 BACKGROUND

2.1 PROJECT LOCATION AND UPLAND SOURCES

The RM6E area is located within the Portland Harbor (RM 1.9 to RM 11.8) and is situated on the east bank underneath the St. Johns Bridge. The shoreline upland property owners are shown in Figure 1-2. The City owns both the Cathedral Park (Bureau of Parks and Recreation) and the WPCL (BES) properties.

The City properties are bounded to the north and south by former industrial sites that have been listed in the Oregon Department of Environmental Quality (DEQ) Environmental Cleanup Site Information (ECSI) Database. Upstream (south) of the WPCL property is the Crawford Street Corporation (ECSI Site ID: 2363). In October 2001, "black sand" was removed from the riverbank and beach, and clean fill was replaced on the riverbank. Residual contamination existing on the beach could include volatile organic carbons (VOC), polycyclic aromatic hydrocarbon (PAH), petroleum hydrocarbons, PCBs, and metals. A source control evaluation for riverbank erosion is currently underway. Until results of the source control evaluation are known, it is assumed by DEQ that this riverbank may be a current source.

The former MarCom Marine (MarCom) properties are located downstream (north) of the Cathedral Park Boat Ramp. The former MarCom South property (ECSI Site ID: 2250) has been used for ship and equipment repair, and for lumber manufacture, storage, and sales. Contaminated soil has been identified onsite and the COIs include VOCs, PAHs, PCBs, phthalates, organotins, and metals. Source control investigations have been conducted and a source control decision (No Further Action) was issued by DEQ on November 30, 2011, for the upland portion of the site above the ordinary high water (OHW; +20 feet North American Vertical Datum of 1988 [NAVD 88]) mark. Additional sampling below the OHW mark will be conducted in the summer of 2012.

The WPCL property (ECSI Site ID: 2452) is just upstream of Cathedral Park and was remediated in 1995 as part of the development of the facility. A source control decision (No Further Action) was issued by DEQ on April 26, 2010.

This reach of the Willamette River is characterized by a relatively deep channel and coarse-grained sediment, which are indicative of an energetic environment. The federal navigation channel (maintained at a depth of -40 feet, Columbia River) is located approximately 200 feet offshore in the lower portion of the study area, but steps out to approximately 450 feet offshore upstream of RM 5.75 (Figure 1-2). Some fine-grained sediment deposition occurs in the near-shore areas, although the area as a whole is characteristic of dynamic equilibrium in which net deposition and erosion generally cancel out. The RM6E sampling area is primarily located outside of the navigation channel in a lower energy nearshore environment dominated by sediment containing silty sands.

A log boom is present between the Cathedral Park Boat Ramp and the fishing dock on the south end of Cathedral Park (between approximately RM 5.7 and RM 5.85.) Remnant wood pilings and submerged debris are present behind this boom, making access difficult. Remnant pilings also are present in nearshore areas upstream of RM 5.93. TriMet removed a 20,000-square-foot field of derelict pilings in front of City Outfall (OF) 50 (Figure 1-2) in August 2011 (TriMet, 2011).

2.2 REVIEW OF AVAILABLE INFORMATION

LWG documents and data associated with the Portland Harbor RI/FS and information associated with BES sampling efforts in this area were reviewed to gain a preliminary understanding of contaminant distribution within RM6E.

LWG Inriver Investigation

The LWG collected surface sediment, subsurface sediment, beach sediment, sediment trap, tissue, and surface water samples from this general area (Integral, 2007a, 2007b, 2007c, 2008a, and 2008b; Anchor, 2008). Other, non-LWG samples represent a patchwork of data for various chemicals and sampling locations to support activities such as maintenance dredging of the navigation channel and environmental characterization by MarCom Marine, EPA, and the City between 1997 and 2008. Existing sample locations in the RM6E area are symbolized by sample matrix in Figure A-1 of Appendix A and descriptions of these sample tasks are provided in Table A-1 of Appendix A for reference.[2] The LWG and non-LWG data have been compiled by the LWG in a Site Characterization and Risk Assessment (SCRA) database, which is presented in Appendix H of the RI report (Integral et al., 2011) and further refined for use in the FS (Anchor QEA et al., 2011). However, data of unknown or suspect quality (Category 2 data) are excluded from the FS database and not used for plotting and mapping.

Evaluation of Inriver Data

The LWG prepared scatter plots and maps to evaluate concentrations of indicator chemicals as a function of river mile (within the Portland Harbor). These plots and maps, included in Section 5 the LWG RI report (Integral et al., 2011), are useful for assessing the relative concentrations of COIs at RM6E as compared to other segments of the Willamette River. For example, the plots suggest that concentrations of PCBs in tissue samples, (inriver) sediment traps, and surface water are not significantly elevated in this area compared to the rest of Portland Harbor.

The LWG identified slightly elevated concentrations of PCBs and other COIs in river bottom sediment. The highest PCB detections in surface sediment (460 micrograms per kilogram [µg/Kg]) and subsurface sediment (705 µg/Kg) were observed in front of the former MarCom private outfalls (WR-86 and WR-219). Figures 2-1 and 2-2 show the PCB concentrations in surface and subsurface sediment, respectively. Other slightly

[2] Note that a single point is mapped for the two composite beach sediment samples, but these points actually reflect composited sediment collected from the nearshore areas shown in Figure A-1.

elevated PCB detections were observed in two discrete locations, at approximately RM 5.75 (250 to 260 µg/Kg) and RM 6.0 (250 µg/Kg). With the exception of one subsurface sediment sample at RM 6.1 (maximum detection of 260 µg/Kg), elevated PCB concentrations in subsurface sediment were limited to the area in front of the former MarCom property between RM 5.5 to RM 5.7.

In addition to PCBs, concentrations of metals, tributyltin, and chlordane in front of the former MarCom property are relatively elevated in surface and subsurface sediment. Metals are also relatively elevated in nearshore surface sediment in front of the City OF 50 (RM 5.9) and in front of the Crawford Street Corporation property at RM 6.15. Note that no nearshore sediment samples have been collected and analyzed between these two locations. Copper concentrations in surface sediment are shown in Figure 2-3, which generally illustrates the distribution of metals and other COIs in the RM6E area. Other COI distribution maps are included in Section 5.1 of the RI report (Integral et al., 2011).

3.0 SAMPLING APPROACH

This section describes the sampling approach intended to meet the objectives of the focused sediment characterization. Thirty-five stations are identified for collection of surface sediment samples (approximately zero to 30 cm depth). Figures 3-1a through 3-1c show 33 of the proposed surface sediment sampling locations and indicate the chemical analyses to be performed on each sample. These figures also denote 14 samples where rush analysis will be requested (with preliminary results provided within 48 hours). Two sampling locations have been left undefined and are intended to fill in potential gaps identified following the rush analytical results described below. Sediment sample identifications, proposed location coordinates, and chemical analysis are listed in Table 3-1.

Surface sediment samples will be collected using power-grab sampling methodologies as described in Section 5. The sampling stations/locations are based largely on a grid and transect approach. With a few exceptions near RM 5.9, samples will be analyzed for PCBs and total solids at each station. Sediment from the nearshore stations in AOPC 12 will be analyzed for metals. Many of the grab sample locations are focused along nearshore areas beneath and shoreward of piers and loading dock structures. Some of these grab sample locations may be difficult to access by boat, or there may be in-water debris or obstructions that otherwise may preclude use of the power-grab sampler, so protocols are included for manual collection of surface sediment samples using divers, if necessary.

The sampling locations are intended to better delineate areas where PCBs exceed 200 µg/Kg, which defines the SMA boundary for the draft FS Alternative E. Sampling will be conducted in two phases. Samples within and directly adjacent to the outer edge of the Alternative E boundary will be collected first and sent to the WPCL for rush turn-around for PCB Aroclor analysis. Laboratory results of these initial samples will be used to the extent possible to either adjust the remaining sample locations or add new sample locations.

Split samples from each grab sampling location will be archived (frozen) at the WPCL for possible additional chemical and physical analysis in the future.

4.0 PROJECT ORGANIZATION

This section describes the organizational structure for sampling and analysis activities associated with the focused sediment characterization, including fieldwork, laboratory services, data validation, data management, reporting, and schedule.

4.1 TEAM ORGANIZATION AND RESPONSIBILITIES

This SAP will be implemented by a team of consultants, subcontractors, BES Field Operations (FO) staff, and the WPCL. GSI, under contract to BES, will serve as the principal consultant and will oversee and coordinate all field sampling activities.

4.1.1 Project Manager

Kevin Parrett, PhD (GSI) is the Project Manager (PM). In this role, he will oversee all phases of the work and will be the point of contact for BES. Kevin will work closely with the Field Director (FD) and other project staff to ensure that the project objectives are achieved. Principal deviations from the SAP will not be made without prior approval from the PM.

The PM is generally responsible for the following:

- Oversee the planning and implementation of all field sampling efforts in accordance with the SAP.
- Coordinate with the FD to address any field problems, approve deviations to SAP, or resolve other emergencies that could arise.
- Facilitate sample collection and delivery as needed.
- Assist safety operations and investigation-derived waste (IDW) management.
- Track schedule and performance of the sampling and analysis activities according to the SAP.

4.1.2 Field Director and Sampling and Analysis Coordinator

Erin Carroll, RG (GSI), is the FD and the Sampling and Analysis Coordinator (SAC), and will report directly to the PM and coordinate with other project staff. The FD is generally responsible for the following:

- Serve as the registered geologist in conducting geological interpretations.
- Direct the planning and implementation of all field sampling efforts, including arranging for necessary sampling equipment and overseeing the operations of vessel subcontractors (described below).
- Mobilize for field work and direct all aspects of the sampling to ensure that the appropriate procedures and methods are used in accordance with the SAP.
- Coordinate with the WPCL and BES FO staff to facilitate sample deliveries.

- Log, photograph, and process surface sediment samples on the vessel.
- Coordinate closely with the PM and other BES FO staff to address any field problems, deviations from the SAP, or other emergencies that could arise.
- Function as the field safety officer and ensure that the sampling activities adhere to the Health and Safety Plan (HSP) and are in general compliance with 29 *Code of Federal Regulations* (CFR) 1910.120.
- Maintain copies of field documentation and laboratory chain-of-custody (COC) forms.
- Assist the PM in tracking schedule and performance of the sampling and analysis activities according to the SAP.
- Assist with IDW management.

The FD will work closely with the PM to fulfill the listed responsibilities and may be assisted at times by other project staff.

4.1.3 BES Field Operations Staff

BES FO staff will work closely with the FD to facilitate the field sampling efforts. It is anticipated that this project will require full-time support from one FO staff member during the active sampling efforts. The primary responsibilities of the FO staff will be:

- Coordinate with the WPCL to acquire sampling materials (e.g., sample containers, decontamination solutions, coolers, ice, temperature blanks, etc.) for use on the vessel.
- Assist with sample collection and processing efforts on the vessel.
- Assist with equipment decontamination and the collection of rinsate blanks.
- Work with the FD to ensure that field documentation is complete and accurate, as per the procedures outlined in this SAP.
- Assume primary custody of the surface sediment samples and in accordance with the COC procedures outlined in this SAP.
- Transport samples to the WPCL at the end of each day and bring coolers with fresh ice onto the vessel each morning.
- Provide copies of relinquished COCs to the FD.
- Assist with IDW management.

The assigned FO staff member may be assisted at times by other FO staff members, the WPCL staff, or the FD to fulfill the listed responsibilities.

4.1.4 Vessel Operations

Sampling will be facilitated by Research Support Services (RSS) of Bainbridge Island, Washington, under contract to GSI. RSS will provide the marine vessel, sediment sampling equipment and operators, and location control using a differential global positioning system (GPS). Eric Parker (RSS) has performed similar work within Portland Harbor, has extensive experience in collecting surface sediment grab samples, and will provide additional diving services for manual grab sample collection at limited access locations.

The FD will be present on the vessel and oversee sampling activities of RSS. The FD will be assisted on the vessel by City support staff.

4.1.5 Quality Assurance Managers

QA managers have been assigned for field sampling activities and laboratory services. All QA managers will report to the PM.

Field QA Manager

Erin Carroll (GSI) also will serve as the Field QA Manager to ensure that all appropriate field procedures and methods are followed. Periodically, the PM will observe activities of the Field QA Manager/FD during implementation of the focused sediment characterization.

The Field QA Manager may be assisted at times by other field staff.

Chemistry QA Manager

James McAteer (QA/QC Solutions LLC), under contract to GSI, will serve as the Chemistry QA Manager. He will coordinate with the WPCL and will conduct the third-party QA review of the analytical data. James McAteer will add qualifiers to the electronic data deliverable (EDD) from the laboratory, as required during data review and validation (Section 6.3), and prepare a data quality assessment report; the data validation report will be appended to the field and data report (Section 7).

4.1.6 Data Management

Erin Carroll (GSI) will serve as the Data Manager (DM) and will maintain the project database. She will coordinate directly with the PM, Chemical QA Manager, and the laboratory, as needed. Validated laboratory results will be provided as electronic deliverables to the DM by the Chemistry QA Manager. The DM will coordinate with the Chemistry QA Manager to determine the appropriate data deliverable structure, verify the satisfactory electronic transfer of validated data, maintain the integrity of the dataset, and oversee all data queries and reporting.

4.1.7 Laboratory Services

The City's WPCL is the primary laboratory for the focused sediment characterization. The WPCL will perform all of the physical chemical analyses of the river sediment samples collected. Peter Abrams will serve as the point of contact for the WPCL and will work with laboratory managers and the WPCL QA Specialist to oversee laboratory performance in accordance with the SAP. Peter works for the Investigation and Monitoring Services (IMS) group within the City's Environmental Investigations Division. He has helped to coordinate most of the upland project work related to Portland Harbor and is familiar with the City's *Amended Programmatic Quality Assurance Project Plan* (QAPP; City of Portland, 2007).

The WPCL is a full-service analytical laboratory and has expertise in the analysis of various complex matrices for inorganic and organic parameters, including solids analyses conducted for the Portland Harbor RI/FS.

4.2 HEALTH AND SAFETY

The primary hazards for the sampling event are physical hazards associated with the river environment and working on a vessel with moving (and heavy) equipment. Diving for sediment sample collection also requires careful adherence to safety procedures. The field crew will exercise sound field judgment and practices to maintain a safe working environment during sample collection and during all field activities described in this SAP.

The field crew will comply with HAZWOPER regulation under 29 CFR 1910.120. Consultants, subcontractors, and the City FO personnel will prepare and adhere to their own HSP and will be responsible for their own health and safety. As noted above, the FD will function as the field safety officer during the field work and while on the vessel and will determine the limits of safe practice and operating conditions during field activities. The FD will confirm that field personnel have up-to-date 8-hour refresher training and also will provide a safety briefing at the beginning of the field work and periodically during the sampling event, as needed (e.g., when conducting new or different field activities). The FD also will provide a safety briefing to any new participant involved in the field activities.

4.3 PROJECT SCHEDULE

The target start date for field work is April 16, 2012. Sediment grab sampling is scheduled for completion by April 20, 2012. The actual field schedule may be affected by subcontractor availability, adverse weather, river levels, access to sampling locations, equipment conditions, and other unforeseen factors.

Laboratory analyses will be completed in phases, with 48-hour turn-around requested on the samples collected during the first 2 days of fieldwork. For the remaining samples, a

turn-around time of approximately 10 business days is anticipated with electronic data reports provided to the Chemistry QA Manager for review and validation beginning approximately on May 7, 2012. Further information on data reporting is provided in Section 7.

5.0 SAMPLE COLLECTION PROCEDURES

This section describes the procedures that will be used for sample collection, recordkeeping, sample handling, storage, shipping, and field QC. These procedures are based closely on the LWG's *Portland Harbor RI/FS Round 3B Comprehensive Sediment and Bioassay Testing Field Sampling Plan* (Integral, 2007d), which was reviewed extensively by EPA and DEQ before implementation.

5.1 SAMPLING VESSEL

RSS will mobilize the vessel *Carolyn Dow* to conduct portions of the power-grab sampling near and around shoreline areas and overwater structures, and to stage diving operations for sediment trap installation and quarterly sampling. The *Carolyn Dow* is a 32-foot-long Munson design low-tunnel catamaran landing craft with flat-deck design to support all sampling and diving operations with support crew. A hydraulically operated A-frame with boom provides up to 4,000 pounds of hydraulic winch capacity when operated over the ship's 3-foot by 5-foot moon hole. The vessel draft is 2 feet and can deploy hydraulic power-grab sampling equipment provided by RSS.

The FD will direct the operations of RSS during the sampling event.

5.2 NAVIGATION AND STATION LOCATING

Station positioning from the sampling vessel will be accomplished using a GPS with pre-loaded target sample location coordinates. RSS will operate the GPS and attempt to position the grab sampler as close as possible to the target sample location. After the sampling equipment has been deployed, the actual latitude and longitude coordinates will be obtained when the equipment is on the river bottom, using a GPS on the vessel. The standard projection method to be used during field activities is Horizontal Datum: North American Datum of 1983 (NAD 83), State Plane Coordinate System, Oregon North Zone. The positioning objective is to accurately determine and record the positions of all sampling locations to within ± 6 feet . Station accuracy may be affected by satellite positioning and obstructions, such as the St. Johns Bridge and heavy cloud cover. The vessel operator or the FD will record the coordinates for each sample location in the field logbook and will mark the approximate sample location on a high-resolution aerial photo. Difficulties in achieving satellite coverage will be noted in the logbook.

Vertical positioning is required to establish the elevation of the river bottom at the sampling locations. While the sampling device is in place at the sampling station, depth to the river bottom will be measured using a lead line or fathometer immediately before or during the sampling. Vertical measurements will be recorded to the nearest 0.1 foot. Willamette River stage data is recorded on a 30-minute basis from U.S. Geological Survey (USGS) station number 14211720 (USGS, 2011). This station is located on the upstream side of the Morrison Bridge (RM 12.8). River stage elevation data reported by the USGS are relative to the Portland River Datum at this location. The river stage data

are corrected to NAVD88 at approximately RM 6 by adding approximately 5 feet to the USGS reading. The depth to river bottom measurements will be combined with the corrected river stage data to estimate an elevation of the river bottom at each sample location.

During sediment sampling, the combination of river levels and subsurface obstructions may preclude collecting a sample at the target location. Attempts will be made to relocate the sample to an area that has comparable sediment characteristics and rationale objectives for the initial location. All samples will be collected within 45 feet of the target sampling location, when possible. The FD will contact the PM regarding any significant revisions to sampling locations, and any revised location will be appropriately documented.

5.3 FIELD LOGBOOK AND FORMS

The field activities and observations will be noted in a field logbook. Information will include personnel, date, time, station designation, sampler, types of samples collected, and general observations. Any changes that occur at the site (e.g., personnel, responsibilities, deviations from the SAP) and the reasons for such changes will be documented in the field logbook.

Logbook entries will be written clearly with enough detail so that participants can reconstruct events later, if necessary. Requirements for logbook entries include the following:

- Logbooks will be bound, with consecutively numbered pages.
- Removal of any pages, even if illegible, will be prohibited.
- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The date and time, based on a 24-hour clock (e.g., 0900 a.m. for 9 a.m. and 2100 for 9 p.m.), will appear on each page.
- When field activities are complete, the logbook will be retained in the project file at GSI's Portland, Oregon, office.

In addition to the preceding requirements, the person recording the information must initial each page of the field logbook. If more than one individual makes entries on the same page, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry of each day.

Logbook corrections will be made by drawing a single line through the original entry allowing the original entry to be legible. The corrected entry will be written alongside

the original. Corrections will be initialed and dated and may require a footnote for explanation.

The type of information that may be recorded in the field logbook and/or field data forms includes the following:

- Names of all field staff.
- Sampling vessel.
- A record of site health and safety meetings, updates, and related monitoring.
- Station name and location.
- Date and collection time of each sample.
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort.
- Sample description (e.g., texture, coloration, and other characteristics detailed in Section 5.6.2).
- Depth of the river bottom below water surface.
- Any deviation from the SAP.

Field notes and sample description forms will be completed for all samples and kept in the project file. A sample Grab Sample Description Log is provided in Appendix C.

The FD is responsible for ensuring that the field logbook and all field data forms are completed and accurate.

5.4 EQUIPMENT AND SUPPLIES

Equipment and supplies will include sampling equipment, utensils, decontamination supplies, sample containers, coolers, logbooks and forms, personal protection equipment, and personal gear. Protective wear (e.g., hard hats, gloves), as required for the health and safety of field personnel, will be as specified in the HSP. A staging area for field equipment and supplies will be available in the FO office at the WPCL.

Sample containers, decontamination fluids, as well as coolers and ice, will be supplied by the WPCL. Commercially available, pre-cleaned and certified jars will be used. Sample containers will be clearly labeled at the time of sampling. Labels will include the project name, sample location and number, sampler's initials, analysis to be performed, date, and time. The nomenclature used for designating field samples is described in Section 7.1.4.

5.5 EQUIPMENT DECONTAMINATION PROCEDURES

Equipment that comes in direct contact with sediment samples, such as scoops, spoons, and mixing bowls, will be decontaminated in the following manner before use at each station and between field replicates:

- Rinse with site water.
- Wash with brush and Alconox™ or other phosphate-free detergent.
- Double rinse with distilled water.
- Rinse with 0.1 percent N nitric acid.
- Rinse with deionized water.
- Rinse with methanol or ethanol.

The sediment grab samplers will be rinsed between stations with site water. If the grab sampler contacts visibly contaminated sediment, it will be thoroughly washed using Alconox™ or other phosphate-free detergent and rinsed with site water before sampling a new station.

Decontamination of stainless-steel bowls and utensils will be performed before sampling and between each composite sample. Sample handling equipment also will be wrapped in aluminum foil following the methanol rinse. Before being used to remove sediment from the samplers, all equipment will be rinsed with deionized water. To minimize sample contamination, gloves will be replaced or thoroughly washed using Alconox™ or other phosphate-free detergent and rinsed with distilled water before and after handling each sample, as appropriate. Decon solutions containing Alconox™, nitric acid, or methanol/ethanol will be held in sealed plastic buckets and disposed of at the WPCL.

5.6 SEDIMENT SAMPLING PROCEDURES

This section describes the sampling procedures for the collection of surface sediment grab samples for chemical analysis. These procedures were developed from the LWG standard operating procedures (SOP) for sediment sample collection as presented in the *Round 3B Field Sampling Plan* (Integral, 2007d).

5.6.1 Surface Grab Sampling

Surface sediment grab samples for chemistry analyses will be collected using standard protocols and guidelines (e.g., EPA, 2001; USACE et al., 1998; PSEP, 1986), as described below. Procedures are described for power-grab sampling, which is anticipated for most stations/locations. Procedures for collecting grab samples manually using divers also are included if boat access or power-grab operation is restricted at some locations.

Power-Grab Collection

Before sampling, target station coordinates will be entered into the navigation system (see Table 3-1 for target coordinates). After the sampling equipment has been deployed, the actual position will be recorded when the equipment is on the river bottom. All samples will be collected within 45 feet of the target sampling location, when possible. Surface sediment samples will be collected in a consistent, repeatable manner with a

stainless-steel, approximately 0.3-square meter (m^2) hydraulic power-grab sampler provided by RSS.

The power-grab sampler will be attached to the winch cable. The device will be raised and lowered through the water column by the vessel's winch at a rate no more than 60 feet/minute. This will ensure that the sampler does not flip over on descent and will prevent disturbance of the sediment surface upon retrieval. After the sampler is brought onto the vessel, it will be secured by the vessel operator. Access doors in the cover on the top of the sampler will allow visual characterization of the sediment surface to assess sample acceptability. Before characterization, the overlying water in the sampler will be removed with a disposable suction pipette.

The maximum penetration of the power-grab sampler is 30 cm and this is the target depth for sample collection. A minimum penetration of 20 cm will constitute an acceptable grab if a 30-cm depth sample cannot be obtained.[3] A minimum of three consecutive casts of the grab will be attempted while trying to achieve the 30-cm target depth or 20-cm minimum penetration. If a 20-cm penetration cannot be attained, the sampling crew will go to the next station. Following consultation with the PM, the target coordinates at the unsuccessfully sampled station may be adjusted, a lesser penetration depth may be accepted, or the station may be deferred for manual collection by a diver.

The following physical characteristics of the surface sediment grab samples will be described and recorded on the grab sample description form (see Appendix C); sediment texture; sediment color; presence, type, and strength of odors; grab penetration depth (nearest cm); degree of leakage or sediment surface disturbance; and any obvious features or characteristics, such as wood or shell fragments or large organisms. In addition, at least one photo of each successful grab sample will be taken.

Because an undisturbed sediment surface is desired for chemical sampling, the physical characterization of the sediment in the grab sample will be delayed until after the chemical samples have been collected. Sediment for chemical analyses will be collected from the sampler using a stainless-steel spoon. Sediment that is in contact with the sides of the sampler will not be sampled. Large organisms and pieces of debris will be removed and noted in the sample description form. The sediment sample then will be placed into a stainless-steel mixing bowl for homogenization. Up to approximately 24 ounces of sediment will be needed at stations where both PCB and metals analyses are planned (Tables 3-1 and 5-1) and for sample archiving and laboratory QA/QC. A single cast of the power-grab to the minimum depth should provide adequate sediment volume; therefore, only one power-grab sample will be collected at each target location. After filling one or two 8-ounce sample jars for planned chemistry analyses (Table 5-1), an additional 8-ounce jar of the homogenized sediment will be collected from the mixing bowl for frozen archival at the WPCL.

[3] A recovery between 10 and 20 cm may be acceptable under certain field conditions to be determined by the PM and FD.

If sediment collected by the sampler is grossly contaminated (e.g., oily), the sediment residuals will, to the extent practicable, be retained in a designated waste drum on the vessel and managed as described in Section 5.10.

Manual-Grab Collection

At some nearshore grab sample locations, boat access may be limited or there may be in-water debris or obstructions that otherwise preclude use of the large power-grab sampler. Under these circumstances, grab samples may be collected manually by divers using a stainless-steel 35-cm hand corer. The large diameter of the corer (20 cm) minimizes sediment compaction and disturbance, allows for retention of fines, and is anticipated to yield adequate sample volumes for project sampling objectives.

The sample location is marked from the vessel or by other means with a marker buoy. A single, line-tended diver will descend with the sampler. After the sampling station is reached, the diver will remove a sliding door from the base of the sampler and open the vent at the top of the sampler. The diver will manually push the corer into the sediment until the top of the sampler is flush with the river bottom. A small trough will be excavated beside the sampler to allow insertion of the sliding door without disturbing the sample.

The corer and enclosed sediment then will be brought carefully to the surface and transferred to the vessel for description and processing similar to sample preparation for other grab samples described above.

Sample Handling and Storage

The homogenized grab samples will be distributed to the appropriate sample containers according to the sample requirements identified in Table 5-1. Because environmental samples are not being collected for VOCs or for toxicity tests in which oxidation of sulfides may be of concern, compositing and homogenizing of the sediment are acceptable.

All sample containers will be filled, leaving 0.5 to 1 inch of headspace to prevent the jars from breaking during storage. Sediment samples will be stored on ice before unloading onshore. At the end of each day, samples will be transferred in coolers to the WPCL. At approximately 5 percent of the stations, equipment rinsate blanks, and field split samples will be prepared and submitted to the WPCL for analysis; field QC sampling is described in Section 5.8.

5.8 FIELD QUALITY CONTROL SAMPLES

QC requirements will be instituted during field sampling, sample transfer, and data management to ensure that the data quality objectives are met; detailed information on laboratory QA/QC procedures and reporting are provided in Section 6.2. WPCL staff will ensure that all QC protocols are followed upon receipt of the samples at the laboratory. Field QC procedures are described further in this section.

If any field QC problems are encountered, they will be brought to the attention of the PM, FD, or Chemistry QA Manager. Corrective actions, if appropriate, will be implemented to meet the project's data quality objectives.

5.8.1 Field QC Sample Types

Field QC samples are used to assess within-station variability (e.g., replicates), evaluate the effectiveness of sample homogenization and within-sample variability (e.g., splits), evaluate potential sources of sample cross-contamination (e.g., rinsate and trip blanks), or confirm proper shipping/storage conditions (e.g., temperature blanks). Replicate samples will not be collected during the sampling event because sediment heterogeneity is not a primary objective of the focused sediment characterization. In addition, trip blanks will not be collected because volatile compounds are not a target analyte for the focused sediment characterization.

The types of QC samples that will be collected during the sampling event are described below.

Split Samples (Field Duplicate Samples)

Field split samples, also called “field duplicate” samples, are multiple samples taken from a single sample composite after it is fully homogenized. The resulting data provide information on the variability associated with sample preparation/handling and laboratory analysis operations. Their origin is not revealed to the laboratory. Field split samples will be collected at approximately 5 percent (two) of the sediment sampling stations as shown in Table 5-1.

Rinsate Blanks

The introduction of chemical contaminants during sampling and analytical activities will be assessed by the analysis of rinsate blanks. Rinsate blanks, consisting of sampling equipment rinsates, will be generated for all chemical parameter groups at approximately 5 percent (two) of the sediment sampling stations and submitted for analysis to the laboratory.

Temperature Blanks

Temperature blanks are used to measure and ensure cooler temperature upon receipt of samples at the laboratory. One temperature blank will be prepared and submitted with each cooler delivered to WPCL. The temperature blank will consist of a sample jar containing deionized water that will be packed into the cooler in the same manner as the rest of the samples and labeled "temp blank."

5.9 SAMPLE HANDLING AND TRANSPORT

Samples will be traceable from the time of collection through laboratory and data analysis. To ensure samples collected during the focused sediment characterization are traceable, the following procedures will be followed.

5.9.1 Chain-of-Custody Procedures

Samples are in custody if they are in the custodian's view, stored in a secure place with restricted access, or placed in a container secured with custody seals. A COC record will be signed by each person who has custody of the samples and will accompany the samples at all times. Copies of the COC will be included in laboratory and QA/QC reports.

An example COC form is provided in Appendix C. At minimum, the form will include the following information:

- Site name.
- Field task leader's name and team members responsible for collection of the listed samples.
- Collection date and time of each sample.
- Sampling type (e.g., composite or grab).
- Sampling station location.
- Number of sample containers shipped.
- Requested analysis.
- Sample preservation information.
- Name of the carrier relinquishing the samples to the transporter, noting date and time of transfer and the designated sample custodian at the receiving facility.

The PM and FD will share responsibility for sample tracking and COC procedures for samples collected in the field, and will be responsible for any final sample inventory and maintaining sample custody documentation. COC forms normally will be completed before removing samples from the sampling vessel. When transferring sample custody, the COC will be signed, dated, and the time of transfer will be noted on the form.

The original COC form will be transported with the samples to the laboratory. The laboratory also will designate a sample custodian, who will be responsible for receiving samples and documenting their progress through the laboratory analytical process. Each custodian will ensure that the COC and sample tracking forms are properly completed, signed, and initialed upon transfer of the samples.

Because the WPCL is located adjacent to the sampling location, samples will be hand-delivered to the WPCL on ice in sound coolers at the end of each day. Samples may be securely stored and refrigerated in the BES FO lab, inside of the WPCL facility for one or

more days to decrease the number of sample batches processed by the laboratory. After sample batches have been compiled, samples will be transferred by the FO staff to the laboratory sample custodian and tracked using the COC. It is anticipated that samples will be transferred out of the coolers and into the refrigerators at the time of delivery. Coolers and fresh ice will be housed at the WPCL and picked up by the FO staff at the beginning of each day.

Upon receipt of the samples at the laboratory, the laboratory sample custodian will inventory the samples by comparing sample labels to those on the COC document. The custodian will enter the sample number into a laboratory tracking system by project code and sample designation. The custodian will assign a unique laboratory number to each sample and will be responsible for distributing the samples to the appropriate analyst or for storing samples in an appropriate secure area. Specific laboratory COC procedures are described in the City's QAPP.

5.9.2 Sample Transport and Delivery

The WPCL will supply sample coolers and packing materials (ice) for the sampling event. Individual sample containers will be labeled and placed into a sealed plastic bag to prevent loss of the sample should breakage occur. Samples then will be packed in a cooler on ice to maintain a temperature of approximately 4ºC. A temperature blank will be added to each cooler.

At the end of each field day, coolers will be hand-delivered to the laboratory by the FO staff and a completed COC form will accompany all samples. The COC form documents transfer of sample custody from the field sampler to the laboratory sample custodian. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the COC.

5.10 WASTE MANAGEMENT

Any excess water or sediment remaining after processing will be returned to the river near the collection site. Similarly, any water or sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site before proceeding to the next station. Decon solutions containing Alconox™, nitric acid, or methanol/ethanol will be held in sealed plastic buckets and disposed of at the WPCL at the conclusion of the sampling event.

If oily or other obviously contaminated sediment is generated during sampling, the material will be retained, to the extent practicable, in 5-gallon buckets (or, if necessary, a 55-gallon drum) stored on the vessel and designated (and labeled) for IDW management. During transfer to the drum, if used, a representative sample of the sediment will be placed in an appropriate container for later compositing to prepare a representative sample for submittal to the laboratory for waste characterization analysis; a dedicated spoon will be reserved for transferring any obviously contaminated materials to the drum

or IDW sample jar. If more than one station exhibits oily contamination, the material will be retained in the same drum until a composite sample is collected from the drum as a representative IDW sample. At the completion of the project, the drum(s) will be properly labeled and offloaded at the dock for temporary storage at the WPCL. The IDW bucket sample or representative IDW drum sample (if waste is generated) will be submitted to the WPCL separately for waste characterization analysis for the following parameters: flash point; toxicity characteristic leaching procedure metals (8); pesticides; PCBs (as Aroclors); and VOCs. After IDW sample results are available, BES FO staff will coordinate with GSI and a local waste management company to arrange proper disposal.

All disposable materials used in sample collection and processing, such as paper towels and disposable coveralls and gloves, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies will be removed from the vessel by sampling personnel and placed in a normal refuse container for disposal at a solid waste landfill.

6.0 LABORATORY ANALYSIS AND QUALITY ASSURANCE/QUALITY CONTROL

This section summarizes the analytical program that will be performed on samples collected during the focused sediment characterization. Procedures for chemical analysis and laboratory QA and QC conform to the City's QAPP (City of Portland, 2007), which has been reviewed and approved by DEQ. The QAPP employs EPA, American Standard Test Method (ASTM), and other regulatory-accepted methods and protocols. These protocols will be followed to ensure that data quality and representation are in accordance with method requirements and data usability is appropriately assessed for the project objectives.

6.1 PHYSICAL AND CHEMICAL ANALYSES

The WPCL will perform the physical and chemical analyses on all RM6E samples. Surface sediment (grab) samples will be analyzed for total solids, PCB Aroclors, and/or metals as listed in Table 3-1 and shown in Figure 3-1. The corresponding analytical methodologies to be used for the sampling event are provided below:

- Total Solids – ASTM Standard Method (SM) 2540G
- Metals – (As, Cr, Cu, Pb, Ni, Zn) – EPA 6020
- Low-level PCBs as Aroclors – EPA 8082

Laboratory methods and the associated method reporting limits (MRL) for all target analytes are summarized in the QAPP.

6.2 LABORATORY QA/QC PROCEDURES

Laboratory QA/QC will be maintained through the use of standard EPA methods and other accepted methods and standard analytical procedures for the target analytes. The method-specific and other analytical and laboratory QC procedures and protocols followed are detailed in the QAPP. These procedures incorporated the collection and analysis of the following laboratory QA/QC components:

- Internal QC samples
- Method reporting limit checks
- Method blanks
- Matrix spike (MS) and matrix spike duplicate (MSD) samples
- Laboratory blank spikes
- Surrogate spikes
- Calibration check samples

- Laboratory replicates

Analytical QC measurements will be performed exclusively on sample matrices from the RM6E project and samples from other projects will not be mixed with the RM6E sample analyses.

6.3 DATA VALIDATION PROCEDURES

Validation and reporting of data quality will follow: *Guidance on Environmental Data Verification and Validation* (EPA, 2002); *EPA CLP National Functional Guidelines for Organic Data Review* (EPA, 1999); *EPA CLP National Functional Guidelines for Inorganic Data Review* (EPA, 2004); *EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like PCB Data* (EPA, 1995); and, following method-specific and laboratory-established QC requirements and other EPA-approved or accepted methods and protocols for analysis, as applicable.

The Chemistry QA Manager will coordinate with the contract laboratories during performance of the chemical analyses and through delivery and validation of the laboratory results. The Chemistry QA Manager will perform data validation of the reported results to document the performance of the laboratory analyses and to determine the usability of the data toward meeting project objectives. The data validation generally will address the following components:

- Case narratives discussing analytical problems (if any) and procedures.
- COC documentation to verify completeness of the data set.
- Sample preparation logs or laboratory summary result forms to verify analytical holding times were met.
- Results for applicable instrument tuning, initial calibrations, and continuing calibration verifications results to assess instrument performance (summary of results review only).
- Results for applicable instrument blanks (i.e., initial calibration blanks and continuing calibration blanks) and method blanks, to determine whether an analyte reported as detected in any sample was the result of possible contamination introduced at the laboratory.
- Results for applicable internal standards performance to ensure that instrument sensitivity and response were stable during the analysis of the samples.
- Results for applicable surrogate compound, laboratory control sample (LCS) (i.e., blank spike), duplicate LCS, MS, and MSD recoveries to assess analytical accuracy.
- Results for applicable laboratory duplicate sample, duplicate LCS, and MSD analyses to assess analytical precision.

- A review of instrument printouts (e.g., chromatograms, mass spectra, and quantification reports) to assess the validity of analyte identification as either detected or undetected.
- Verifying quantification of sample results and applicable quality control measurement results (e.g., instrument calibrations; surrogate, MS/MSD, and LCS recoveries; and other applicable information for accuracy and precision) by recalculation.
- Review of laboratory summaries of analytical results.

A full data validation review will be performed on 10 percent of the data and an abbreviated review will be performed on the remaining 90 percent of the data. A comprehensive review of all chromatograms from analysis of PCBs also will be performed. If significant, systemic QC problems are discovered, the Chemistry QA Manager will consult with the PM to determine if full data validation is warranted for additional samples. To accommodate the potential for additional data validation, the laboratories will provide EDDs for all samples.

The findings of the data validation will be presented in a data quality assessment report that will be appended to the field and data report prepared for the focused sediment characterization (Section 7). Final, qualified (as necessary) laboratory results will be transmitted in electronic format to the DM for data management, further evaluation, and reporting.

7.0 DATA MANAGEMENT

Data management protocols for both field data and electronic data will be implemented to provide consistent, accurate, and defensible documentation of data quality. Data generated as part of the focused sediment characterization will be documented and managed as described in this SAP. These data will include field logbooks, grab sample description logs, photographs, and electronic data files.

7.1 FIELD DATA MANAGEMENT

Field activities and observations will be described in field logbooks during implementation of the sampling activities. The procedures and requirements for logbook entries are detailed in Section 5.3.

Daily field records (a combination of field logbooks and data sheets) and navigational records will make up the main documentation for field activities. The SAP components most applicable to field activities are summarized in the following sections.

7.1.1 Field Logbooks

Field activities and observations will be described in field logbooks. The procedures and requirements for logbook entries are detailed in Section 5.3.

7.1.2 Field Data Sheets

Grab sample description forms will be completed for all samples and kept in the project file as a permanent record of the sampling or field measurement activities. This form and a sample COC form are provided in Appendix C. A reference date and activity will be entered into the logbook to refer to the field data sheets being generated. If field data sheet entries are entered in an electronic format, each sheet will indicate who completed the data entry and when. The FD is responsible for ensuring that all field data sheets are correct; GSI will ensure that field records are maintained in the project file.

7.1.3 Field Data Management

As soon as possible after collection, field notes and data sheets will be copied and scanned to create an electronic record for the project file. Relevant field data will be hand-entered into the database. At least 20 percent of the transferred data will be verified on the basis of hard copy records. Electronic QA checks to identify anomalous values also will be conducted following entry.

7.1.4 Sample Identification

Station identification numbers and coordinates for surface sediment sampling locations are listed in Table 3-1. During sample collection, a unique code will be assigned to each sample as part of the data record. This code will indicate the project phase, sampling location, sample type, and level of replication/duplication.

All samples will be assigned a unique identification number based on a sample designation scheme designed to meet the needs of the project personnel and data users. Sample identifiers will consist of two to four components separated by dashes. The first component, RM6E, identifies the data as belonging to the RM6E sampling event. The second component will contain a one-letter abbreviation for the sample type followed by the station number. The following abbreviation for sample types will be used:

G = Grab, surface sediment sample

Additional codes may be adopted, if necessary, to reflect sampling needs. Leading zeros will be used for stations with numbers less than 100 for ease of data management and correct sorting.

For field duplicates or split samples, sequential numbers starting at 500 will be assigned and integrated with the station ID number of the original sample. For equipment rinsate blanks, sequential numbers starting at 900 will be assigned and integrated with the station ID number. The sample type code (i.e., G) will correspond to the sample type for which the field split sample or rinsate blank was collected.

Examples of sample identifications are offered below for grab (surface sediment) samples:

RM6E-G001: grab sediment sample from Station 1.

RM6E-G501: duplicate grab sediment sample from Station 1.

RM6E-G905: equipment rinsate blank sample during collection of grab sample from Station 5.

7.1.5 Chain-of-Custody

The COC record provides documentation of sample possession and handling from the time of collection through sample transfer and management at the WPCL.

COC forms and procedures are described in Section 5.9.1.

7.2 ELECTRONIC DATA MANAGEMENT

Electronic data management protocols generally will be consistent with those developed by the LWG, but the data will be handled using MS Excel and MS Access rather than EQuIS® database (EarthSoft, Inc.).

7.2.1 Database Management

To the extent practicable, field measurements as well as qualitative analytical data will be incorporated into Excel and/or an Access database by the DM. The project database will include only data necessary for utilization in the focused sediment characterization field and data report tables. These data will include grab sample results, field duplicates, and rinsate blank sample results. Remaining laboratory QA/QC results (such as laboratory duplicates, dilutions, MS, surrogates, and method blanks will be presented in the associated laboratory reports and discussed in the associated data validation report. Data management, reduction, and handling procedures are discussed further in this section.

Electronic Data Deliverables (EDD)

Sediment samples will be submitted to the WPCL for physical chemical analyses. After analyses are completed, the laboratory will provide EDDs. The EDDs will be sent from the laboratory to QA/QC Solutions LLC and GSI. The validated files will be forwarded to GSI after QA/QC Solutions LLC has completed data validation according to the procedures in Section 6.3. Copies of the EDDs will be made and the contents will be modified to reflect adjustments identified during the data validation process. The primary modification is expected to be the addition of a field for the data validation qualifier, where the final qualifier for the result will be placed. This procedure ensures the original laboratory qualifiers remained intact. Additional information needed to complete the database (such as sampling locations and field split information) will be compiled by GSI for inclusion into the RM6E database.

Database Quality Control

Data entered from the EDDs into the project database will be double checked against the hard copy lab reports for accuracy and completeness. Additionally, Access will be used to check information such as date and time formats, and text field lengths to ensure consistency throughout the database. Original copies of the EDDs will be saved for purposes of documenting and tracking the data.

Database Deliverables

An Excel flat file will be generated that will include the reduced data set (i.e., it will include the calculated averages described in Section 7.2.2 and not the individual sample results) for RM6E samples. The flat file will contain only data collected as part of the focused sediment characterization.

7.2.2 Data Reduction and Handling

Data reduction and handling will be done in general accordance with the data management rules described in the following documents:

- *Portland Harbor RI/FS Draft Final Remedial Investigation Report* (Integral, 2011).
- *Portland Harbor RI/FS Round 3B Sediment Data Repo*rt, Appendix D, Summation Rules and SCRA Combo Database, Excel® Flat File Format (Integral, 2008).
- *Portland Harbor RI/FS Technical Memorandum: Guidelines for Data Averaging and Treatment of Non-detected Values for the Round 1 Database* (Kennedy Jenks, 2004).

Data Summation Rules

The Portland Harbor RI/FS guidelines provide two sets of rules for summing data and retaining or modifying qualifiers (RI data set summation rules and baseline risk assessments [RA] and the background data set summation rules), and for reducing the data to a single value per sample analyte. The summation rules apply to select analytical groups such as PCB Aroclors. The "RI data rules" are intended for site characterization and generally use zero to represent non-detect values while the "RA/background data rules" are intended for RA and determination of background preliminary remediation goals and generally use one-half the MRL to represent non-detect values: the RA/background data rules are more conservative in that they result in higher values than with the RI data rules, especially for low concentration samples. Data from the focused sediment characterization will be reported in the tables using both sets of data rules and mapped using the RA/background data rules.

RI data set summation rules are as follows:

- Calculated totals are the sum of all detected concentrations; non-detected concentrations are treated as zero.
- If all analytes for a total are not detected, then the highest detection limit is used for the summation.

Baseline RAs and the background data set summation rules are as follows:

- Calculated totals are the sum of all detected concentrations, and non-detected results for analytes detected at least once in the RA data set within the study area for a given medium are included in the summation at one-half the detection limit.
- If none of the analytes is detected for a given sample, but is determined to be present within the study area, then the highest detection limit is used for the summation.
- Non-detects for analytes never detected within a data set for a given medium are excluded (i.e., treated as zero).

Data qualifies should be carried through the summation procedure. If all of the analytes were not detected, a "U" qualifier will be carried through to indicate that all results were reported as undetected. All calculated totals will be flagged with a "T" indicating they are mathematically derived values.

Data Averaging

Samples subject to averaging include field QC splits. In contrast to LWG guidance, laboratory QC duplicates and triplicates (for total solids and metals) will not be averaged. Analytical results for individual or field QC split samples will be presented in the field and data report tables along with their averaged values. However, only the averaged values will be used in any data analysis/presentations (e.g., statistical analyses, scatter plots, analyte concentration maps) and in Excel data files.

When averaging multiple results, the data validation qualifiers will be propagated according to LWG guidelines. If all results, including the calculated average, have the same qualifier, then that qualifier will be applied to the calculated average. If one or more of the results is qualified as estimated (J - flagged), then the calculated average will be similarly qualified (J). A "T" qualifier will be added to results that are mathematically derived, including averaged and summed results.

Significant Figures

The LWG guidelines address the retention of significant figures and these guidelines will be followed in generating and maintaining the RM6E database. The number of significant figures provided by the analytical laboratory will be maintained in the RM6E database. Consistent with LWG guidelines, a minimum of two significant figures will be assumed for all results. The significant figures will be maintained during calculations, such as averaging splits and summing totals. The final results of these calculations will be rounded to the smallest number of significant figures for the values included in the calculations.

8.0 REPORTING

A draft and final field and data report will be prepared for the focused sediment characterization. This report is anticipated to include the following:

- Summary of sampling approach and objectives.
- Summary of field sampling activities, sample collection procedures, and any deviations from the SAP.
- Maps showing actual sampling stations.
- Analyte concentration maps of PCBs and metals including existing sediment data presented in the FS sediment database.
- Tables providing analytical results.
- Grab sample description logs and other relevant field data collected during the RM6E sampling event. Field notes and other voluminous documentation will be provided on a CD or DVD.
- Data validation report(s) will be appended to the report.
- Laboratory reports will be provided as PDFs on a CD or DVD.

The draft field and data report will be submitted to the City in late May 2012 (within 3 weeks after receiving the laboratory report(s) from the WPCL). The final field and data report will be completed within approximately 3 weeks of receiving City comments and will be submitted to EPA.

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FIGURES

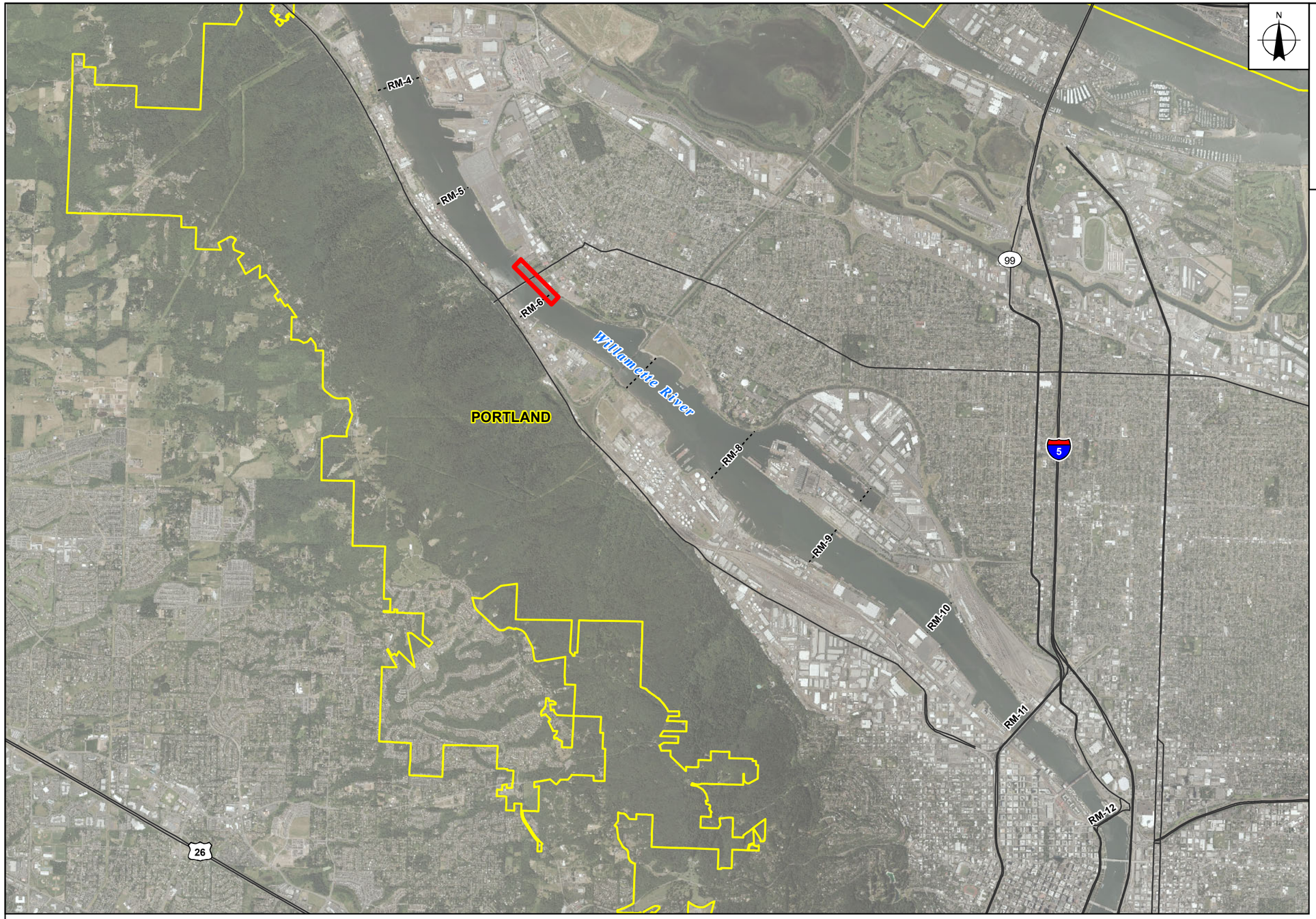


Figure 1-1
Vicinity

River Mile 6 East
Focused Sediment Characterization
Sampling and Analysis Plan

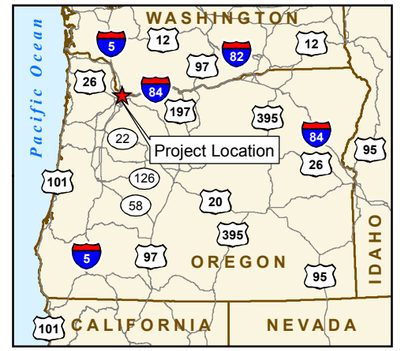
Portland Harbor

Willamette River
Portland, Oregon

LEGEND

- Study Area
- River Mile (RM)
- Freeway or Highway
- Portland City Limits

Regional Inset Map



MAP NOTES:
Date: March 1, 2012
1. Aerial photo taken by METRO in 2010

2,100 0 2,100 4,200
1 inch = 4,200 feet

GSI Water Solutions, Inc.

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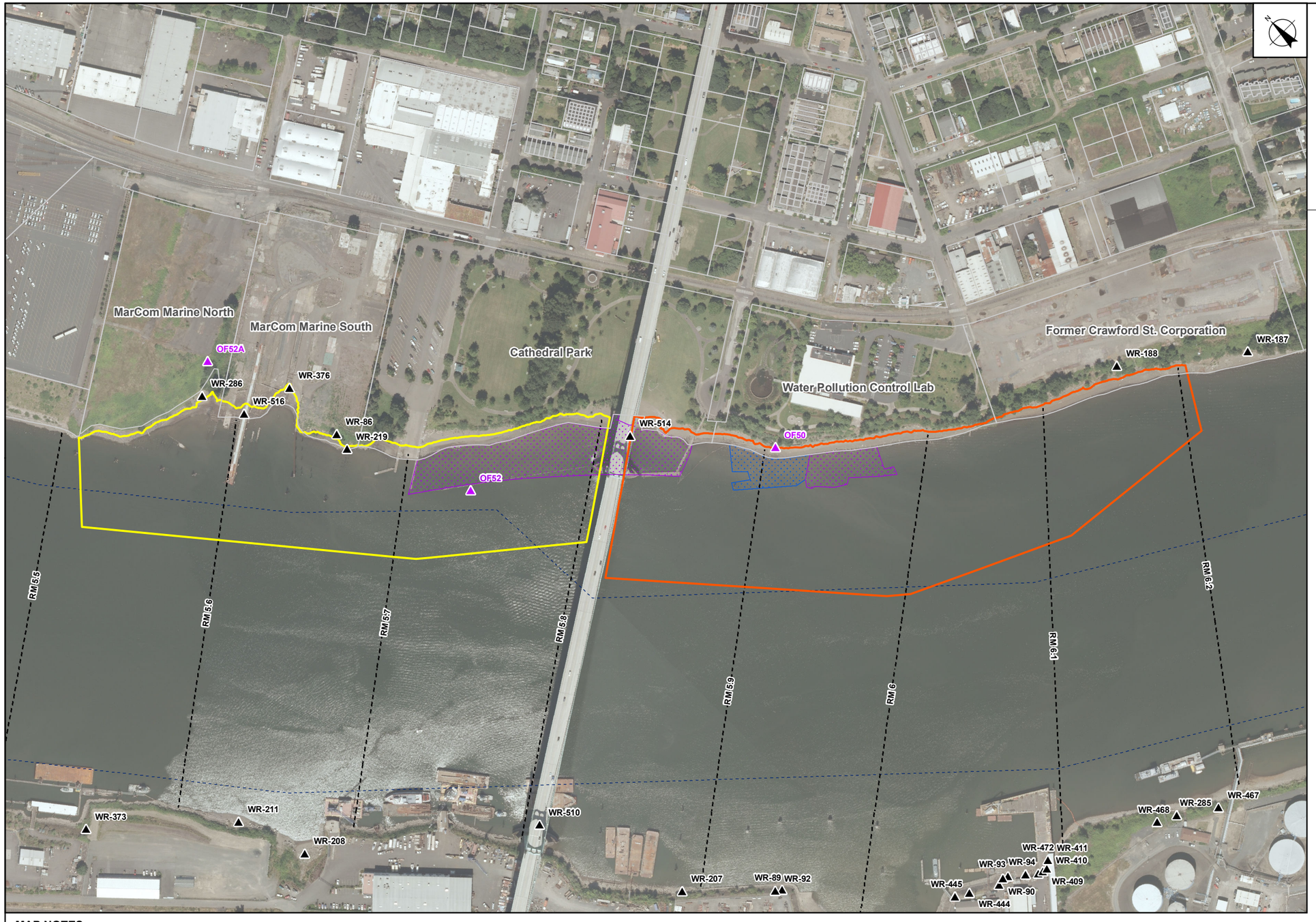
Figure 1-2
Site Map

River Mile 6 East
Focused Sediment Characterization
Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



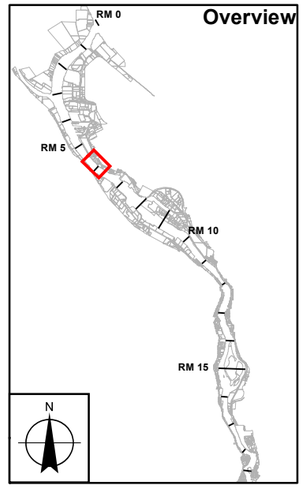
LEGEND

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- Submerged Piling and Debris
- Pilings Removed in 2011
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- 1/10th River Mile (RM)



MAP NOTES:

Date: March 27, 2012

1. Aerial photo taken by METRO in 2010

200 0 200 400

1 inch = 400 feet

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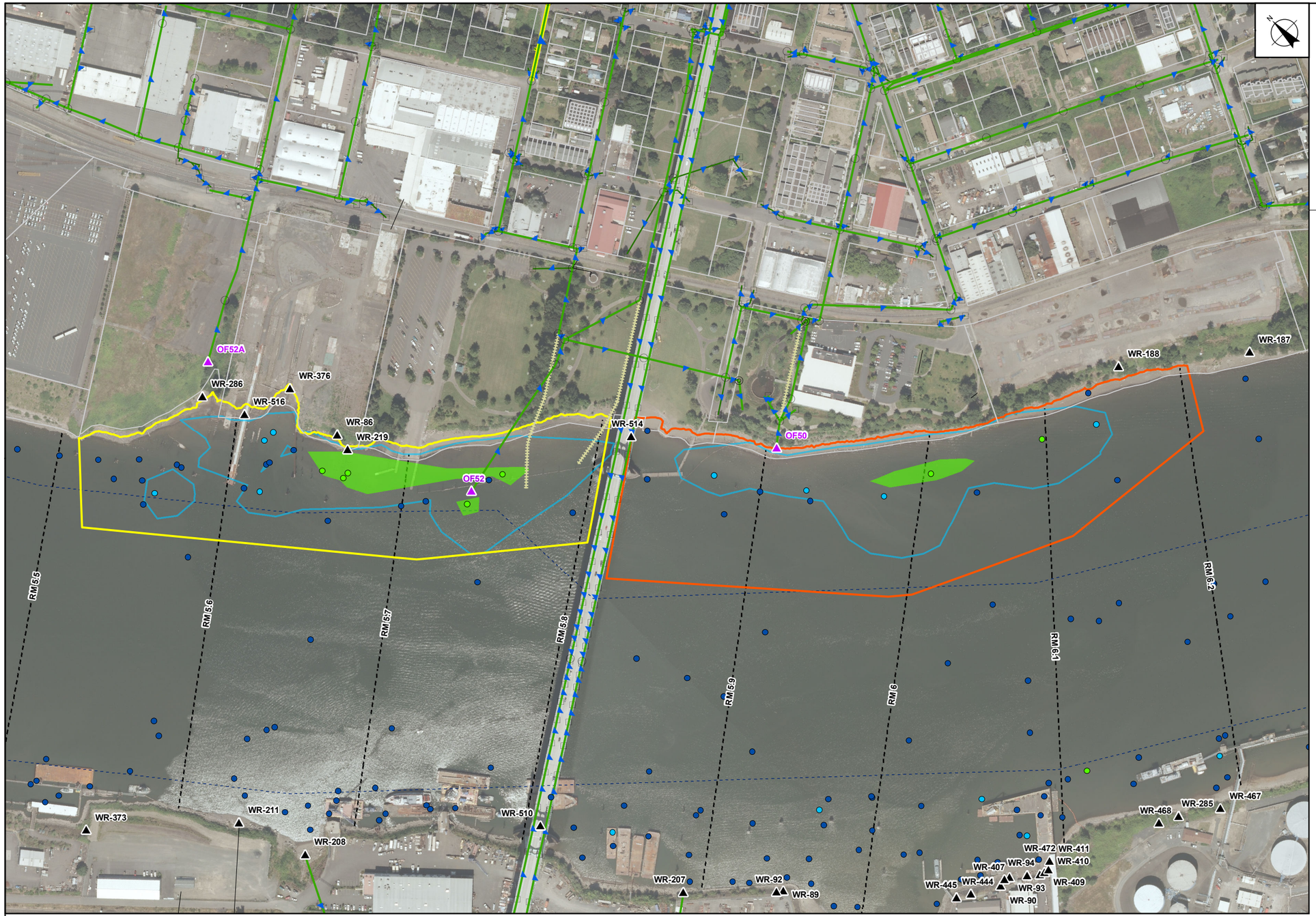
Figure 2-1
Total PCB Concentrations in Surface Sediment

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

Total PCBs in Surface Sediment (ug/kg)

- <75
- 75 - 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- >1,000

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

200 0 200 400
1 inch = 400 feet

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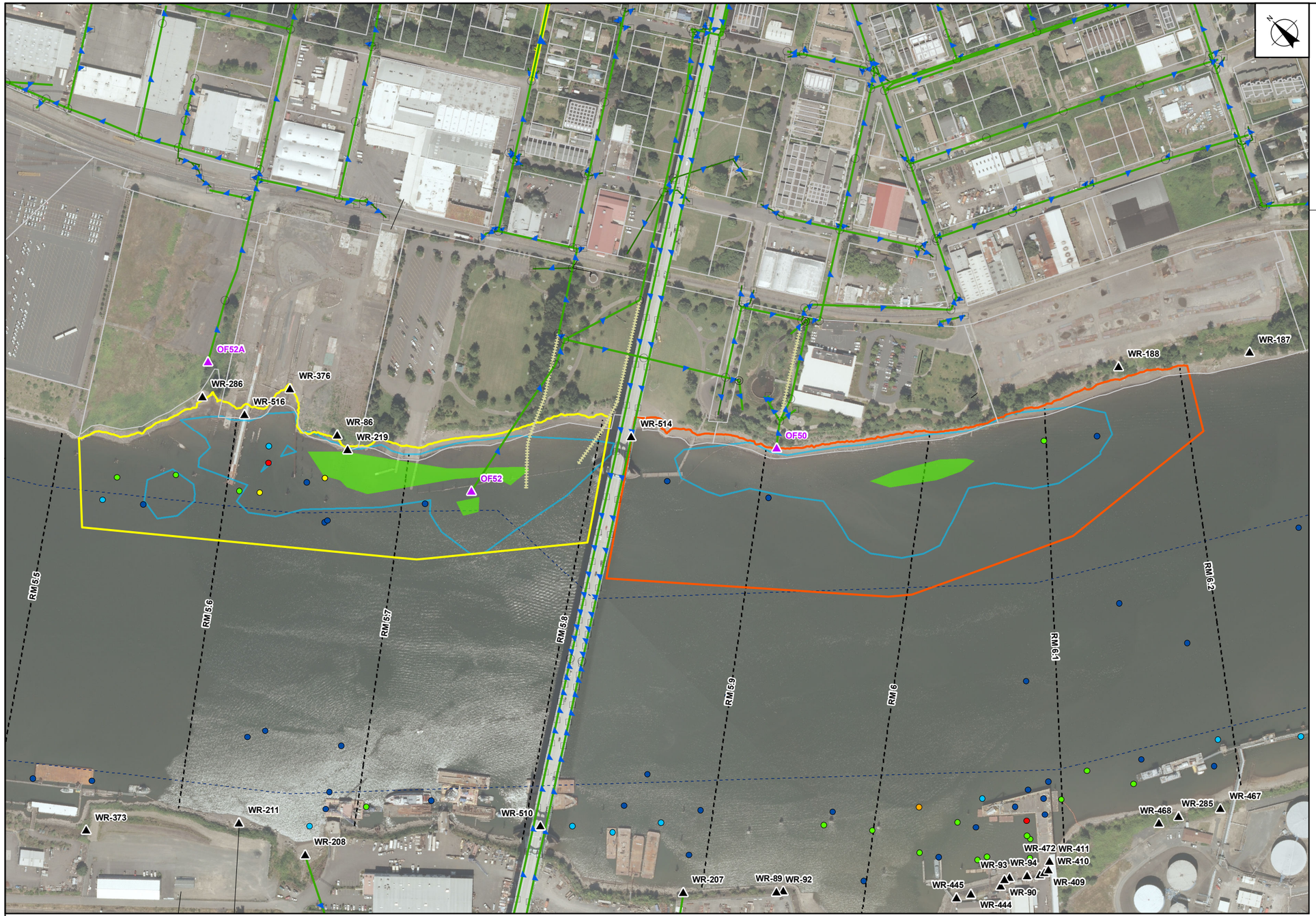
Figure 2-2
Total PCB Concentrations in Subsurface Sediment

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

Total PCBs in Subsurface Sediment (ug/kg)

- <75
- 75 - 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- >1,000

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. For subsurface data, samples were collected at multiple depths. Subsurface concentrations shown indicate the highest concentration sample collected at any given location.
4. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor QEA, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

200 0 200 400
1 inch = 400 feet

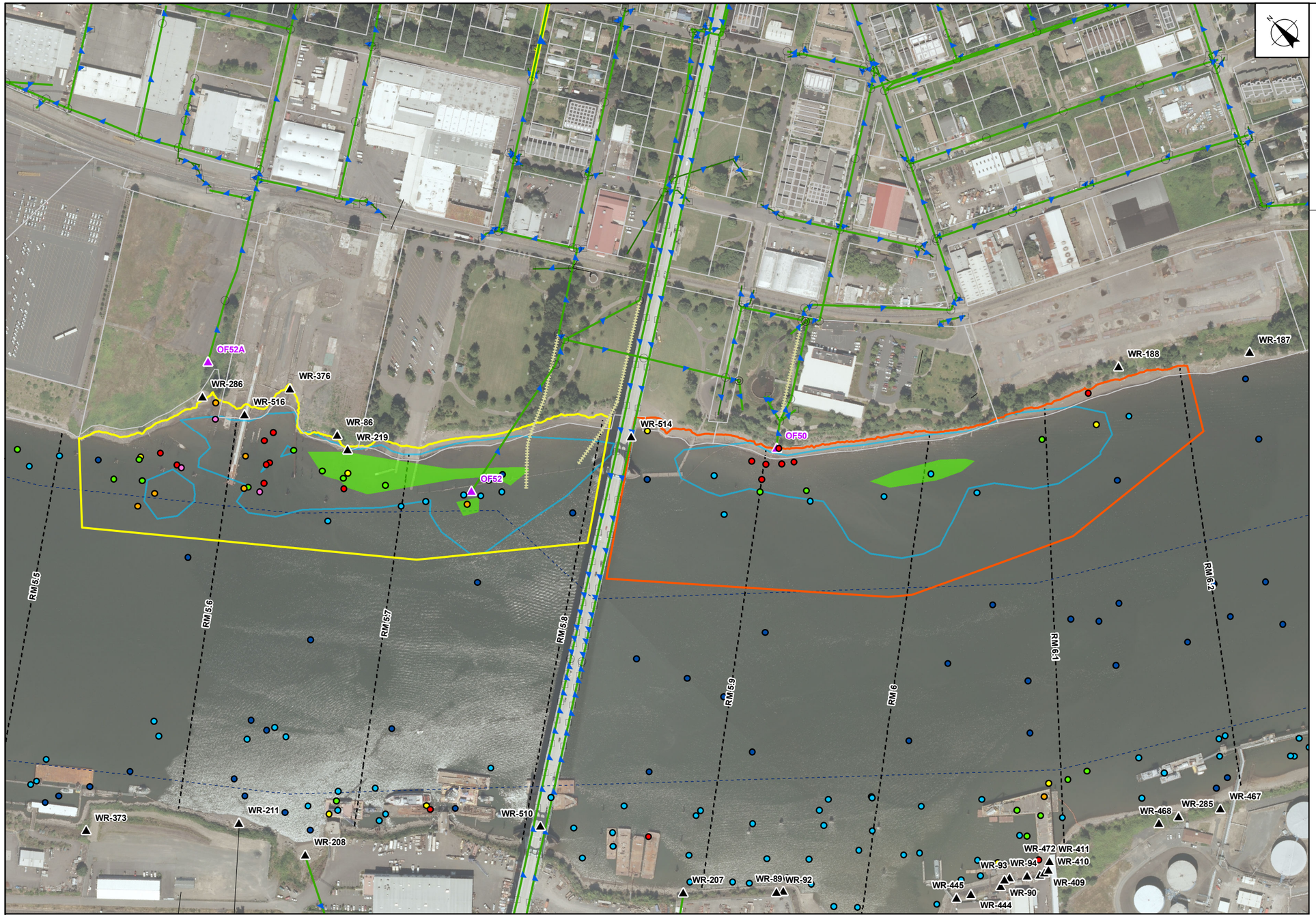
File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\Figure2_2_Total_PCB_Subsurface_Sed.mxd, Date: March 27, 2012 12:11:52 PM

Figure 2-3
Copper Concentrations in Surface Sediment

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

Copper in Surface Sediment (mg/kg)

- <30
- 30 - 60
- 60 - 90
- 90 - 120
- 120 - 150
- 150 - 180
- >180

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor QEA, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

200 0 200 400
1 inch = 400 feet

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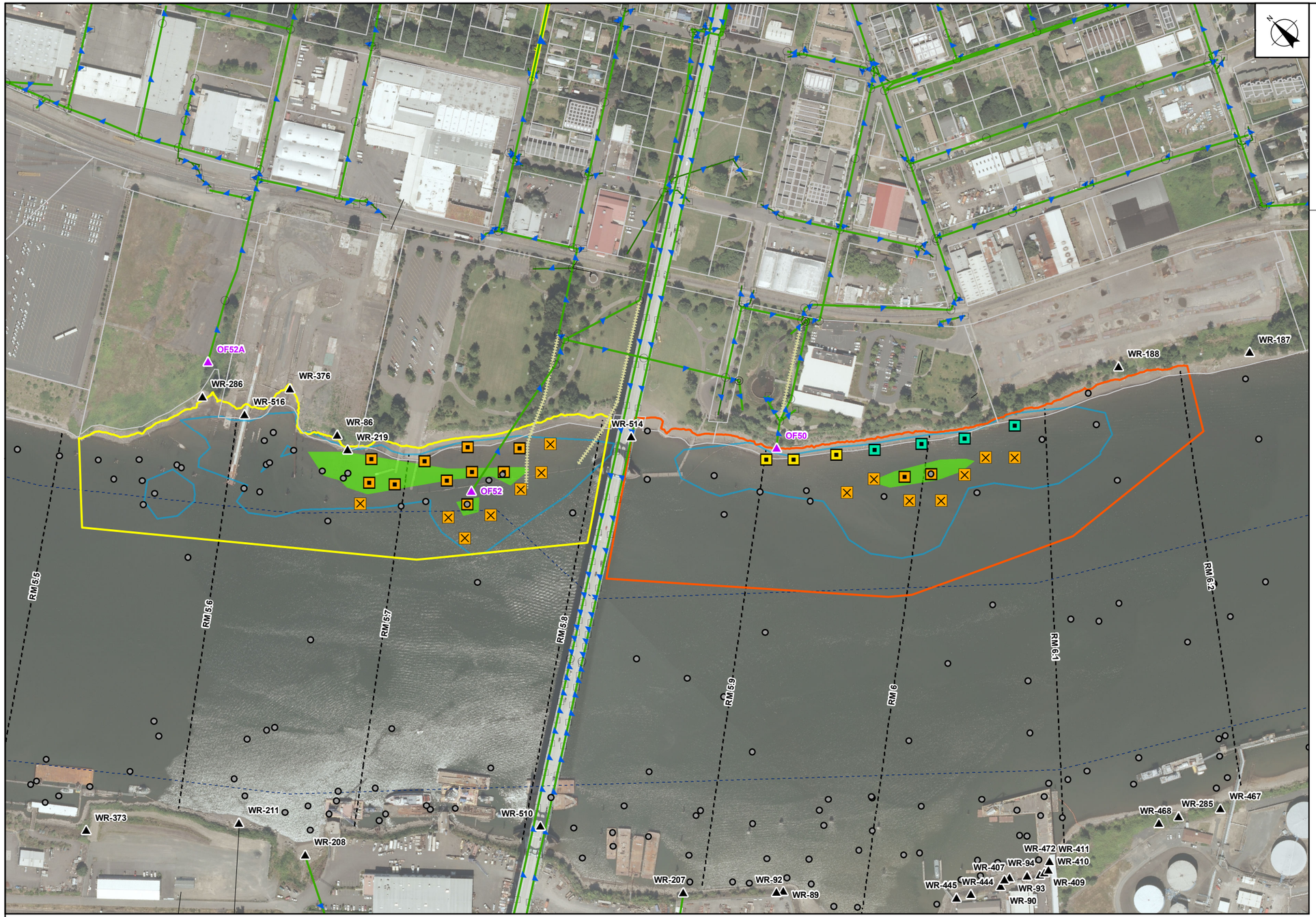
Figure 3-1a
Planned Surface Sediment Sampling Locations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location

Proposed Surface Sediment Sample Location

- Rush Analysis
- Standard Analysis
- Analyzed for Metals and Total Solids
- Analyzed for PCB Aroclors and Total Solids
- Analyzed for PCB Aroclors, Total Solids, and Metals

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)

200 0 200 400
1 inch = 400 feet

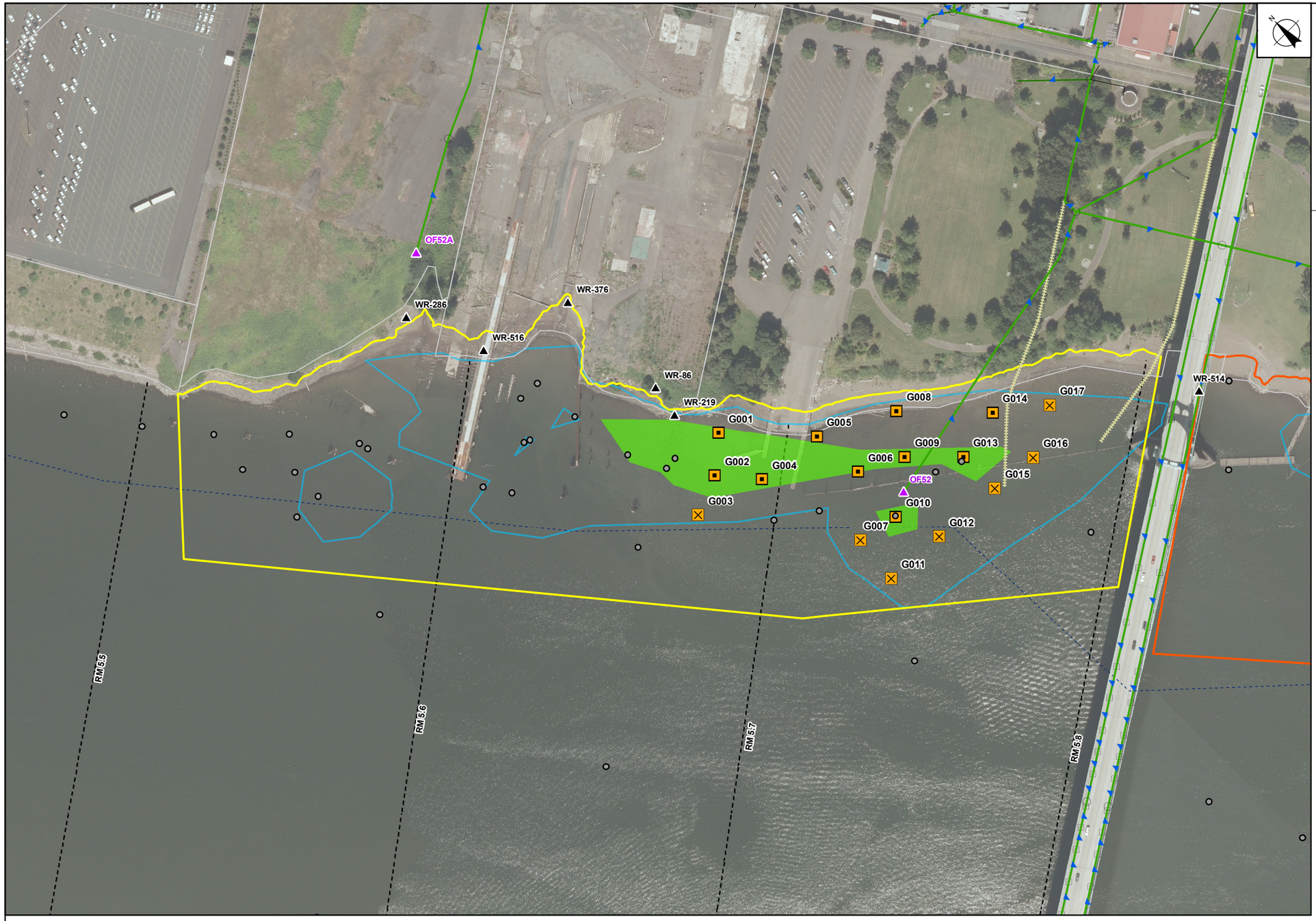
File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\Figure3-1a_Planned_Surface_Sed_Samps_5_5_6_2.mxd, Date: March 27, 2012 12:17:40 PM

Figure 3-1b
Planned Surface Sediment Sampling Locations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 5.8

Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location

Proposed Surface Sediment Sample Location

- Rush Analysis
- Standard Analysis
- Analyzed for Metals and Total Solids
- Analyzed for PCB Aroclors and Total Solids
- Analyzed for PCB Aroclors, Total Solids, and Metals

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)

90 0 90 180
1 inch = 180 feet

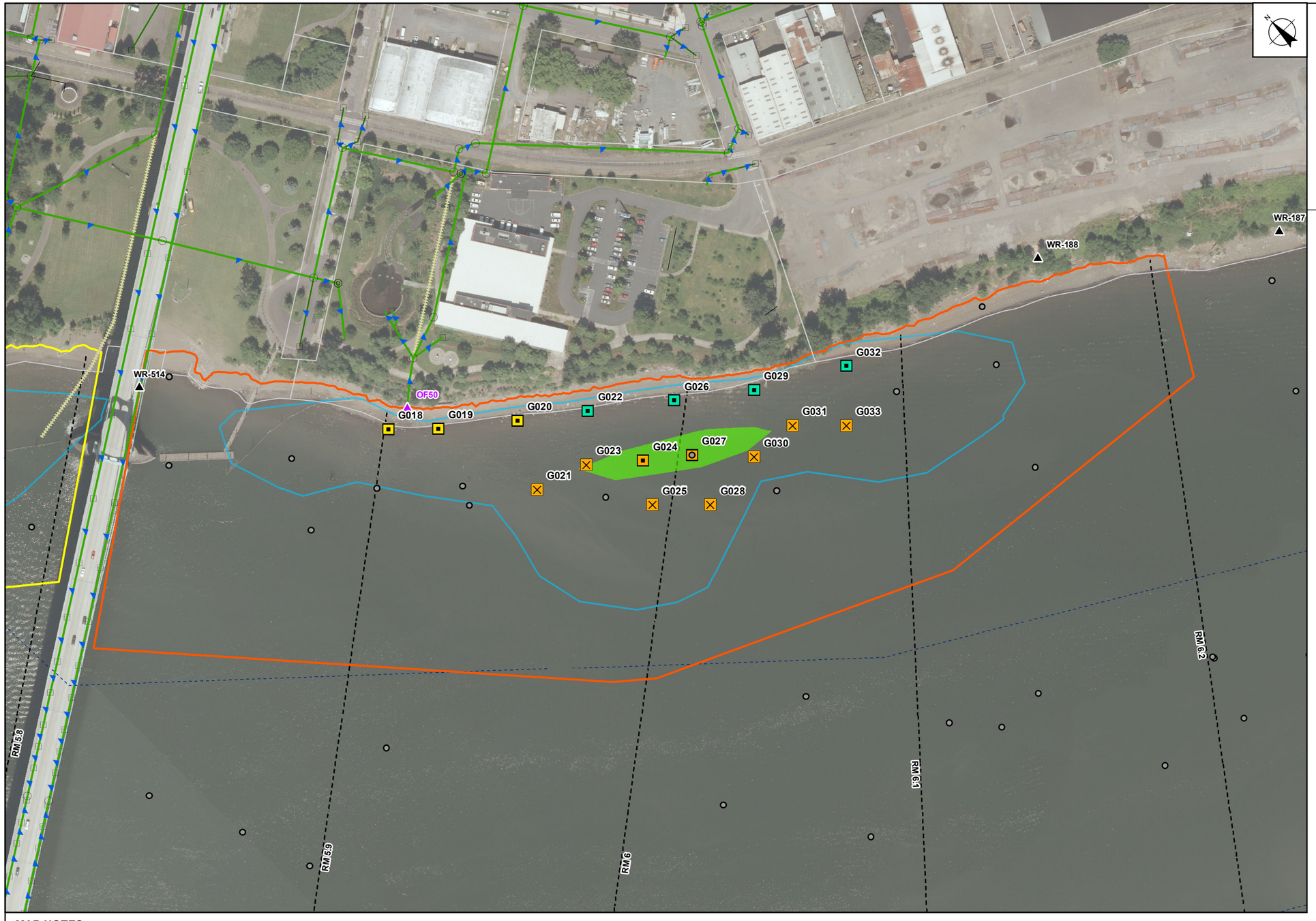
File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\Figure3-1b_Planned_Surface_Sed_Samps_5_5_5_8.mxd, Date: March 27, 2012 12:20:32 PM

Figure 3-1c
Planned Surface Sediment Sampling Locations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.8 to 6.2

Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location

Proposed Surface Sediment Sample Location

- Rush Analysis
- Standard Analysis
- Analyzed for Metals and Total Solids
- Analyzed for PCB Aroclors and Total Solids
- Analyzed for PCB Aroclors, Total Solids, and Metals

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)

90 0 90 180
1 inch = 180 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\Figure3-1c_Planned_Surface_Sed_Samps_5_8_6_2.mxd, Date: March 27, 2012 12:36:32 PM

TABLES

Table 3-1
Surface Sediment Grab Sample Locations and Analyses

Sample ID	Analysis [1]			Rush Turn-Around-Time	Sample Coordinates [2,3]			
(RM6E - xxxx)	PCB Aroclors	Total Solids	Metals [4]		Northing	Easting	Latitude	Longitude
G001	x	x			708480.5034	7622389.0882	45.587677	-122.764741
G002	x	x			708432.5289	7622331.8878	45.587541	-122.764959
G003	x	x		x	708404.8513	7622263.6164	45.587460	-122.765223
G004	x	x			708369.7930	7622385.3978	45.587373	-122.764744
G005	x	x			708355.0316	7622505.3341	45.587342	-122.764274
G006	x	x			708260.9278	7622512.7148	45.587084	-122.764235
G007	x	x		x	708174.2046	7622431.5271	45.586840	-122.764542
G008	x	x			708288.6054	7622634.4962	45.587170	-122.763762
G009	x	x			708222.1791	7622588.3669	45.586984	-122.763935
G010	x	x			708159.4432	7622503.4889	45.586805	-122.764259
G011	x	x		x	708089.3266	7622422.3013	45.586607	-122.764569
G012	x	x		x	708081.9459	7622533.0117	45.586595	-122.764136
G013	x	x			708150.2174	7622660.3287	45.586792	-122.763646
G014	x	x			708168.6691	7622750.7422	45.586850	-122.763295
G015	x	x		x	708072.7201	7622660.3287	45.586580	-122.763638
G016	x	x		x	708063.4942	7622745.2066	45.586561	-122.763305
G017	x	x		x	708107.7784	7622830.0846	45.586689	-122.762979
G018		x	x		707582.4991	7623284.5234	45.585284	-122.761147
G019		x	x		707521.6933	7623347.1176	45.585122	-122.760896
G020		x	x		707434.0614	7623454.4220	45.584890	-122.760467
G021	x	x		x	707324.9686	7623393.6162	45.584586	-122.760693
G022	x	x	x		707358.9483	7623552.7843	45.584691	-122.760075
G023	x	x		x	707294.5657	7623484.8249	45.584510	-122.760333
G024	x	x			707230.1831	7623559.9379	45.584339	-122.760033
G025	x	x		x	707164.0121	7623517.0162	45.584154	-122.760193
G026	x	x	x		707265.9512	7623672.6075	45.584446	-122.759597
G027	x	x			707176.4400	7623627.0600	45.584197	-122.759765
G028	x	x		x	707092.4759	7623588.5524	45.583964	-122.759906
G029	x	x	x		707180.1078	7623783.4886	45.584219	-122.759155
G030	x	x		x	707097.8411	7623701.2220	45.583987	-122.759467
G031	x	x		x	707088.8991	7623787.0655	45.583969	-122.759131
G032	x	x	x		707096.0527	7623926.5611	45.583999	-122.758587
G033	x	x		x	707022.7280	7623853.2365	45.583793	-122.758865
G034	x	x			TBD	TBD	TBD	TBD
G035	x	x			TBD	TBD	TBD	TBD
QC Split (Duplicate) Samples [5]								
G5__	x	x			TBD	TBD	TBD	TBD
G5__	x	x	x		TBD	TBD	TBD	TBD
No. Samples	*34*	*36*	*8*	*14*				

Table 3-1
Surface Sediment Grab Sample Locations and Analyses

Notes:

[1] All analyses will be conducted at the City of Portland's Water Pollution Control Laboratory (WPCL). PCB Aroclors will be analyzed by EPA Method 8082. Total Solids will be analyzed using ASTM Standard Method 2540G. Metals will be analyzed by EPA Method 6020.

[2] Northing and easting coordinates exist in the following coordinate system: NAD 83 Oregon State Plane North Zone International Feet.

[3] Latitude and longitude coordinates exist in the following coordinate system: WGS 1984 international feet.

[4] Samples will be analyzed for the following metals: arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), and zinc (Zn).

[5] Two QC Split (field duplicate) samples will be determined in the field.

PCB = Polychlorinated Biphenyl

TBD = To be Determined

Table 5-1
Sample Containers, Preservation, Holding Times, and Sample Volume

Container[1]		Analysis	Preservation	Holding Time
Type	**Size[2]**			
Sediment Samples				
WMG	8-oz.	Metals and total solids	4ºC	6 months
WMG	8-oz.	PCBs Aroclors[3]	4ºC	14 days[4]/ 40 days[5]
WMG	8-oz.	Archival	-20ºC	TBD[6]
Equipment Rinsate Blanks				
HDPE	250-mL	Metals	HNO_3 to pH<2; 4ºC	6 months
AG	1-L	PCBs	Dark; 4ºC	7 days[4]/ 40 days[5]

Notes:
WMG = wide-mouth glass
HDPE = high-density polyethylene
AG = amber glass
TBD = To be determined
[1] Size and number of bottles may be modified by lab
[2] Sample size shown overestimates the actual sample volume needed for laboratory analysis. Extra volume is provided to allow for necessary laboratory QC analyses (when required).
[3] For sample stations where metals analysis is not required, total solids will be analyzed from the same sample container as PCB Aroclors.
[4] Days until sample extraction.
[5] Days from extraction to analysis.

[6] Holding times for frozen samples is two years for metals (except mercury) and one year for PCBs.

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APPENDIX A

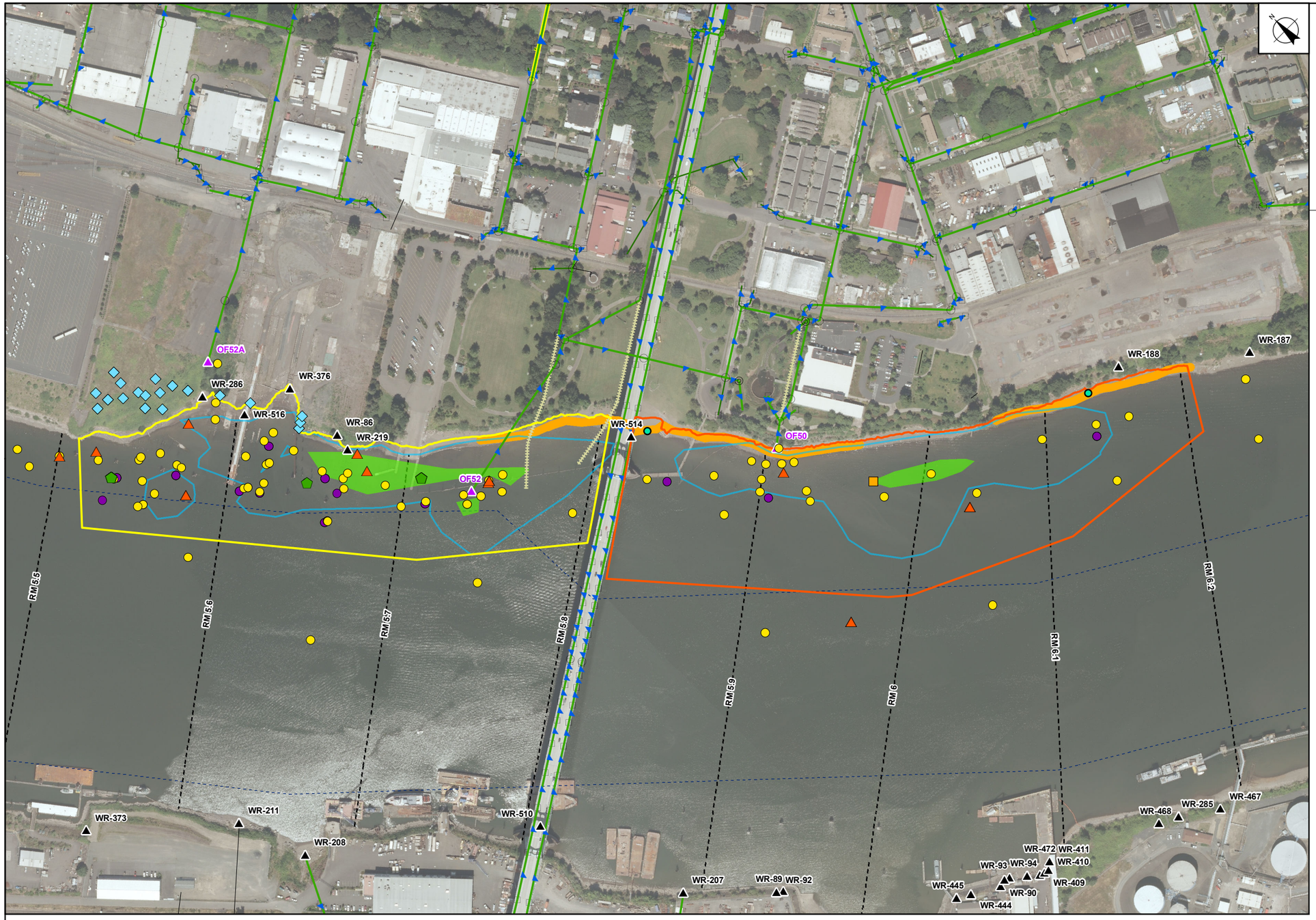
Existing RM6E Data

Figure A-1
Existing Sampling Locations

River Mile 6 East
Focused Sediment Characterization
Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

Existing Sample Locations

- Riparian Soil Samples
- Subsurface Sediment
- Surface Sediment
- Composited Beach Sediment
- Sediment Trap
- Surface Water
- Tissue
- Approximate Beach Sediment Composite Area

Sediment Management Areas*

- FS Alternative F (Total PCBs = 75)
- FS Alternative E (Total PCBs = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)
4. Beach sediment composite areas were approximated from Map 2-1 of the Portland Harbor RI/FS, Draft Final Remediation Investigation Report

200 0 200 400
1 inch = 400 feet

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Table A-1
Existing Data Task Descriptions

Sample Matrix		LWG Task Code	Task Description	Sample Year	Data Validation Cetegory
Sediment		WR-WSI98	Portland Harbor Sediment Investigation	1997	QA2Cat1
		WLCMCL00	Marcom Marine, 28 riparian samples	2000	NACat2 [1]
		Colocated1	Round 1 co-located surface sediment	2002	QA2Cat1
		HHRAbeach1	Round 1 HHRA beach sediment	2002	QA2Cat1
		WLCMCB02	MarCom Expanded Preliminary Assessment	2002	QA1Cat1
		WLCOFJ02	City outfall sediment investigation	2002	QA2Cat1
		B01-01-48B_SC	Round 2a sediment cores	2004	QA2Cat1
		B01-01-48B_SG	Round 2a sediment grabs	2004	QA2Cat1
		WLCDRD05	2005 O&M Dredge Sediment Characterization	2005	QA2Cat1
		B01-01-51B_BSE	Round 2a benthic sediment	2005	QA2Cat1
		B01-01-68B_SC	Round 3B sediment cores	2007	QA2Cat1
		B01-01-67B_ColocSed	Round 3B Biota - Co-located Sediments	2007	QA2Cat1
		B01-01-68B_SG	Round 3B sediment grabs	2007	QA2Cat1
		B01-01-68B_SC	Round 3B sediment cores	2008	QA2Cat1
		B01-01-78B_MobSE	Round 3B Mobility Testing Sediments	2008	QA2Cat1
Sediment from In River Sediment Trap		B01-01-61B_ST1	Round 3 in river sediment trap event 1	2007	QA2Cat1
		B01-01-61B_ST2	Round 3 in river sediment trap event 2	2007	QA2Cat1
		B01-01-61B_ST3	Round 3 in river sediment trap event 3	2007	QA2Cat1
		B01-01-61B_ST4	Round 3 in river sediment trap event 4	2007	QA2Cat1
Soil		WLCMCL00	Marcom Marine, 28 riparian samples	2000	NACat2 [1]
		WLCMCL00	Marcom Marine, 28 riparian samples	2002	NACat2 [1]
		WLCMCL00	Marcom Marine, 28 riparian samples	2003	NACat2 [1]
Surface Water		B01-01-48H_WS1	Round 2a surface water event 1	2004	Cat1 & QA2Cat1
		B01-01-48H_WS2	Round 2a surface water event 2	2005	Cat1 & QA2Cat2
		B01-01-48H_WS3	Round 2a surface water event 3	2005	Cat1 & QA2Cat3
		B01-01-57B_WS3	Round 3 surface water November 2006	2006	QA2Cat1
		B01-01-57B_WS4	Round 3 surface water 2007 high flow event	2007	Cat1 & QA2Cat1
		B01-01-78B_MobWS	Round 3B Mobility Testing Surface Water	2008	QA2Cat1
Tissue	Carp	ORRORS00	Oregonian River of Risk Series	2000	Cat2 [1]
	Clam	B01-01-51B_BT	Round 2a benthic tissue	2005	QA2Cat1
	Clam	B01-01-67B_Biota	Round 3B Biota	2007	QA2Cat1
	Crayfish	Tissue1	Round 1 tissue samples	2002	QA2Cat1
	Lumbriculus Variegatus	B01-01-51B_BT	Round 2a benthic tissue	2006	QA2Cat1
	Osprey	WLRASE08	EPAs PBDEs in osprey eggs	2008	NACat2 [1]
	Osprey	WLRASE08	EPAs PBDEs in osprey eggs	2008	QA2Cat1
	Sculpin	B01-01-67B_Biota	Round 3B Biota	2007	QA2Cat1
	Smallmouth Bass	ORRORS00	Oregonian River of Risk Series	2000	Cat2 [1]
	Smallmouth Bass	Tissue1	Round 1 tissue samples	2002	QA2Cat1
	Smallmouth Bass	B01-01-67B_Biota	Round 3B Biota	2007	QA2Cat1

Notes:

[1] Data Validation Category 2 data is not included in analytical mapping files.

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APPENDIX B

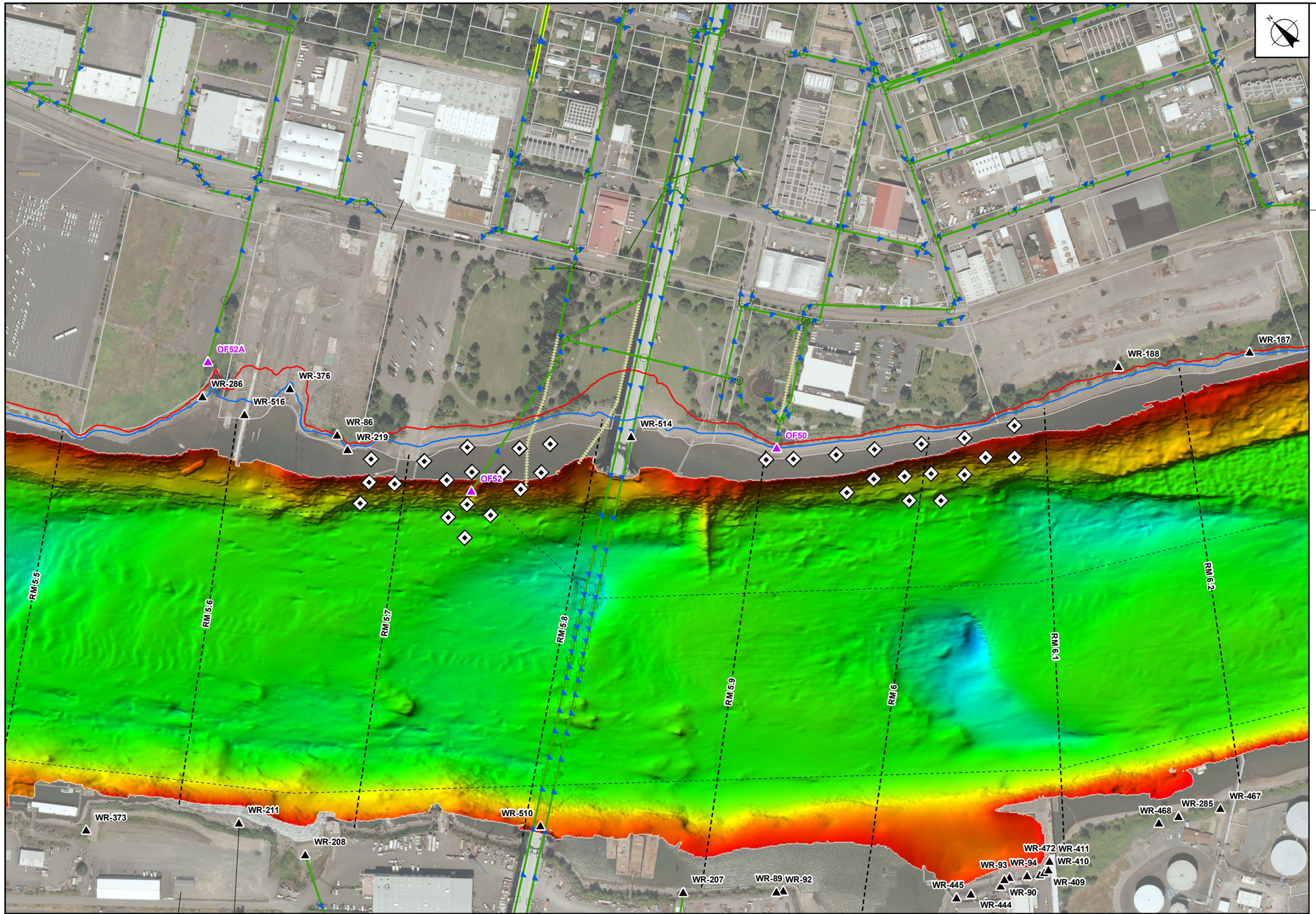
Planned Sediment Sampling Locations Figures

Figure B-1
Planned Surface Sediment Sampling Locations with Bathymetry

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2

Willamette River
Portland, Oregon



LEGEND

- Proposed Sampling Location
- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

DEPTH LEGEND

NAVD88 (FEET)	CRD (FEET)
15	10
5	0
-5	-10
-15	-20
-25	-30
-35	-40
-45	-50
-55	-60
-65	-70
-75	-80
-85	-90

MAP NOTES:

Date: March 27, 2012
1. Aerial photo taken by METRO in 2010

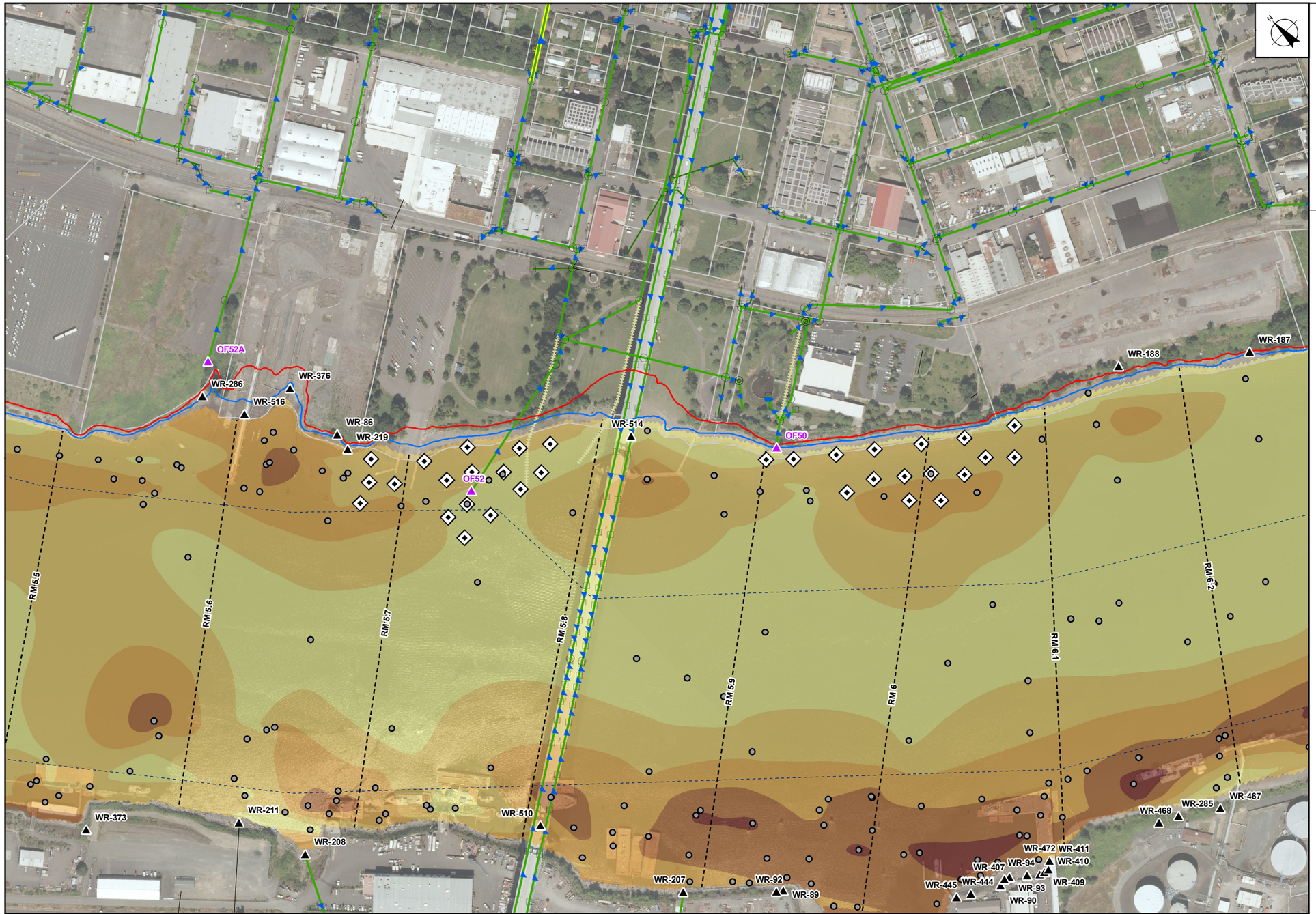
200 0 200 400
1 inch = 400 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_1_Planned_Surface_Samps_Bathymetry.mxd, Date: March 27, 2012 1:13:53 PM

Figure B-2a
Planned Surface Sediment Sampling Locations with Percent Fines and Existing Surface Sediment Samples

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2
Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location
- Proposed Sampling Location

Fines (%)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 95

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
1. Aerial photo taken by METRO in 2010
2. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor, 2011)

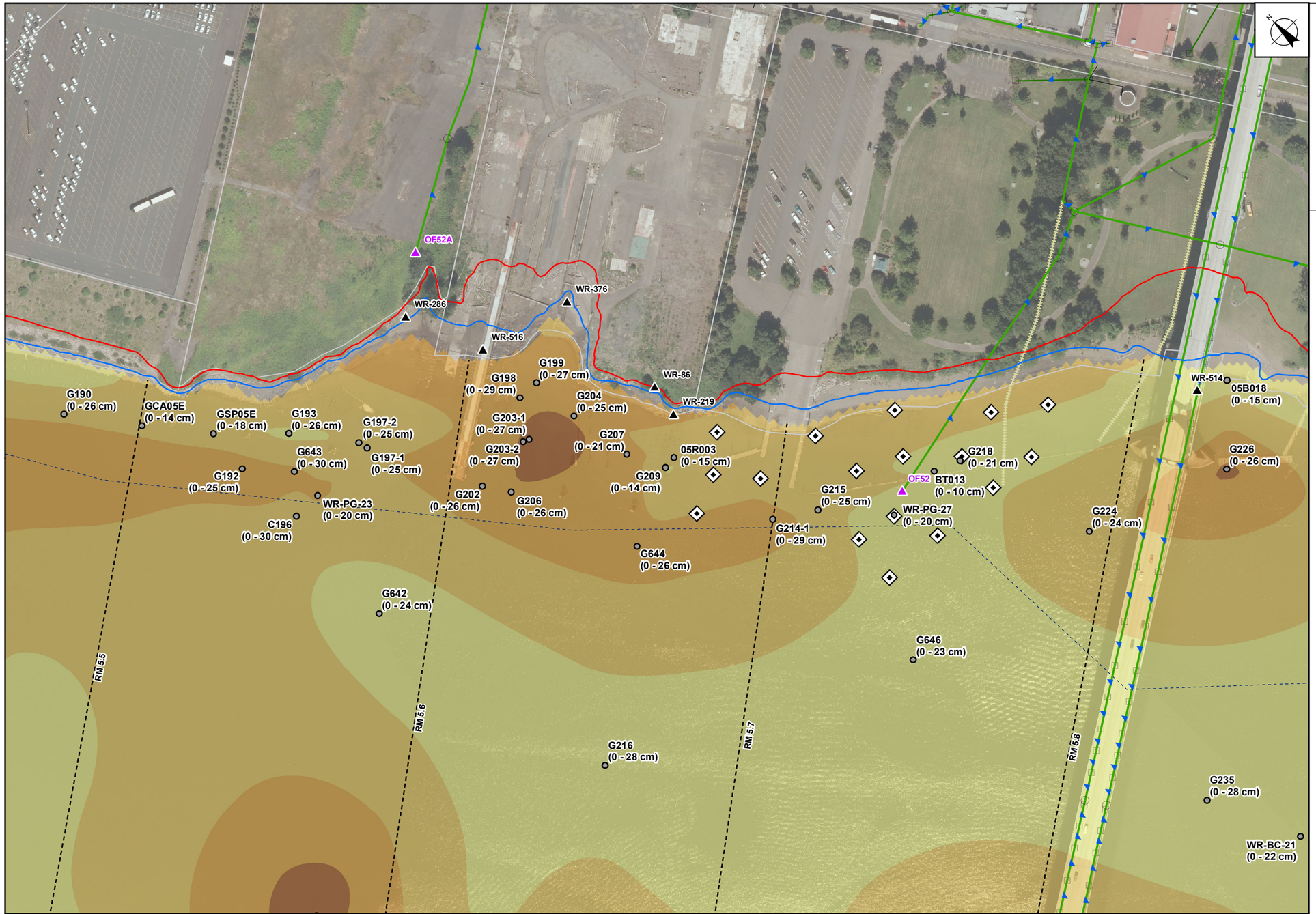
200 0 200 400
1 inch = 400 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_2a_Planned_Surface_Samps_Fines.mxd, Date: March 27, 2012 1:15:15 PM

Figure B-2b
Planned Surface Sediment Sampling Locations with Percent Fines and Existing Surface Sediment Samples

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 5.8
Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location
- Proposed Sampling Location

Fines (%)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 95

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
1. Aerial photo taken by METRO in 2010
2. Numbers in parentheses indicate penetration depth.
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)

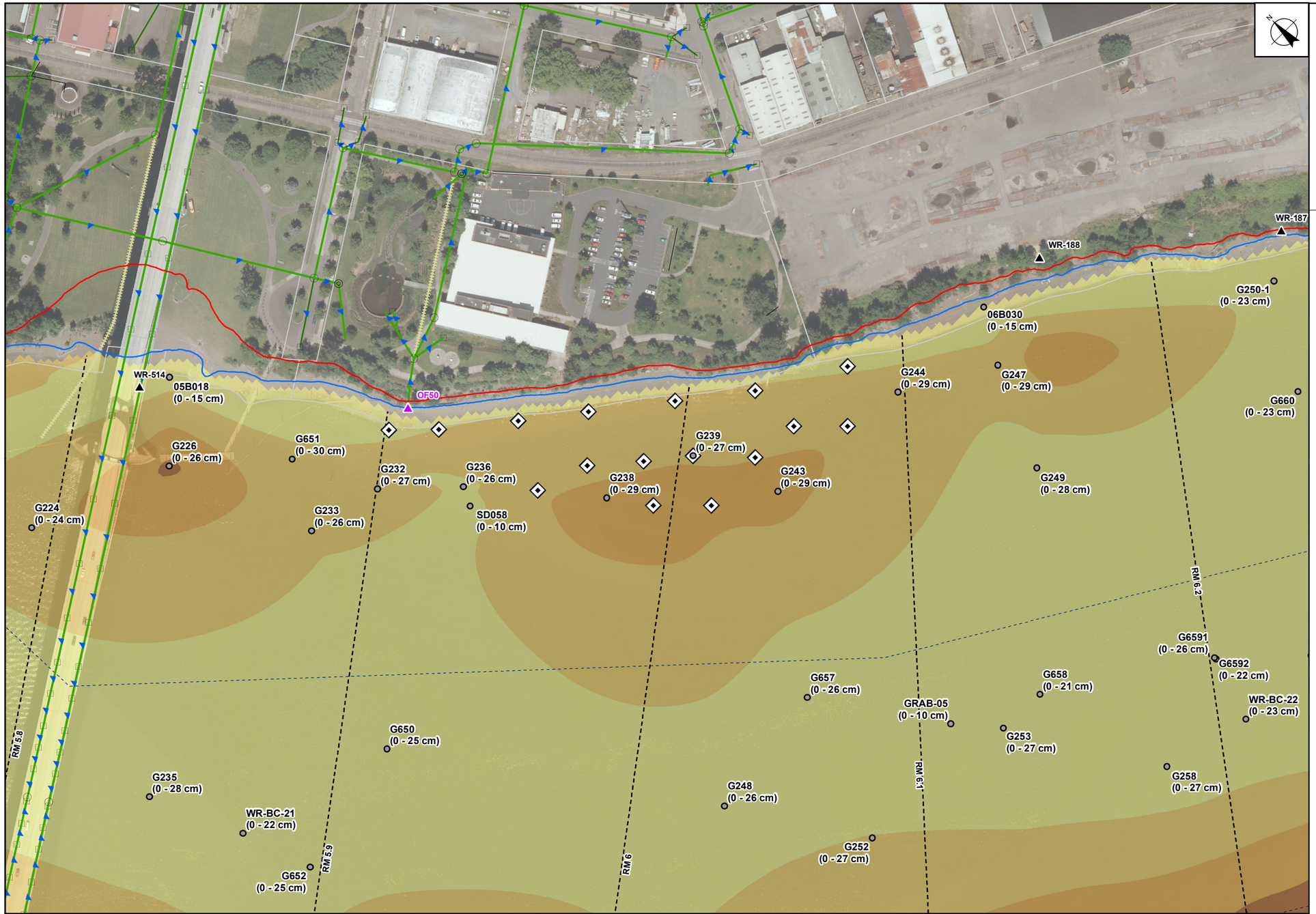
90 0 90 180
1 inch = 180 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_2b_Planned_Surface_Samps_Fines.mxd, Date: March 27, 2012 1:17:23 PM

Figure B-2c
Planned Surface Sediment Sampling Locations with Percent Fines and Existing Surface Sediment Samples

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.8 to 6.2
Willamette River
Portland, Oregon



LEGEND

- Existing Surface Sediment Sample Location
- Proposed Sampling Location

Fines (%)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 95

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
1. Aerial photo taken by METRO in 2010
2. Numbers in parentheses indicate penetration depth.
3. Source of existing sediment sample locations is the Lower Willamette Groups Feasibility Study Sediment Database (Anchor QEA, 2011)

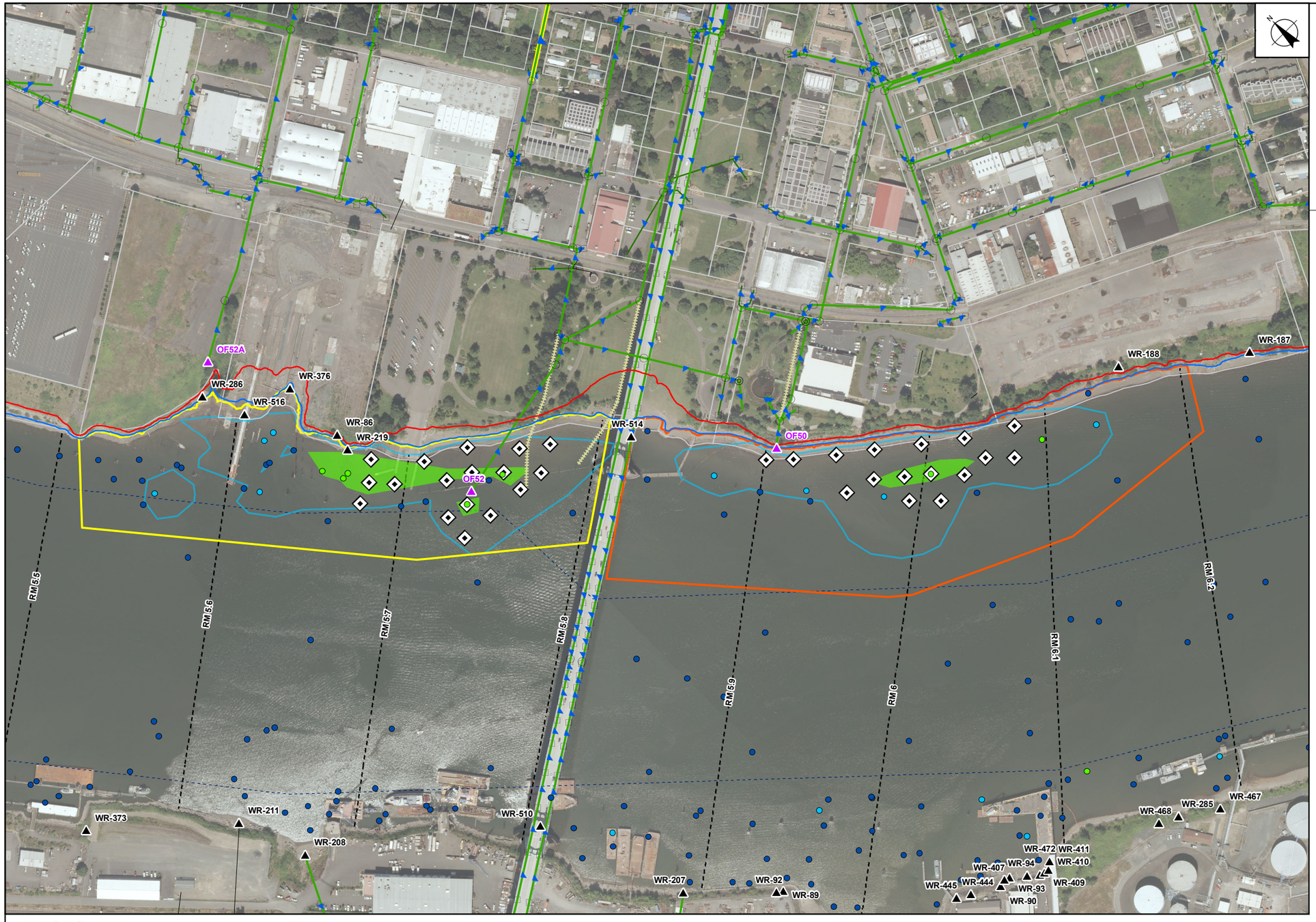
90 0 90 180
1 inch = 180 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_2c_Planned_Surface_Samps_Fines.mxd, Date: March 27, 2012 1:19:25 PM

Figure B-3a
Surface Sediment Sampling Locations with Existing Surface Sediment PCB Concentrations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 6.2
Willamette River
Portland, Oregon



LEGEND

- Proposed Sampling Location

Total PCBs in Surface Sediment (ug/kg)

- <75
- 75 - 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- >1,000

Sediment Management Areas*

- FS Alternative F (PCB = 75)
- FS Alternative E (PCB = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor QEA, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

200 0 200 400
1 inch = 400 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_3a_Planned_Surface_Samps_PCBs.mxd, Date: March 27, 2012 1:20:55 PM

Figure B-3b
Planned Surface Sediment Sampling Locations with Existing Surface Sediment PCB Concentrations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.5 to 5.8
Willamette River
Portland, Oregon

LEGEND

- Proposed Sampling Location

Total PCBs in Surface Sediment (ug/kg)

- <75
- 75 - 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- >1,000

Sediment Management Areas*

- FS Alternative F (PCB = 75)
- FS Alternative E (PCB = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor QEA, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

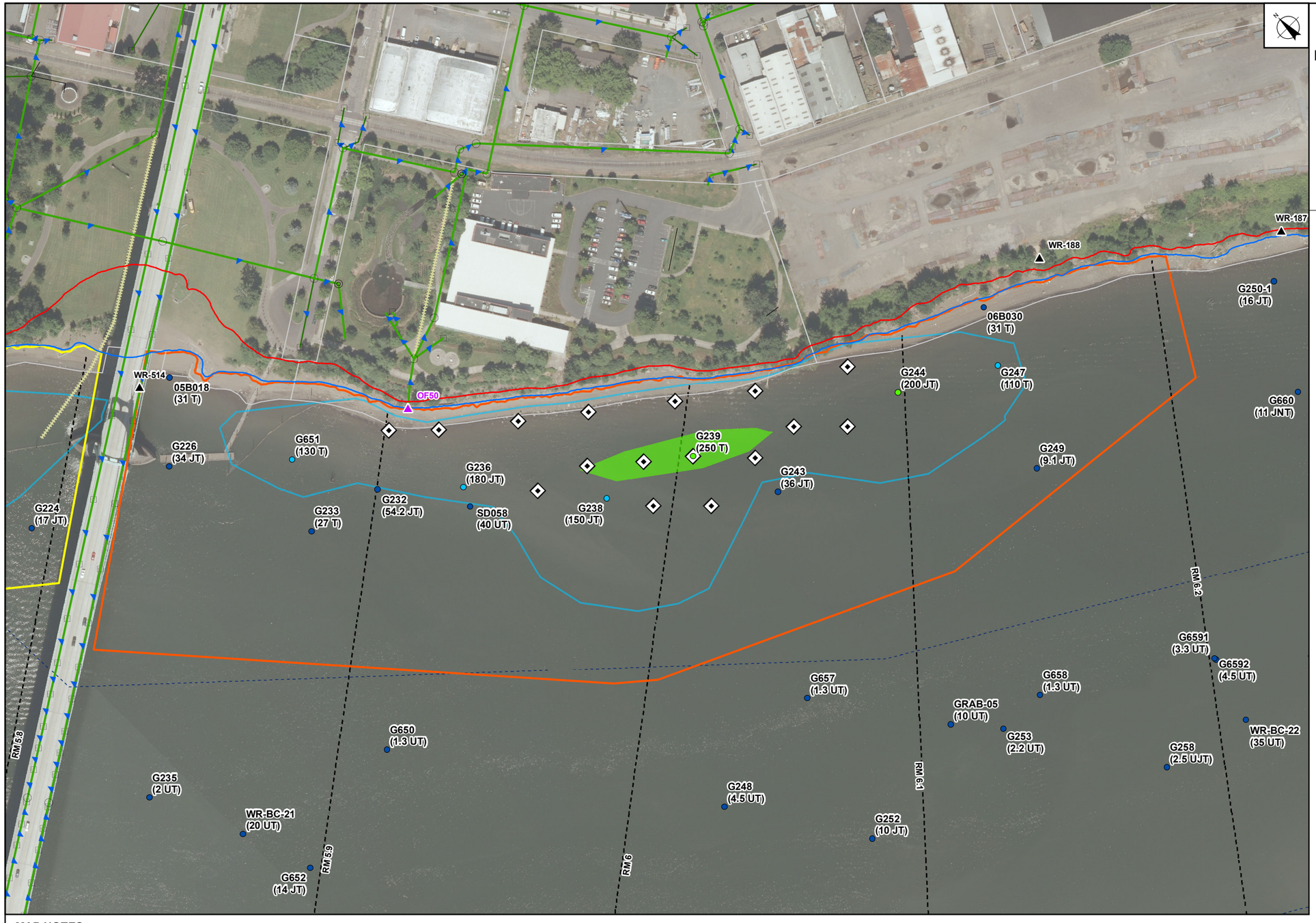
90 0 90 180
1 inch = 180 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_3b_Planned_Surface_Samps_PCBs.mxd, Date: March 27, 2012 1:22:19 PM

Figure B-3c
Planned Surface Sediment Sampling Locations with Existing Surface Sediment PCB Concentrations

River Mile 6 East
Focused Sediment Characterization Sampling and Analysis Plan

River Miles 5.8 to 6.2
Willamette River
Portland, Oregon



LEGEND

- Proposed Sampling Location

Total PCBs in Surface Sediment (ug/kg)

- <75
- 75 - 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- >1,000

Sediment Management Areas*

- FS Alternative F (PCB = 75)
- FS Alternative E (PCB = 200)

Areas of Potential Concern (AOPC)

- AOPC 11
- AOPC 12

All Other Features

- Ordinary High Water (+20ft NAVD88)
- Mean High Water (+13.3ft NAVD88)
- City Outfall
- Non City Outfall
- Federal Navigation Channel
- Storm Gravity Main
- Abandoned Main
- Manhole
- Catch Basin
- 1/10th River Mile (RM)

MAP NOTES:

Date: March 27, 2012
*Shown for AOPCs 11 and 12 only
1. Aerial photo taken by METRO in 2010
2. FS = Portland Harbor RI/FS Draft Feasibility Study. Prepared for the Lower Willamette Group, Portland, OR. (Anchor QEA et al., 2012)
3. Source of data is the Draft Portland Harbor Feasibility Study (FS) Sediment Database, prepared by the Lower Willamette Group (LWG) on March 29, 2011 (Anchor QEA, 2011). The FS sediment database was derived from the Site Characterization/Risk Assessment (SCRA) database prepared by Integral and provided to Anchor QEA up to February 4, 2011.

90 0 90 180
1 inch = 180 feet

File Path: P:\Portland\110 - BES\GIS\Project_MXDs\007_CONFIDENTIAL_CERCLA\RM6E_Focused_Sed_Char_SAP\FigureB_3c_Planned_Surface_Samps_PCBs.mxd, Date: March 27, 2012 1:26:05 PM

APPENDIX C

Field Forms

Grab Sample Description Form

Station	Rep	Date	Time	Water Depth (ft)	Water Depth Source	Recovery Depth (cm)	Sediment Type and Description	Debris	Odor	Sheen	Color

Date: _____

Water Pollution Control Laboratory
6543 N. Burlington Ave.
Portland, Oregon 97203-4552
Sample Custodian: (503) 823-5696
General Lab: (503) 823-5681

City of Portland Chain-of-Custody

Bureau of Environmental Services

Work Order #: _____

Collected By: _____

Client Name:	Directors Office	Project Number (if applicable):	
Project Name:	Portland Harbor	Project Contact:	

Requested Analyses

Special Instructions:

Turn-Around-Time Request:

- ❑ Standard (10 business days)
- ❑ Rush (5 business days)
- ❑ Other: _____

Lab Number	Location ID	Sample Date	Sample Time	Grab or Comp	Sample Matrix	# of Containers	Remarks
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							

Relinquished By:	Received By:	Relinquished By:	Received By:
Signature: Date:	Signature: Date:	Signature: Date:	Signature: Date:
Printed Name: Time:	Printed Name: Time:	Printed Name: Time:	Printed Name: Time: