EPA REGION 10
BROWNFIELDS CLEANUP COOPERATIVE AGREEMENT
WORKPLAN

FOR

Moore and Wright Islands Natural Area Sediment Cleanup

Period of Performance (4 years):
October 1, 2023 – September 30, 2027

Date of Final Workplan: December 1, 2023

Submitted by

Barbara Park Poage
Oregon Department of State Lands
775 Summer Street NE, Ste. 100
Salem, OR 97301
971.332.0265
barbara.poage@dsl.oregon.gov

Sarah Miller
Oregon Department of Environmental Quality
700 NE Multnomah St. Suite #600
Portland, Oregon
503.229.5040
sarah.miller@deq.oregon.gov
Story Map: *https://arcg.is/0uWiaG*
Columbia Slough Sediment Project webpage

EPA Cooperative Agreement Number: *4B-02J51101*

WORKPLAN FOR BROWNFIELDS CLEANUP COOPERATIVE AGREEMENT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ADDENDUMS

Addendum 1 - Quality Assurance Project Plan, Brownfields Program, November 2016
Addendum 2 – 90% Remedial Design Report
Addendum 3 - Remedial Objectives

1 INTRODUCTION

1.1 Project Description, Goals, and Objectives

Background: The Moore and Wright Islands Natural Area (MWINA) consists of an area where a contaminated sediment hot spot is present (significant sediment contamination) in the Columbia Slough (Slough) in Portland, Oregon. The Slough is a 19-mile chain of narrow navigable waterways and ponds paralleling the Columbia River. Sediment throughout the Slough is highly contaminated with polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and pesticides. The Slough provides habitat for wildlife, from coyotes to turtles, and some of the contaminants present at the Site are known to bioaccumulate in fish, mammals, and birds. This not only reduces biodiversity but also increases the risk of toxic exposure for human consumers of Slough fish. In 1994, Oregon Health Authority issued a fish consumption advisory for fish caught from the Columbia Slough. The Oregon Department of Environmental Quality (DEQ) prepared a 2005 Record of Decision (ROD) to address contamination and improve the health of the Slough. The 2005 ROD described the approach to cleaning up the Slough: Control sources of ongoing contamination (primarily stormwater); actively remediating significant sediment contamination (such as MWINA); monitoring sediment and tissue concentrations over the long-term to assure natural recovery is occurring; and modifying the approach as new information becomes available. Cleanup activities have occurred in the Slough through private party lead efforts, in addition to Orphan-lead cleanup action. DEQ also has a process in areas where multiple parties contribute to the same area of contaminated sediment and can join the settlement process to contribute to cleanup within each segment of the Slough.

Environmental justice issues in the area date to the 1920s, when water and air pollution from industrial and agricultural activity on the Slough began to negatively and disproportionately impact the health of neighboring underserved communities. This intensified in the 1940s when Vanport, the nation's then-largest publicly subsidized housing development, was built north of the project site. Over one-third of Black Portlanders lived in Vanport, and when a neighboring embankment holding back the Columbia River collapsed on May 30, 1948, it rendered over 17,000 people homeless. Housing discrimination forced many of Vanport's former Black residents to stay in adjacent neighborhoods. The Columbia Slough watershed is currently home to one of Oregon's most ethnically and racially diverse communities.

Contaminated sediment in the Slough continues to disproportionately impact low-income, homeless, and other underserved communities, groups that are more likely to rely on the Slough as a food and shelter resource. Cleanup activities in the Slough will reduce the risk of toxic exposure for those using the Slough as a food resource, directly benefitting these environmentally overburdened communities. Cleanup will also improve habitat quality for birds, fish, and mammals, which will increase biodiversity. Following implementation of the ROD cleanup activities, the Slough will be a higher-quality natural area, and therefore more attractive as a destination for educational and recreational opportunities for neighboring underserved communities.

Description of Site:
The 7-acre Moore and Wright Islands Natural Area Sediment Cleanup Site is an in-water contaminated "hotspot", with all sediment located below the ordinary high-water line in the Slough between Slough miles 5.2 and 5.4. It extends from 45.5965° N, 122.7128° W to 45.5954° N, 122.7086° W. A site map is available as Figure 1.1. The target site is bordered on the north by Moore and Wright Islands, and on the south by four properties owned by Portland Parks and Recreation, Pacific Carbide & Alloys Co. (Pacific Carbide), Portland at St. Paul, and Baker Commodities. A Burlington Northern Santa Fe railroad bridge transects the target site at Slough Mile 5.3. Public access to the target site is via the adjacent City wastewater treatment plant and nearby boat launches.

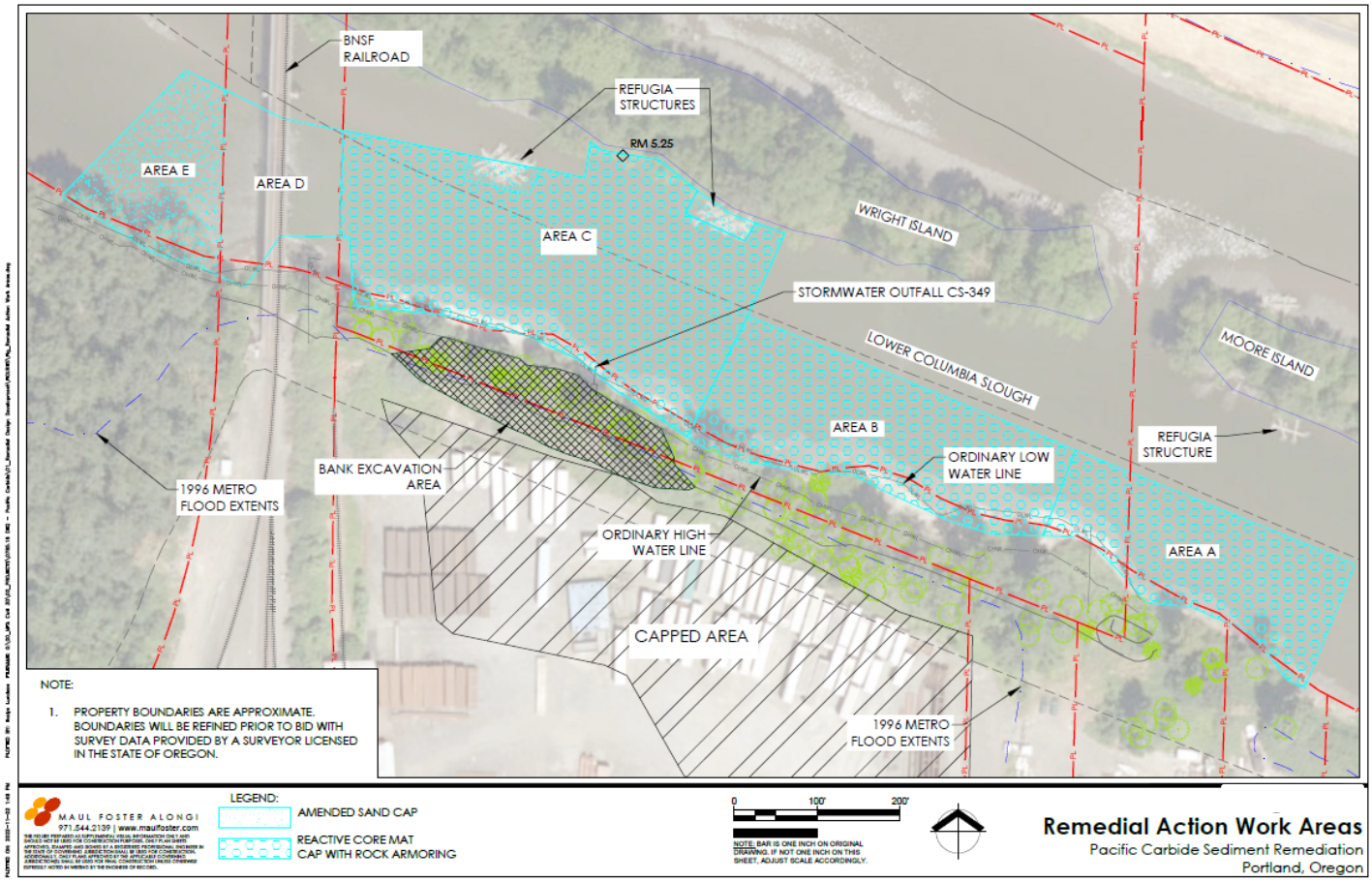
Contamination stems from the upland Pacific Carbide property, which produced calcium carbide and acetylene gas. From the 1940s to 1970s, discharge pipes and the adjacent Pacific Carbide settling pond released waste materials containing PCBs, PAHs, metals, and calcium carbide into the Slough, and contaminated sediments in a 2.8-acre area within the target site. The toxic sediments impact populations of bottom-dwelling organisms, an important food resource for young salmon and other species in the Slough.

In 2003, Pacific Carbide entered into DEQ's Cleanup program and conducted upland characterization and some sediment characterization. In 2013, Pacific Carbide entered into a Consent Judgement to implement the upland remedy, which also resulted in upland source control in 2015 to prevent contaminants from migrating to the in-water portion of the Site. Pacific Carbide entered into a settlement with DEQ for the in-water portion of the remaining contamination. Pacific Carbide is now defunct.

In 2015, using settlement funds, DEQ began completing the sediment characterization and in-water portion of the cleanup work at Pacific Carbide to help provide data to complete a feasibility study (Apex, 2018) for the in-water areas. 2016 sediment samples at the target site revealed PCBs, PAHs, calcium, and metals at concentrations toxic to human health and wildlife were more extensive. In 2021, the site was declared an Orphan site. In 2021, DEQ also prepared a document ("Remedial Design Optimization Report"), which provided additional justification for the final selected in-water remedial approach to address the remaining contamination in the sediment. Reducing contaminant concentrations requires capping 122,252 square feet of sediment. As a requirement of placing fill in-water for the cap, fill will be removed from the upland, which is necessary to fulfill the FEMA cut/fill and flood control requirements in the Columbia Slough. The excavation/removal activities will be completed above ordinary high water and will regrade the riverbank slope to improve riverbank stability and decrease risks of recontamination to the in-water cap. The riverbank work will be completed under a separate source of funding. The in-water work will be completed using this grant funding. Following riverbank soil removal, the riverbank will be vegetated with native vegetation.

The selected remedial action will reduce PCB concentrations in porewater by greater than 85% initially, with additional reduction in concentrations following a longer-term application of monitored natural recovery withing the MWINA project area. The remedial action will also mitigate direct contact risks to people and wildlife.

Figure 1.1: Site Map



1.2 Organizational Structure and Responsibilities

Figure 1.2 Organization Chart

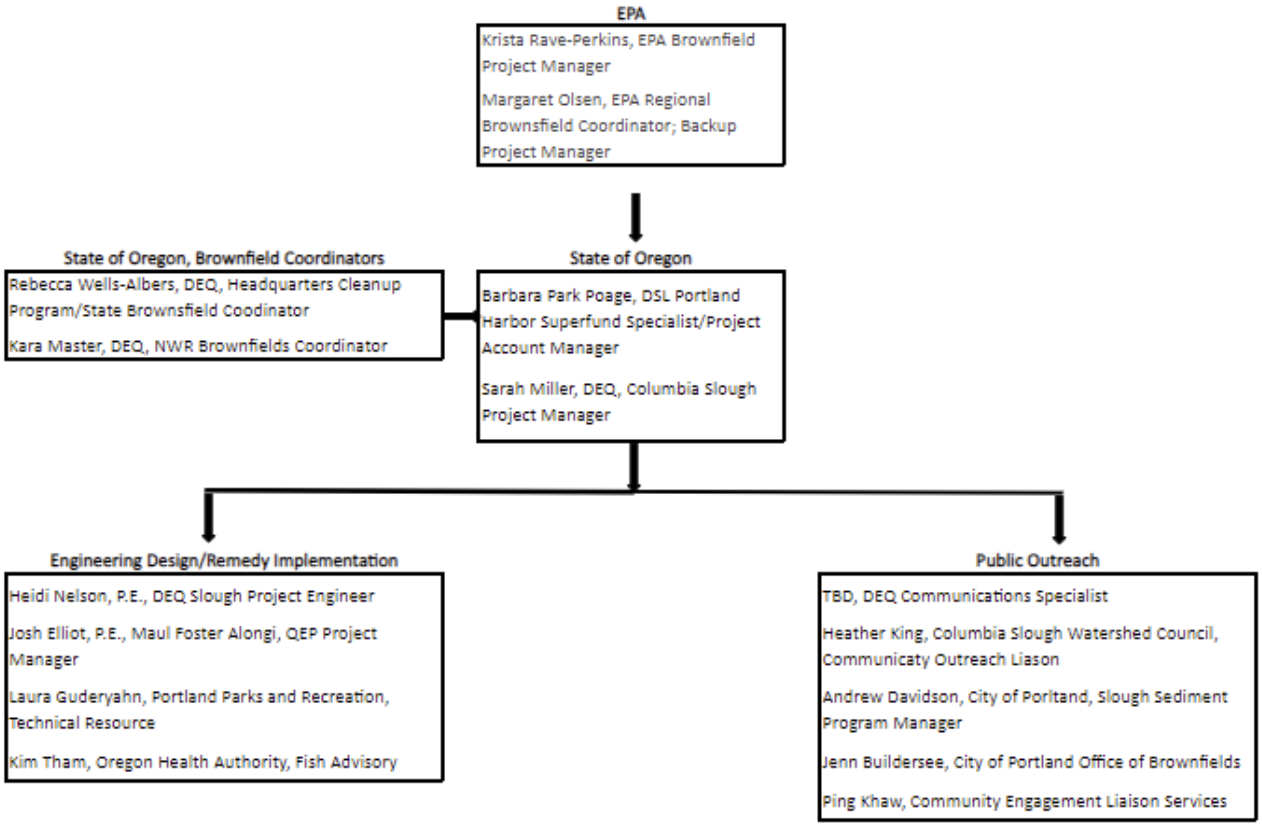


Figure 1.2 above provides and overview of the organizational structure for the project. The cleanup grant will be administered by Oregon Department of State Lands (DSL's) Operations Division, with implementation support from DEQ's Northwest Region Cleanup Program via interagency agreement. As grant manager, DSL will provide project and technical review oversight, administer and disburse funds, and manage accounting and reimbursement requests to EPA. DEQ Northwest Region Cleanup Program will manage day-to-day grant activities, plan and implement cleanup activities, contract with and manage the Qualified Environmental Professional (QEP), lead community engagement, contract for remediation services, and coordinate with DSL to support financial management and reporting to EPA.

Key personnel include:
Rebecca Wells-Albers, DEQ Headquarters Cleanup Program, is DEQ's Statewide Brownfields Coordinator. She has over 12 years' experience managing brownfields projects, including DEQ's EPA 128(a) State Response Grant. She will assist with grant management and compliance.

Kara Master, DEQ NW Region Cleanup Program, is DEQ's Northwest Region Brownfields Coordinator. Kara manages brownfields projects in two regions, and also conducts project management oversight of cleanup projects. Kara will assist with public outreach and coordination with EPA and project partners.

Barbara Park Poage, DSL Portland Harbor Superfund Specialist, who has over 20 years' experience as a hydrogeologist and natural resource specialist and is DSL's Columbia Slough Project Account Manager. With support from DSL accounting staff, she will communicate with and report to EPA; manage accounting and reimbursements; and review DEQ reports and work products.

Sarah Miller, DEQ NW Region Cleanup Program Columbia Slough Project Manager. Sarah manages DEQ's Columbia Slough cleanups and has 14 years' experience working on upland and in-water remediation projects. She will be responsible for grant management, including reporting to and coordinating with DSL; developing reimbursement requests for DSL's submission to EPA; supervising the QEP and contractor; supervising outreach; and ensuring DEQ compliance with reporting and financial requirements. Sarah will also support technical oversight of cleanup related activities.

Heidi Nelson, P.E., DEQ NW Region Cleanup Program, Project Engineer. Heidi will be responsible for supporting technical oversight of cleanup related activities. She has 20 years of experience working on sediment cleanups in private consulting and DEQ oversight.

Josh Elliot, P.E., Maul Foster Alongi, Senior Engineer/QEP Project Manager. Josh will be supporting DEQ as a consultant for the in-water remedial action design. Josh has over 12 years of experience in civil and environmental engineering and will be "Engineer of Record" for the cleanup project.

TBD, Cleanup Communication Specialist, DEQ. This new position will be the public point of contact for this project, review communications materials and assist with communication coordination. The position will be filled summer 2023 and under the DEQ Cleanup Program manager (Ned Fairchild) supervision with assistance from Rebecca Wells-Albers.

Heather King, Columbia Slough Watershed Council, Executive Director. Heather will facilitate public meetings, share project updates, and engage the community around site reuse. Will advise DEQ on community engagement and messaging.

Andrew Davidson, City of Portland-Columbia Slough Sediment Program Manager. Andrew will coordinate with Community Engagement Liaisons (CELs) and provide feedback on Columbia Slough engagement and workshops, share project updates with public via websites and other city media.

Ping Khaw, Community Engagement Liaison Project Manager. Ping will coordinate 14 CEL liaisons to underserved communities to provide collective input on the affected communities interests in Columbia Slough remediation and reuse based on accessible and culturally appropriate ways. Ping will primarily engage with Andrew Davidson at the City of Portland.

Laura Guderyahn, Portland Parks & Recreation, Technical Resource. Laura will provide technical assistance for developing benthic monitoring plan. Advise DEQ on creating opportunities to engage community members and support existing environmental job training programs for racial minorities.

Kim Tham, Oregon Health Authority. Kim will advise DEQ and project partners on fish advisory and related communications to the community about contamination in the Slough.

Jenn Buildersee, City of Portland Office of Brownfields. Jenn will share news about community meetings and project updates with residents via newsletter, website, and social media. Collect and share community feedback and questions with DEQ.

1.3 Project Outputs and Outcomes

Table 1.3 below identifies proposed project outputs and outcomes. DSL is requesting pre-award costs starting August 1, 2023 to cover a portion of the Cleanup Planning tasks. This will allow the project to remain on schedule for in-water construction summer 2024. DSL/DEQ understands pre-award costs are incurred at the grant recipient's own risk. The DEQ Columbia Slough project manager will be responsible for reporting and tracking outputs and outcomes in quarterly reports to EPA and will compare actual accomplishments to the outputs and outcomes described herein. DEQ Project Manager will also report progress in EPA's Assessment, Cleanup, and Redevelopment Exchange System (ACRES) tracking system. Outputs funded with federal funds are **bolded** and assuming pre-award costs are approved. Recognizing that some outcomes will not be completed during the four-year grant cycle, DSL/DEQ commits to provide results, such as contaminant decreases in sediment and fish tissue, to EPA by email after the grant has ended. By keeping track of outputs and outcomes, the project team will be able to keep the community better informed and provide EPA the data necessary to demonstrate that funds are being used as intended and the cleanup action is being completed on schedule. If there is a lack of progress, actions will be taken to correct the course of the project.

TABLE 1.3 - PROPOSED OUTCOMES AND OUTPUTS		
Main Task Area	Outcomes	Outputs
Project Management & Reporting	• Efficient Delivery of output items • Increased knowledge of Brownfields Grant Program	• **48 project team meetings,** • **15 Quarterly Reports,** • **4 Disadvantaged Business Enterprises (DBE) Reports,** • **4 Federal Financial Reports (FFR),** • **1 Final Cleanup Work Plan (This document),** • **1 Final Performance Report,** • **Attendance at 1 national brownfields conference, attendance at 3 state or regional brownfields conferences, and** • **15 quarterly ACRES updates**
Community Engagement	Number of people engaged with project: • Increased knowledge of Brownfields Cleanup process to underserved communities • Increased community knowledge of DEQ's Columbia Slough Cleanup strategy • Provide field trips to underserved youth interested in environmental careers	• **7 Community meetings with notes/attendance/recordings** • 1 Webpage and online information repository, • 16 press releases or newspaper/web articles and social media posts, and • **Direct community outreach, such as two kayak trips or as determined by project partners, including the Columbia Slough Watershed Council**
Cleanup Planning	• Finalize Remedial Action Design and prepare for in-water construction • Benthic Sampling Plan developed to further assess capping impacts and benthic biota recovery	• **1 Draft and Final Cleanup Work Plan,** • 1 QAPP – (Quality Assurance Project Plan, Brownfields Program, November 2016 [Addendum 1] to this document), • **1 Construction Bid document,** • **1 100% Remedial Design Document,** • **1 HASP – (Included in the 100% Remedial Design Document), and** • 1 Benthic Sampling Work Plan
Cleanup Performance and Completion	Perform Cleanup action: • Decrease in PCBs, PAHs, calcium concentrations, and ancillary contaminants in shallow surface porewater • Reduce chemical exposure to fish and wildlife by capping contaminated sediments	• **1 Bathymetry survey,** • **Install water quality best management practices (sediment curtain),** • **Install 105,154 sf of reactive core mat, armor rock, and habitat sand layer (across Areas A, B, and C),**

	• Obtain further knowledge of capping impacts to benthic communities • Contaminant reduction in fish tissue in home range of the target site over time (Collected as part of larger Columbia Slough Long-Term Monitoring Program)	• **Install17,098 sf of amended sand cap in remaining areas (Below refugia and Area E).** • **Collect a minimum of five verification samples** • Institutional controls in place as appropriate (i.e., use restrictions and fish consumption advisory) • **1 Draft and Final Construction Completion Report** • 1 Benthic Sampling Results Report • 1 Fish Tissue Sampling Report (Planned FY2027, to be submitted post-grant closure)

2 PROJECT TASK DESCRIPTIONS

This section describes the primary tasks and subtasks that will be performed for this project. The project includes four primary tasks including 1) Project Management and Reporting, 2) Community Engagement, 3) Cleanup Planning, and 4) Cleanup Performance and Completion. DSL has developed an organizational structure and communication network for this project and has assembled an inter-jurisdictional project team as previously detailed in the Organizational Structure and Responsibilities section.

2.1 TASK 1 – PROJECT MANAGEMENT AND REPORTING

The primary goal of the project management and reporting task is to enable efficient delivery of cleanup-related deliverables and to ensure that the project complies with all reporting requirements, procurement standards, and other statutory requirements. The project management tasks will be split between the DSL Account Manager and DEQ's Columbia Slough Project Manager for specific leads for Task 1, as further described below. Roles and responsibilities will also be included in the Interagency Agreement (IAA described below) between DSL and DEQ, which will be completed by fall of 2023.

2.1.1 Project Management

The objective of the project management task is to ensure efficient communication and delegation of duties. The project team will be responsible for overall project management of the core functions of cleanup action, public outreach and education, and project compliance with the QAPP, HASP, Work Plans, and 100% Remedial Design Document. DSL and DEQ will use its own funds to perform project management work. The selected QEP(s) will also be responsible for some project oversight and communication on sub-tasks related to project management, community engagement, cleanup planning, and cleanup performance and completion.

To further define the roles and specific project management tasks that will be divided between DSL and DEQ, the State agencies will enter an IAA to administer the grant. As grant account manager, DSL will provide project and technical review oversight, administer, and disburse funds, and manage accounting and reimbursement requests to EPA. DEQ Northwest Region Cleanup Program will manage day-to-day grant activities, including, but not limited to planning and implementing cleanup activities, contracting and managing the QEP, leading community engagement, contracting for remediation services, and coordinating with DSL to support financial management and reporting to EPA.

DEQ, DSL, and QEP will meet monthly. Other technical team members or organization point of contacts will attend the monthly meetings as needed. The DEQ project manager will prepare monthly emails and quarterly reports to DSL on project progress. DSL will submit quarterly reports to EPA.

2.1.2 Project Reporting - Periodic

The objective of the project reporting subtask is to ensure that the project is in compliance with all applicable regulations, the project is progressing in accordance with the anticipated timeline, and that required quarterly progress reports are submitted to EPA Project Officer in a timely manner. The DEQ Columbia Slough Project Manager will prepare and DSL's Account Manager will be responsible for providing Quarterly Progress Reports to the EPA Project Officer by email within 30 days of the end of each federal fiscal quarter in December, March, June, and September (due by January 30, April 30, July 30, and October 30). DEQ Project Manager will also use the ACRES tool to report project progress quarterly and promote the results publicly.

2.1.3 Staff Training/Travel

DEQ's Columbia Slough Project Manager and/or DSL's Account Manager will attend one national Brownfields conference within the next three years, with the intent of presenting site cleanup work information. In addition, DEQ and DSL will engage project staff to attend up to three state or regional Brownfields conferences. Partners, such as Columbia Slough Watershed Council staff or a student intern may also attend a state or regional Brownfields conference along with a project team member. DSL/DEQ will work closely with the EPA Project Officer to identify additional training opportunities. DSL staff travel is under the travel category of the budget and ODEQ travel costs are in the other category.

2.1.4 Contractor Procurement

DEQ will procure a QEP in compliance with state regulations and 2 CFR 200.317-326 to conduct the following design tasks: Finalize remedial design, assist with regulatory approvals, prepare follow-up sampling plan, prepare health and safety plan, prepare the 100% design documents, prepare solicitation request for procuring cleanup contractors, and provide cleanup contractor

solicitation process support. Procurement planning will begin in summer 2023 with QEP available no later than October 1, 2023.

DEQ and QEP will competitively procure a remediation subcontractor to implement the cleanup work in compliance with state regulations and 2 CFR 200.317-32. The DEQ Columbia Slough Project Manager will oversee the procurement with QEP assistance. Procurement will begin in fall 2023 with remediation subcontractor contract in place no later than June 1, 2024.

2.1.5 Final Performance Report

The DSL Account Manager will be responsible for submission of the Final Performance Report to close out the grant. DEQ Project Manager or its QEP may prepare the drafts for DSL account manager review and approval. DSL account manager will submit the report to EPA. It will summarize the entire project period, include a fact sheet, before and after photos, describe the nature of the work done for the in-water area, quantify spending by category, and cover lessons learned by DSL, DEQ, and the contractor(s) in implementing the Brownfields cleanup grant. The report will also include document outreach efforts and a summary of all other activities. It will be submitted to the EPA Region 10 Project Officer within 120 calendar days after the expiration or termination of the award, currently set for September 30, 2027.

2.2 TASK 2 – COMMUNITY ENGAGEMENT

DSL/DEQ has worked closely with Columbia Slough governmental and non-profit partners and would like to further engage with the Columbia Slough community directly considering feedback from the November 2022 ABCA public meeting. DSL/DEQ or its partners will conduct community outreach and involvement. Direct community engagement will be developed as conversations mature with community partners over the next year.

2.2.1 Community Outreach and Involvement

DEQ anticipates holding 7 community meetings facilitated by the Columbia Slough Watershed Council, with a virtual option. Project information will be communicated through newspapers, newsletters, social media, email, and websites. Partners will be encouraged to also disseminate materials on their respective websites.

DEQ project manager will involve the community on issues and tasks funded by EPA, as well as those funded by DEQ, such as revegetation of the Slough bank. Possible additional community involvement will include:

- DEQ project manager and engineer anticipate working with the Columbia Watershed Council to provide at least two field trips during project implementation to environmental workforce development programs prioritizing racial minority communities in the Columbia Slough watershed. The field trips may include small groups of kayakers into the project in-water work area to get a better understanding of activities that will be

happening in the Columbia Slough work area, habitat and setting, and overall area of the remedial action.
  - DEQ may engage an undergraduate intern in summer 2024 to develop or implement the pre/post construction benthic assessment or other aspect of the cleanup or outreach work.
  - DEQ will work with the City of Portland to engage CELs to provide a better understanding of their respective community's relationship with the Columbia Slough and how to approach engagement to underserved communities. This may include small group kayak trips to facilitate conversations and experiences. Activities will be developed as conversations mature over the next 6 months to year.

2.2.2 Public Notice and Comment

As part of the EPA Brownfields Cleanup grant application, the ABCA was presented to 18 members of the public during a public meeting on November 2, 2022. Public notice for the meeting was issued on October 19, 2023 and appeared on DSL and DEQ's public meetings webpages. Invitations were sent via email to 1,952 email addresses, in collaboration with nonprofit project partner the Columbia Watershed Council. At this meeting, community feedback indicated that economic pressures have pushed more underserved communities into using its fish as a survival resource, increasing risk of exposure to PCBs. Two comments were received at the public meeting and one written comment was received. One verbal comment focused on longevity of cap materials; two comments highlighted additional fish consumption advisory communication needs. Based on this feedback, the project budget was adjusted to include more funding for diverse, direct, and culturally appropriate forms of community feedback.

2.2.3 Project Updates and other Public Information

- DEQ project manager will publish quarterly articles or press releases in a variety of languages to keep the community informed throughout the project. Articles will be shared with project partners for further distribution to the community.
- An ArcGIS StoryMap website will be developed by DEQ to graphically display the cleanup work in plain language.
- A DEQ online repository for site documents is already available for public review.

2.3 TASK 3 - CLEANUP PLANNING

Under the IAA, DEQ Columbia Slough Project Manager will take lead on cleanup planning, with DSL Account Manager providing input and reporting during the planning process as needed. The 90% Remedial Design Report is attached as Addendum 2. DSL/DEQ may request pre-award costs for specific cleanup planning tasks as noted below.

2.3.1 Analysis of Brownfields Cleanup Alternatives

The ABCA was finalized on November 18, 2022 incorporating public comments. The technical portion remains substantively the same as presented to the community and was submitted for the EPA grant application. The ABCA presents area of concern information, nature and extent of known contaminants, cleanup standards/applicable laws, evaluation of cleanup alternatives, and selection of preferred alternative. The ABCA evaluated three alternatives, (1) Full removal, (2) Capping, and (3) Partial Removal with Capping. Alternative 3, Partial Removal with Capping was selected.

2.3.2 Integrating Sustainability

The ABCA presented a remedial alternative evaluation using DEQ removal authority. Typically, under DEQ removal authority (OAR 340-122-0090), remedial alternatives are evaluated using the following criteria:

- Effectiveness
- Long-term reliability
- Implementability
- Implementation risk
- Reasonableness of cost

The above factors, along with climate change and sustainability related to resilience per EPA guidance, are discussed in the document. The selected alternative minimizes the amount of material filled and removed; this reduces material management in terms of material shipped via truck traffic and corresponding carbon atmospheric impacts. As the effects of climate change increase, the frequency and magnitude of flood events are expected to increase during the rainy season (October through April), and summer flows are expected to decrease. This work will avoid increasing flood risk by removing soil on the adjacent City-owned bank to compensate for capping material that will be added.

2.3.2 Endangered Species Act (ESA) and National Historic Preservation Act (NHPA) Requirements

EPA will perform the ESA and NHPA notification requirements for the project. DSL/DEQ will assist by providing information as requested by EPA. DSL/DEQ will host a project webinar and invite ESA, NHPA, and Tribal interests during project planning phase. DSL/DEQ will work with EPA to establish webinar participants and invitees.

The November 23, 2022 Pacific Carbide Sediment 90% Remedial Design contains summarized information for planning and conservation (IPaC) service from the U.S. Fish and Wildlife Service (USFWS) (USFWS, 2021). The National Marine Fisheries Service species profiles and critical habitat maps, and a search for rare, threatened, and endangered plant and animal records for the vicinity of the Site from the Oregon Biodiversity Information Center (ORBIC) data system 2021.

A Cultural Resources Review and Assessment was prepared in 2021. The assessment concluded the proposed project will have no effect on previously recorded archaeological sites and historic properties. Under US Army Corps of Engineer Corps No. NWP-2020-439-1, an Inadvertent Discovery Plan will be available.

2.3.3 Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HSP)

When environmental data are collected as part of the brownfield cleanup (e.g., cleanup verification sampling, post-cleanup confirmation sampling), the recipient will use the 2016 *DEQ Quality Assurance Project Plan: Brownfields Program.* EPA will provide concurrence before any additional sampling is completed. DEQ will update the document if requested. Addendum 1 contains the 2016 QAPP; project remedial objectives are presented in Addendum 3.

A Health and Safety Plan (HSP) was developed for the 90% Design Document. The HSP will be finalized by the QEP in the 100% Design document.

2.3.4 Final Cleanup Plan and Remedial Design

DEQ will hire a QEP to finalize the 100% Cleanup Remedial Design. Under DEQ project manager direction, the QEP will finalize regulatory approvals, complete 100% design documents, prepare bid documents for soliciting cleanup contractors, and provide bidding process support. The above tasks may begin between August 1st and October 1st, 2023, to facilitate construction in summer 2024. DSL/DEQ will work with EPA to negotiate any pre-award costs. DSL/DEQ understands pre-award costs are incurred at the grant recipient's own risk. The 100% Cleanup Design Plan will include the cleanup standards to be achieved and any institutional, land use, or engineering controls that will be required as part of the cleanup.

2.4 TASK 4 – CLEANUP PERFORMANCE AND COMPLETION

2.4.1 Cleanup Activities

The 90% Design document describes the detailed action at the Moore & Wright Islands Sediment Cleanup. Bank preparation work will begin in January 2024 with in-water work occurring June-September 2024. Federal funds will be used for only DSL owned property and in-water portion of the work; however, the entire scope of the cleanup project is presented below for a complete description of the work. Construction activities funded by federal funds are in **bold text**. Remaining remedial design plans and post construction documentation will be funded primarily with federal funds.

- Bank preparation including removal of vegetation to facilitate excavation and construction access.
- **Installation of a thin-layer amended isolation cap (reactive core mat covered by a rounded rock armoring layer and sand habitat cover) over 122,252 square feet of sediment with total PCB concentrations above 100 micrograms per kilogram and calcium concentrations**

above 100 grams per kilogram, which coincides with areas impacted by PAH and metal contaminants.

- **Installation of a thin layer of activated carbon-amended sand cap below and adjacent to affixed refugia structures, and over sediment downstream of the railroad bridge.**
- Removal and off-site disposal of approximately 3,175 cubic yards of contaminated riverbank soil to meet City floodplain development code requirements, and restoration of portions of the riverbank disturbed by construction with native plantings, consistent with City of Portland and DSL requirements.
- DSL Permanent Easement will be applied to the capped area after project work is complete.

2.4.2 Confirmation sampling

Several lines of evidence will be used to confirm project success. Including a Construction Quality Assurance Plan, benthic sampling and utilizing the established Columbia Slough Long-Term Monitoring Plan.

DEQ will finalize the Construction Quality Assurance Plan during 100% Remedial Design development for project specific activities including:

- Suitability of Imported Materials to confirm that Oregon Clean Fill Criteria and Columbia Slough Screening Level Values are met for imported sand.
- Bank Excavation Material Management sampling for offsite disposal of contaminated riverbank soil.
- Water quality monitoring will be conducted during construction as required under the 401 Water Quality Certification.
- Armor and sand layer thickness
- Restoration of bank and 3-year plant survivorship

DEQ and project partners will develop a benthic sampling plan to evaluate pre-and post-remediation impacts to benthic animals. Benthic evaluation scope is to be determined but may continue up to 3 years after construction. A completion evaluation report will be prepared and submitted to EPA before grant closeout.

Long-term remedy effectiveness monitoring will be completed under the City of Portland's Columbia Slough Long-Term Monitoring Plan, established in 1994 and updated in 2011. The City collects sediment and fish tissue data every 10 years with the next event occurring between 2025 and 2027. The City prepared report is anticipated after the EPA grant reporting period. DEQ will submit the final 10-year reports to EPA, if requested.

2.4.3 Final Construction Completion Report

The project QEP will prepare a Construction Completion Report by summer 2025 that confirms cleanup is complete and meets the standards identified in the 100% Remedial Design. DEQ's Columbia Slough Project Manager will review the draft report before submittal to DSL Account Manager. The Report will identify institutional, land-use, or engineering controls.

3 SCHEDULE AND DELIVERABLES

The schedule below anticipates a start date of August 1, 2023. DSL/DEQ will request pre-award reimbursement of Task 3 Cleanup Planning costs. DSL/DEQ understands pre-award costs are incurred at the grant recipient's own risk.

Note that Oregon DEQ is the regulatory agency (State) and as such will implement the schedule and deliverables outlined below. Therefore, the 'State' column was relabeled NA in the 'Send to' table.

DUE DATE	ITEM	Send to:			
		EPA PM	NA	EPA GRANTS	EPA FINANCE
Month 1 (August 2023)	Property Profile Form entered in ACRES or submitted to PM	X			
Month 1-9	Remedial Design Planning				
Month 2	Fact sheet - project starting	X			
Month 2	First Community Outreach meeting w/ CSWC. Minimum Quarterly until/during construction. Every 6 months after construction.	X			
Month 4	Quarterly Progress Report (QPR) Begins 1st QPR Report	X			
Month 5	Project website online	X			
Month 6	Fact Sheet- construction update	X			
Month 7	Bank preparatory work (Vegetation clearing)	X			
Month 7	100 % Cleanup Remedial Design Document	X			
Month 7	Benthic Sampling Plan	X			
Before fieldwork begins	QAPP/Health and Safety Plan	X			
Before field work begins	EPA prepared Endangered Species Act (ESA) & National Historic Preservation Act (NHPA) Letters				

DUE DATE	ITEM	Send to:			
		EPA PM	NA	EPA GRANTS	EPA FINANCE
Month 9-10	Conduct In-water Benthic Sampling	X			
Months 10-13	In-water Construction	X			
Months 11-12	Community Workshop/kayak event	X			
Month 22-23	Conduct Benthic sampling	X			
Month 22-23	Community Workshop/kayak event	X			
Month 20	Fact Sheet - Cleanup results	X			
Month 22	National Brownfields Conference (2024-5)	X			
Month 30	Construction Completion Report	X			
Month 46	Benthic Evaluation Report	X			
Annually by Oct 30	DBE Report (MBE/WBE) (DBE = Disadvantaged Business Enterprises) Reports must be submitted **annually** by October 30th of each year. For forms & more information, visit: https://www.epa.gov/resources-small-businesses	X (copy)		X	
Every 30 date of every Quarter	Quarterly Progress Reports (QPR) Photos and Lessons Learned	X			
As Needed	Requests for Reimbursement – see Administrative Terms and Conditions				X

DUE DATE	ITEM	Send to:			
		EPA PM	NA	EPA GRANTS	EPA FINANCE
Month –45-48	Final Federal Financial Report (FFR) (SF425) & Final Drawdown Reports must be submitted **annually** within 90 days after end of reporting period (120 days after end of project period for closeout). For forms & more information, visit: https://www.epa.gov/grants/epa-grantee-forms	X (copy)		X (copy)	X
Month –45-48	Closeout: Final Performance Report with Summary Fact Sheet, Photos, and Lessons Learned	X			

4 BUDGET

Project budget is primarily directed towards Task 4- Cleanup Performance and Completion. Based on community feedback, the project budget was adjusted to include more funding for more diverse, direct, and culturally appropriate forms of community engagement.

4.1 Budget Table

Brownfields Cleanup Project Budget Table					
Budget Category	**Task 1 Performance Management & Reporting**	**Task 2 Community Engagement**	**Task 3 Cleanup Planning**	**Task 4 Cleanup Performance & Completion**	**Budget Category Total**
Personnel	$0	$0	$0	$0	**$0**
Fringe Benefits	$0	$0	$0	$0	**$0**
Travel	$2,840	$0	$0	$0	**$2,840**
Equipment	$0	$0	$0	$0	**$0**
Supplies	$0	$0	$0	$0	**$0**
Contractual	$17,100	$32,175	$43,950	$0	**$93,225**
Construction	$0	$0	$0	$896,480	**$896,480**
Other	$6,055	$1,400	$0	$0	**$7,455**
Total Direct Costs	$25,995	$33,575	$43,950	$896,480	$1,000,000
Indirect Costs	$0	$0	$0	$0	$0
Task Totals	**$25,995**	**$33,575**	**$43,950**	**$896,480**	**$1,000,000**

4.2 Budget Narrative

Project budget narrative supports the budget estimates outlined in the Budget Table in Section 4.1. The four budget categories are discussed in detail below.

Task 1: Project Management- Total Budget $25,995

Project Management consists of three budget categories: travel, contract, and other costs.

$2,840 Travel:

One DSL Staff to attend one national brownfields conference. Travel/Training costs were calculated as follows:

- Hotel $250/night x 4 nights = $1,000
- Per diem $50/day x 4 days = $200
- Airfare $620/event = $625
- Ground transportation/parking = $200

One DSL Staff to attend one regional brownfields conference. Travel/Training costs were calculated as follows:

- Hotel $150/night x 3 nights = $450
- Per diem $50/day x 3 days = $150
- Ground transportation/parking = $215

$2,400 Other: Conference registrations (8 registrations X $300 per person=$2,400) is included in the 'other' category. This is assuming at least one regional conference will be conducted where full travel is not needed.

$3,655 Other: One ODEQ to attend one national brownfields conference. Travel/Training costs were calculated as follows:

- Hotel $250/night x 4 nights = $1,000
- Per diem $50/day x 4 days = $200
- Airfare $620/event = $625
- Ground transportation/parking = $200

Two DEQ to attend one regional brownfields conference. Travel/Training costs were calculated as follows:

- Hotel $150/night x 3 nights = $450
- Per diem $50/day x 3 days = $150
- Ground transportation/parking = $215

$17,100 Contract Costs: Contractor costs are estimated 114 hours at $150 per hour. Contract costs are expected to cover reporting items, including 48 project team meetings, 15 quarterly reports, 1 final project performance report and 4 annual DBE and FFR reports, and support for quarterly ACRES updates.

Task 2: Community Outreach Total Budget $33,575

Community Outreach consists of 2 budget categories: contractual costs and other.

$32,175 Contract costs: Contractor costs are estimated at 161 hours at $150 per hour. Contract costs will include community outreach meeting facilitation and documentation, media updates, direct outreach/engagement w/ impacted neighboring communities, interpretation/translation services, website updates and utilization of local non-profit or possibly undergraduate internship stipend ($8,025) to assist with community engagement. If a student is brought on, the budget category will be modified to other.

$1,400 Other: will include support for community outreach such as production of print and online materials for direct community outreach, kayak rentals and other outreach items when developed with community partners. Costs estimated at $400 for printing of resource materials at a location outside of ODSL and $1000 for kayak rentals for community events at $50/kayak for 20 kayaks.

Task 3: Cleanup Planning Total Budget $43,950

Cleanup planning consists of one budget category: contractual costs. Cleanup planning costs are expected to start summer 2023. DSL will request pre-award cost reimbursement beginning August 1, 2023.

$43,950 Contract costs: Contractor costs are estimated at 293 hours at $150 per hour. Contract costs include completing 100% Remedial Design documents, finalizing QAPP, finalizing HASP, assistance with final state and local substantive requirements planning, preparing construction bid documents and construction bid coordination such as pre-bid walks, calling references and evaluating contractor bids.

Task 4: Cleanup Implementation Total Budget: $896,480

Cleanup implementation consists of one budget category: construction costs.

$896,480 Construction costs: include installation of reactive core mat and sand cap in the Columbia Slough.

Install reactive core sediment (RCS) cap $7.61/SF x 105,153 SF = $800,214

Install sand cap in areas unable to be reached by RCS cap: $5.63/SF x 17, 099 SF = $96,266

Addendum 1

Quality Assurance Project Plan

Brownfield Program

November 2016

Operations Division Cleanup Section
700 NE Multnomah St.
Portland, OR 97204
Phone: 503- 229-5696
Fax: 503-229-6977
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

State of Oregon **Department of Environmental Quality**

Last Updated: 11/30/16
DEQ04-LQ-0004-QAPP
Version 3.0

This Quality Assurance Project Plan was prepared by:

Oregon Department of Environmental Quality
3150 NW 229th Avenue, Suite 150
Hillsboro, OR 97123
1-503-693-5700
www.oregon.gov/deq

Contact:
Scott Hoatson
503-693-5786

1. Project Management

1.1. Approval Sheet

Lydia Emer — Date 12-5-16
Lydia Emer
Administrator, Operations Division

Bruce Gilles — Date 12-5-2016
Bruce Gilles
Manager, Cleanup and Emergency Response Program

Gilbert M. Wistar — Date 11/28/16
Gil Wistar
Site Assessment, Brownfields Program

Scott Hoatson — Date 12/6/16
Scott Hoatson
Agency Quality Assurance Officer, DEQ

for Donald Brown — Date 12/20/16
Donald M. Brown
Quality Assurance Manager, EPA Region 10

Susan Morales — Date 12/20/16
Susan Morales
Brownfield Coordinator, EPA Region 10

1.2. Table of Contents

1.3. Distribution List

The following DEQ personnel will be emailed regarding all aspects of this QAPP/SAP. Final reports from the third party laboratories will be faxed/emailed and mailed to the Project Manager (PM), Laboratory Project Manager (LPM). Final reports from the DEQ laboratory may also be faxed/emailed and mailed to thePM, and LPM and data coordinator.

This QAPP will be posted on DEQ's Cleanup program documents web page http://www.deq.state.or.us/pubs/reports.htm#Cleanup as well as internally on Q-Net (DEQ's internal website) at http://deqsps:808/lab/documents.asp. As prescribed by the laboratory's document control procedures, the official signed document will be filed at the DEQ laboratory. This project is expected to continue through multipleyears, thus revisions should be anticipated. The PM may make revisions to this plan, which must be approved by the signatories on the approval page. The DEQ is not responsible for the control of reprinted copies from web sites or photo copies of the original plan. It is the responsibility of the reader to ensure that they are using the most current QAPP. DEQ's Quality Assurance Officer (QAO) will replace posted network files as the plan is revised.

Table 1-1 – Distribution List

Name	Phone	Email
Lydia Emer	503- 229-6411	Emer.lydia@deq.state.or.us
Bruce Gilles	503-229-6391	Gilles.bruce@deq.state.or.us
Katie Robertson	541-278-4620	Robertson.katie@deq.state.or.us
Keith Johnson	503-229-6431	Johnson.keith@deq.state.or.us
Rebecca Wells-Albers	503-229-5585	Wells-albers.rebecca@deq.state.or.us
Mary Camarata	541-687-7435	Camarata.mary@deq.state.or.us
Mike Kucinski	541-687-7331	Kucinski.michael@deq.state.or.us
Gil Wistar	503-229-5512	Wistar.gil@deq.state.or.us
Scott Hoatson	503-693-5786	Hoatson.scott@deq.state.or.us
Donald M. Brown	206-553-0717	Brown.donaldm@epa.gov
Susan Morales	206-553-7299	Morales.susan@epa.gov
David Anderson	541-633-2012	Anderson.david@deq.state.or.us

1.4. Acronyms

^{o}C	Degrees Celsius (or centigrade)
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
DEQ	Oregon Department of Environmental Quality
DI	Deionized (as in deionized water)
DQL	Data Quality Level

DQO	Data Quality Objective
ECSI	Environmental Cleanup Site Information (DEQ's Cleanup program database)
EPA	Environmental Protection Agency (or USEPA)
HASP	Health and Safety Plan
HCID	Hydrocarbon Identification method
HCl	Hydrochoric Acid
HNO_3	Nitric Acid
H_2SO_4	Sulfuric Acid
ISM	Incremental Sampling methodology
ITRC	Interstate Technology and Regulatory Counsel
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System (Also called ELEMENT™ developed by Promium)
LEAP	Laboratory and Environmental Assessment Program
LOD	Limit of Detection
LPM	Laboratory Project Manager
LUST	Leaking Underground Storage Tank (DEQ's Cleanup program database)
MB	Method Blank
MCL	Maximum Contaminant Limit
MDL	Method Detection Limit
Ml	Milliliter
MOM	Mode of Operations Manual
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
NWTPH	Northwest Total Petroleum Hydrocarbon methods
ORELAP	Oregon Environmental Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
Oz	Ounce
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit – (sometimes refered to as Limit of Quantitation (QL) or Reporting Limit (RL)
QMP	Quality Management Plan
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act (EPA)
RPD	Relative Percent Differences
SAP	Sampling and Analysis Plan
SDS	Safety Data Sheet
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TNI	The NELAC Institute
USGS	United States Geological Survey
VOC	Volatile Organic Compounds

WQM Water Quality Monitoring
WRD Water Resources Department

1.5. Definitions

Brownfield Site: A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant...

Sampling Event: A group of samples collected and/or shipped under a single chain of custody; by an individual or individual sampling team (usually a single day's sampling activity).

1.6. Project/Task Organization

Brownfield site investigations may involve DEQ staff or contract staff outside the agency, including:

- Brownfield program staff at headquarters;
- DEQ regional office staff;
- Environmental contractors;
- Laboratory contractors; and
- DEQ Laboratory Division staff.

1.6.1 Brownfield Program Staff at DEQ Headquarters

Brownfield program staff at DEQ's headquarters office will:

- Provide policy oversight and training;
- Provide technical assistance; and
- Secure funding.

1.6.2 DEQ Regional Office Staff

Brownfield program staff in DEQ's regional offices will:

- Serve as Project Managers for Brownfield projects, and in some cases secure funding as well;
- Develop site-specific Sampling and Analysis Plans (SAPs), assemble project teams, implement field work, and coordinate sample analyses for Brownfield projects;
- Train environmental contractors on the requirements of this Brownfield Quality Assurance Project Plan (QAPP) and site-specific SAPs;
- Review and approve site-specific SAPs (and potentially QAPPs) prepared by DEQ's environmental contractors performing work for the agency on Brownfield projects;
- Oversee environmental contractor field implementation, including sample management, for Brownfield projects;
- For projects performed by DEQ staff, communicate project Data Quality Objectives (DQOs) to contract laboratories analyzing samples collected during Brownfield projects;
- Assess laboratory performance in satisfying the specified project DQOs;

- Initiate technical assessments of the performance of environmental contractors and contract laboratories as needed; Prepare and/or review reports evaluating and summarizing Brownfield site activities, sample results, and further-action needs, if any; and
- Update DEQ's Environmental Cleanup Site Information (ECSI) or Leaking Underground Storage Tank (LUST) databases in a timely manner.

1.6.3 Environmental Contractors

Within the scope of their project involvement, environmental contractors conducting field work for Brownfield site assessments will:

- Develop site-specific SAPs in accordance with this QAPP, working closely with the DEQ Project Manager;
- Communicate DQOs to contract laboratories analyzing samples collected during Brownfield projects;
- Assemble project teams, implement field work, and coordinate sample analyses;
- Verify the proper functioning of all equipment before beginning field activities;
- Ensure that the proper number, type, and quantity of sample containers, including preservation requirements, are available for field activities;
- Follow standard sampling protocols as defined in this QAPP or in the site-specific SAP;
- Record all field data in the manner specified in this QAPP;
- Following applicable Standard Operating Procedures (SOPs), ensure that all samples are collected, preserved, labeled, packaged, and shipped to laboratories in an appropriate manner; and
- Prepare reports evaluating and summarizing Brownfield site activities, sample results, and further-action needs.
- Perform data validation as required for project.

1.6.4 Laboratory Contractors

Contract laboratories analyzing and reporting on samples collected for Brownfield projects will:

- Understand and follow DQOs outlined in this QAPP and site-specific SAPs;
- Perform requested analyses using appropriate test methods specified in the QAPP and SAP;
- Satisfy all laboratory and analytical Quality Assurance/Quality Control (QA/QC) objectives and activities;
- Prepare laboratory reports for the DEQ project manager or environmental contractor project officer, including all relevant data and QC reports;
- Communicate any analytical problems, issues, or concerns to the DEQ project manager and/or environmental contactor in a timely manner; and
- Initiate corrective action when deficiencies in sample collection, preservation, handling, test methods, or documentation are identified internally, by the contract laboratory, or by the DEQ project manager.

1.6.5 DEQ Laboratory and Environmental Assessment Program (LEAP) Staff

DEQ's LEAP staff will:

- Assist in the preparation and evaluation of site-specific SAPs and DQOs;
- Provide technical assistance as needed to agency or contractor staff;
- Assist with training on proper sample collection, preservation, handling, and documentation requirements;
- File and maintain originals of the approved Brownfield QAPP;
- If requested, perform required test methods on samples in accordance with this QAPP;
- Prepare laboratory reports and/or QA reports for DEQ project managers, if requested;
- Review contract laboratory analytical results and QC data, if requested;
- Where applicable, report deficiencies in sample collection, preservation, handling, test methods, or documentation to the DEQ project manager and/or environmental contractor; and
- Initiate and support technical audits and corrective action that may arise from deficiencies in sample collection, preservation, handling, test methods, or documentation.

1.7. Background

As part of DEQ's Cleanup Program, DEQ performs and oversees assessments and cleanup actions funded by EPA. With this Brownfield-specific QAPP in place, DEQ or contractor staff need prepare only a streamlined SAP that incorporates this QAPP by reference for Brownfield projects covered by this QAPP.

Approval of this Brownfield QAPP authorizes DEQ to conduct and oversee sampling activities at sites covered by DEQ's State Response grant with EPA, as well as by competitive brownfield grants EPA awards to DEQ and to other parties who opt to use DEQ's contractors for field work and/or lab analyses. This authority derives from EPA's approval of DEQ's Quality Management Plan (QMP).

This QAPP can be applied to any Brownfield project conducted in Oregon. (project managers must evaluate this QAPP and assess whether it meets the specific needs of the project.)

1.8. Project Task/Description

The Brownfields site assessment requires a team approach encompassing a range of knowledge and skills. The Brownfields site assessment process routinely involves one or more of the following activities: review of historical records; coordination with local, state, federal and tribal staff; field investigation including sample collection and analysis; assessment of data useability; and evaluation of cleanup options and costs.

This QAPP defines the duties and responsibilities of staff at DEQ, environmental and laboratory contractors, and DEQ Laboratory staff involved in Brownfield projects. The objective of all QA activities is to ensure that data obtained from Brownfield projects are of known quality, represent actual site conditions, and are adequate and appropriate for making informed environmental decisions.

DEQ will use data obtained under this QAPP and site-specific SAPs to evaluate the nature, magnitude, and extent of contamination at Brownfield sites as well as to perform the remediation of documented contamination at Brownfield sites. The data will also help DEQ or others estimate costs of appropriate remedial actions for anticipated site-redevelopment scenarios. Sampling activities may be performed in

more than one event or multiple events, depending on sample results and funding limitations. In some cases, sampling may be performed in phases that span multiple cooperative agreement periods.

Media to be sampled most frequently under this QAPP include:

- Soil;
- Groundwater; and
- Soil gas.

Additional media that may be sampled infrequently under this QAPP can include but not limited to:

- Sludge;
- Sediment;
- Porewater;
- Surface water;
- Air; and
- Man-made materials (e.g.concrete and materials suspected of containing asbestos).

Categories of contaminants to be analyzed for typically include:

- Petroleum hydrocarbons ;
- Volatile and semi-volatile organic compounds;
- Pesticides and herbicides
- Polychlorinated biphenyls (PCBs);
- Dioxins/furans;
- Asbestos; and
- Metals.

1.9. Quality Objectives and Criteria

The purpose of this section is to provide qualitative and quantitative guidelines that should be used to define goals and DQOs of site-specific SAPs for Brownfield projects. Where time constraints or other resource limitations preclude development of site-specific SAPs, the guidelines defined in this QAPP should be followed.

The primary goal of sampling and analysis for Brownfield projects is to determine the nature and extent of site contamination from current or past uses of hazardous substances. Data collected from Brownfield projects will be used to outline suggested further investigative or remedial actions, to estimate costs to prepare the site for redevelopment, and to determine if any remedial actions that may have occurred are complete. Laboratory quantiation limits for Brownfield projects must be low enough to determine if analyte concentrations are above or below the agency's risk based concentrations (RBCs) for the intended future use of the site (See RBC table available on DEQs Clean-up webpage).

Data for Brownfield projects must be of known quality. Field personnel and laboratories analyzing samples must record and retain sufficient notes and QC documentation to demonstrate and support the level of data quality required for these projects. Before initiating any Brownfield projects, contractors tasked for field work, analytical work (i.e., laboratories), and data-assessment activities should have a DEQ-approved Quality Management Plan (QMP) or Quality Systems Manual. The QMPs of contractors responsible for planning, field work, and data assessment should adequately describe their policies and procedures for ensuring data quality in their activities, including, but not limited to: 1) their organization's

QA policy; 2) a description of their Quality Management System structure; 3) Quality Management System activities; and 4) document/record-management procedures.

Laboratories analyzing samples must have a quality system that meets the requirements in the standards developed by The NELAC Institute (TNI) and adopted by the Environmental Laboratory Accreditation Program (NELAP) (http://www.nelac-institute.org).

Site-specific SAPs must describe field activities, including the following elements:

- A description of the project with relevant background information.
- A list of project members, their responsibilities, and contact information.
- A description of the sampling plan, including the location, number, and type (i.e., soil, water, air, etc.) of samples to be collected.
- Sampling procedures.
- Field documentation and procedures.
- Field equipment calibration and analyses.
- The number and type of QC samples to be collected and submitted for analysis (e.g., trip and rinsate blanks, duplicate samples, etc.). The collection rate for rinsate blanks and field duplicates may not be less than 5% (one blank and one duplicate for every 20 samples). Regardless of the number of samples collected, at least one rinsate blank and one field duplicate should be collected for each media sampled for each field event.
- The analytical methods and minimum detection limits and reporting limits that laboratories analyzing the samples must achieve.
- The analytical and field QC elements (e.g., blanks, replicates, fortified samples, etc.) and assessment criteria that the laboratories must meet, if these differ from those described in the laboratories' quality systems manual. The default laboratory QC requirements for analyses of samples from Brownfield projects are given in Table 1-2.
- Reporting requirements and formats for laboratory data (e.g., reporting units, electronic or printed formats, data flagging, etc.); all laboratory data must be accompanied by supporting QC data.
- Special safety, tribal concerns or other cautionary information.
- Any additional sampling, analytical, or QA/QC requirements that deviate from those established in this QAPP.

Table 1-2 Field and Laboratory QC Elements and Sampling Criteria

	QC Element	Frequency	Media#	Analyte Type*	Criteria
Field QC	Trip Blank	1 per cooler	All	Organic	Only required when collecting VOCs
	Rinsate Blank	5% for each media sampled (but at least one sample per field event)	All	All	< method reporting limit, or <10% of the lowest concentration identified in any sample
	Field Duplicate	5% for each media sampled (but at least one sample per field event)	Air, water	Inorganic	RPD +/- 20% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
				Organic	RPD +/- 30% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
			Solids, non-aqueous liquids	Inorganic	RPD +/- 30% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
				Organic	RPD +/- 35% for concentrations > 5X the QL, or Absolute difference ≤ 2X QL for average concentrations ≤ QL
Laboratory QC	Method Blank	5% for each preparation	All	All	< 1/2 QL or <10% of the lowest concentration identified in any sample
	Laboratory Duplicates or Matrix Spike Duplicates	5% for each media sampled	Air, water	Inorganic	RPD +/- 20% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
				Organic	RPD +/- 30% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
			Solids, non-aqueous liquids	Inorganic	RPD +/- 30% for concentrations > 5X the QL, or Absolute difference ≤ QL for average concentrations ≤ QL
				Organic	RPD +/- 35% for concentrations > 5X the QL, or Absolute difference ≤ 2X QL for average concentrations ≤ QL
	Laboratory Fortified Sample (Matrix Spike)	5% for each preparation	Air, water	Inorganic	Recovery: 80-120%
				Organic	Recovery: 60-140%
			Solids, non-aqueous liquids	Inorganic	Recovery: 70-130% for at least 80% of the analytes
				Organic	Recovery: 50-120% for at least 80% of the analytes
	Surrogates	Each sample	All	Organic	Recovery: 50-150%
	Laboratory Control Sample	1 per analytical batch	All	Inorganic	Recovery: 85-115%
				Organic	Recovery: 70-130%**

Notes:

Water applies to all aqueous media containing less than 15% settleable solids, including drinking water, groundwater, surface water, waste effluent, etc. Solids applies to all aqueous media containing 15% or more settleable solids, including soils, sediments, and sludges. Non-aqueous liquids applies to any non-water substance containing less than 15% solids, including solvents, fuels, oils, etc. Air applies to all media in the gaseous state at ambient conditions at the time of sampling.

* Inorganic analytes include all metals, nutrients, anions. Organic analytes include petroleum hydrocarbons, volatile and semi-volatile organic compounds, pesticides, herbicides, PCBs, and dioxins/furans. Not all analytes may be covered by this list. For additional information, contact the QA chemist at the DEQ laboratory.

** May not apply to compounds that are known to be problematic. Consult with the DEQ Brownfields project manager if wider acceptance limits are needed.

1.10. Special Training Needs/Certification

Field activities pose certain risks. Staff must obtain the proper training to recognize, and protect themselves from, hazardous chemicals known or suspected to be present at Brownfield sites. Staff with questions about risks they might be dealing with should use existing resources (e.g., Safety Data Sheets [SDS], literature, and laboratory staff) and contact the appropriate authority (e.g., DEQ's Health & Safety Manager, Laboratory Managers, or Safety Committee). DEQ's Safety Committee continually reviews health and safety needs. The Health & Safety Manager can recommend and supply the most appropriate personal protective equipment for work at specific sites, and is responsible for managing the respiratory protection program.

Safety training courses relevant to Brownfield projects are readily available. All DEQ field personnel and environmental contractors are required to have appropriate OSHA health and safety training for hazardous waste sites (EPA training is also acceptable), supplemented by annual refresher courses. Contractors are responsible for ensuring that their personnel are informed about and trained on relevant OSHA guidelines. For sites where DEQ staff performs field activities, a site-specific Health and Safety Plan (HASP) will be approved by DEQ's Health and Safety Manager and the appropriate Program Manager before field work begins. For sites where an environmental contractor performs field activities, the contractor will prepare and approve their own HASP.

1.11. Documentation and Records

1.11.1 Introduction

Documents and records produced during Brownfield projects must be properly managed. Documents and records typically produced may include, but are not limited to:

- Site-specific SAPs;
- State Historic Preservation Office, Endangered Species Act, and tribal correspondence;
- Site assessment, Analysis of Brownfield Cleanup Alternatives, and Remedial reports;
- Field notes and records;
- Chain-of-custody forms;
- Laboratory analytical reports;
- Field and laboratory QC data;
- Photographs; and
- Records of communication such as phone logs, memos, e-mails, or other written correspondence.

All documents associated with a specific project will be filed with the project manager and will be uniquely identified by the Site ID number in DEQ's ECSI or LUST databases. Project records will be maintained in both printed and electronic formats whenever practicable.

Printed records[1] serve as the official record and will be maintained in the site's ECSI or LUST file for a period of no less than 30 years after site closure or otherwise as according to the DEQ Record Retention Schedule. Electronic records, wherever possible, will be maintained in write-protected formats such as the Portable Document Format (.pdf). In maintaining and archiving these electronic records, project managers will follow any guidance and procedures that DEQ's Cleanup program has established for electronic records.

Each contractor must have its own record-keeping system to present, organize, and store data and maintain records for at least 10 years or as otherwise directed by contract. This system should be described in the contractor's QMP or Quality Systems Manual (however named). The described record-keeping system must permit the historical reconstruction of all activities that produced the resultant sample analytical data. The history of the sample must be readily understood through the documentation. This includes field and inter-laboratory transfers of samples and/or extracts. Each laboratory must document its record-handling policies in its Quality System Manual.

Samples submitted to laboratories from Brownfield project must be accompanied by a Chain of Custody form that identifies each sample, its location, date/time of collection, collector's name, preservation type, sample type, requested analytes, and any special remarks concerning the sample.

1.11.2 Required Project Documentation

Each contract laboratory must have a documented sample acceptance policy (usually in its Quality Systems Manual). This policy must describe the minimum data elements for samples submitted to the laboratory for analyses and conform to the requirements in the most recent TNI standard (currently 2009). The policy should state that the following conditions will be met for all samples received at the laboratory:

- proper, full, and complete documentation, including sample identification, the location, date and time of collection, collector's name, preservation type, sample type and any special remarks concerning the sample;
- proper sample labeling to include unique identification and a labeling system for the samples with requirements concerning the durability of the labels (water resistant) and the use of indelible ink;
- use of appropriate sample containers;
- adherence to specified holding times;
- sufficient sample volume to perform the necessary tests; and
- procedures to be used when samples show signs of damage, contamination or inadequate preservation.

Sample(s) failing to meet the above criteria may be analyzed, depending on the circumstances (with approval of the DEQ project manager), but the data will be clearly flagged when reported as having been compromised due to a deficiency in one or more of the elements listed above. Release of data from compromised samples will be deferred, awaiting the necessary documentation.

[1] Printed records may be converted to electronic format and designated as the official record and maintained for 30 years or as according to the DEQ Record Retention Schedule. If this is done, all security protections must be in place to conform with agency records policies.

Documentation of any of missing information or instructions may be furnished to the laboratory *in writing* at any time up to the release of the data by the laboratory. When all sample acceptance criteria are met, the qualifying data flag will be expunged from the report provided the quality of the data has not been compromised.

1.) Complete sample documentation must be provided, including:

- Unique sample identification;
- Sample location;
- Sample matrix (e.g., liquid, solid, sludge, sediment);
- Sample classification (grab, continuos, composite);
- Date and time of collection;
- Sampler's name(s);
- Analytes to be analyzed and, when appropriate, the specific analytical method; and
- Special remarks describing the sample, if appropriate.

2.) The laboratory should be provided a copy of the site-specific SAP which should specify the following:

- Number of samples by matrix, including QA (duplicates, matrix spikes & duplicates, blanks, etc.);
- Name of the project manager;
- Name of the person to whom the data are to be reported;
- Analyses requested;
- The detection limit needed [e.g., qualitative screen, DEQ Risk-Based Concentrations (RBCs), drinking water Maximum Contaminant Levels (MCLs), Toxicity Characteristic Leaching Procedure (TCLP), etc.]; and
- Any specific QA/QC requirements.

3.) Third party laboratory analytical reports must include the following information for DEQ review (Note: When DEQ LEAP provides the analytical work, the same information is evaluated prior to reporting results):

- A QA summary of the report, including a discussion of sample conditions upon arrival, as well as any QA/QC issues that may have arisen during analysis.
- A complete result package that identifies analytical results, the units, and any qualifying data flags.
- A complete QC package for each analyte-matrix combination that includes the batch QC data identified by the project's DQOs and DQIs.

  The report must definitively link the samples with their associated QC results.
- Analytical reports will contain sufficient information to unambiguously link sample collection information to the group of analytical parameters.

1.11.3 Corrections to Documentation

All original data recorded in field notebooks, chain-of-custody records, and other forms will be written in waterproof ink. None of these documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a document assigned to one individual, that individual will make corrections by crossing a single line through the error, entering the correct information, and initialing the correction.

Alterations or changes to SAPs, analytical reports, or any other formal written documentation will be accomplished by attaching an erratum or addendum to the ***front*** of the original document. All errata and addenda must be signed and dated. Changes to electronic records must mirror appropriate changes in printed records. Alternatively, a revised document may be created as long as the revision is clearly noted and supersedes the previous document. Both original and revised versions must be maintained in the project files.

2. Data Generation and Acquisition

2.1. Sampling Process Design

Brownfield projects primarily involve sampling of soil and groundwater. These projects may also require sampling of sediment, soil gas, porewater, sludge, hard surfaces that are potentially contaminated (e.g., concrete, construction material), or asbestos containing materials, surface water, and ambient air.

The purpose of sampling at Brownfield sites is to generate information that will inform marketplace decisions about the feasibility of redevelopment, consistent with protection of human health and the environment. ***Data from Brownfield projects are not designed to be used for enforcement purposes.***

Sampling plans for individual Brownfield sites should be designed to document site conditions related to the known or potential releases of hazardous substances. These plans should be developed based on the specific needs and phase of each Brownfield site. Typical plans may focus on providing a baseline assessment of site conditions, filling data gaps from past investigations, or documenting that remedial actions meet regulatory requirements.

Field sampling personnel will make arrangements with the appropriate laboratory for proper sample containers, sampling request forms, and sampling equipment at least two weeks before field work begins. All projects involving the collection and analysis of samples should be described in a site-specific SAP. All SAPs must be reviewed and approved by the DEQ project manager or his/her designee.

Sampling equipment should be assembled based on the type of samples to be collected. Preparation and assembly of required equipment and materials should follow these steps:

1) All equipment will be checked for proper calibration, assembly, and operation prior to use.
2) Sampling equipment will be transported in such a manner as to maintain its cleanliness.

To the greatest extent possible, disposable and/or dedicated personal protective and sampling equipment will be used to avoid cross-contamination. All non-disposable sampling equipment must be cleaned between sample locations. Decontamination will be conducted in a central location, upwind and away from suspected contaminant sources. Investigation-derived waste (IDW), such as soil from drill cuttings/auger spoils, purge water from groundwater sampling, or wastewater from decontamination of sampling equipment, if generated, will be stored in 55-gallon drums prior to disposal. A sample will be collected from the IDW and analyzed for disposal purposes.

The following decontamination procedures will be used for all non-disposable equipment used to collect routine samples undergoing trace organic or inorganic constituent analyses:

1) Clean with tap water and nonphosphate detergent using a brush if necessary to remove particulate matter and surface films. Equipment may be steam cleaned (using high-pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.
2) Rinse thoroughly with tap water.

3) Rinse thoroughly with analyte-free water.
4) Rinse with a 10% nitric acid/deionized water mix, if the sample will be analyzed for trace inorganics. Do not rinse PVC or plastic items with acid.
5) Rinse thoroughly with analyte free water.
6) Rinse with a pesticide-grade acetone/deionized water mix if the sample will be analyzed for organics.
7) Rinse again with distilled/deionized water.
8) Air-dry the equipment completely.
9) Store the decontaminated equipment in a clean container.

2.1.1 Parameter-Specific Sampling Requirements

Parameter-specific sampling requirements, including container type, preservation requirements, and holding times, will be documented in a site-specific SAP whenever they depart from those defined in the DEQ Field Sampling Reference Guide (DEQ86-LAB-0002-QAG). Exceptions to standard sampling requirements may be made with written approval of the DEQ project manager.

The order of sample collection, regardless of the matrix, should be from the most volatile to the least volatile, and should be as follows:

1) VOCs;
2) Hydrocarbon Identifications (HCIDs) and Total Petroleum Hydrocarbons (NWTPH);
3) SVOCs (PAHs);
4) Chlorinated Phenolics;
5) Pesticides and PCBs; and
6) Total Recoverable Metals (RCRA 8 or TAL metals).

2.2. Sampling Methods

All samples must be collected in a manner consistent with the media being sampled and the analytes of interest. Collection methods must follow a DEQ or EPA-approved sampling protocol. Additional methods may be used with the approval of the project manager. Some sources for the appropriate sampling methods include:

- DEQ Water Monitoring and Assessment Mode of Operations Manual (MOM) DEQ03-LAB-0036-SOP (available at http://www.deq.state.or.us/lab/techrpts/technicaldocs.htm) – describes collection methods for surface waters, groundwaters, sediments, benthic infauna, fish, benthic macroinvertebrates, and aquatic invertebrates.

EPA SW-846, Chapter 10 – describes sampling techniques for various media, including soils, sediments, air, water, etc.

It is very important to use proper sample containers and appropriate preservation techniques when collecting samples. Samples should always be collected in containers supplied by the analyzing laboratory. This ensures that the container has been properly cleaned and that the analyzing laboratory will have sufficient sample material to conduct the requested test. Samples submitted to the laboratory that are not in a laboratory-supplied container are likely to be rejected. Samples must also be properly preserved, or they may be rejected. Table 2-1 summarizes required sample containers, preservation techniques, and holding times for the most commonly requested analytes in Brownfield projects. If sampling for VOCs in soil, additional guidance can be found in DEQ Program Policy: *Soil Sampling*

Requirements for Volatile Organics in Land Quality Programs (DEQ15-LQ-0053-QAG) and the follow-up *clarification memo*.

For information about analytes not listed in Table 2-1, check with the analyzing laboratory.

Specific sampling methods for media of interest are discussed in greater detail in Sections 2.2.1 to 2.2.6.

Table 2-1 Sample Containers, Preservation, and Holding Times ‡

PARAMETER	CONTAINER (1)	PRESERVATIVE	HOLDING TIMES
Volatile Organics (including NWTPH-GX)			
Liquids	(2 or 3) x 40-ml vials with Teflon-lined septum caps	4 drops conc. HCL Cool, ≤ 6°C No headspace	14 days
	(2 or 3) x 40-ml vials with Teflon-lined septum caps	Cool, ≤ 6°C No headspace	7 days
Solids	2 x 40ml pre-tared VOA vials with Teflon-lined septum caps containing: low level: 10 ml DI water or empty, high level: 10 ml Methanol	Cool, ≤ 6°C / -7°C	48 hours /14 days 14 days
Pure Product	One 40-ml vial with Teflon-lined septum caps	Cool, ≤ 6°C	14 days
Air	Summa Canister Tedlar Bags	None None	30 days 3 days
Semi-Volatile Organics			
Liquids – NWTPH/HCID	1-quart brown/amber glass jar with Teflon liner	5 ml HCl, pH<2 Cool, ≤ 6°C	7 days extract analysis within 40 days of extraction
Liquids – PAHs/SVOCs	1-quart brown/amber glass jar with Teflon liner	Cool, ≤ 6°C	7 days extract analysis within 40 days of extraction
Solids	4-oz brown/amber glass jar with Teflon liner	Cool, ≤ 6°C	14 days extract analysis within 40 days of extraction
Air	Consult specific analytical method		
PCBs, Chlorinated Pesticides, and Dioxins/Furans			
Liquids	1-quart brown/amber glass jar with Teflon liner	Cool, ≤ 6°C	7 days extract analysis within 40 days of extraction – Pest. 1 yr. - PCB, Dioxins/Furans
Solids	4-oz brown/amber glass jar with Teflon liner	Cool, ≤ 6°C	14 days extract, analysis within 40 days of extraction – Pest 1 yr – PCB, Dioxins/Furans

PARAMETER	CONTAINER (1)	PRESERVATIVE	HOLDING TIMES
Air	Consult specific analytical method		
Organo-phosphorus Pesticides			
Liquids	1-quart brown/amber glass jar with Teflon liner	Adjust pH to 5-8 with NaOH or H_2SO_4 Cool, ≤ 6°C	7 days extract analysis within 40 days of extraction
Solids	4-oz brown/amber glass jar with Teflon liner	Cool, ≤ 6°C	7 days extract analysis within 40 days of extraction
Air	Consult specific analytical method		
Metals (except Cr^{+6} and Hg)			
Liquids	250-ml polyethylene	Total aqueous - unfiltered Dissolved aqueous - filter on-site HNO_3, pH<2	6 months
Solids	Polyethylene or glass jar	None	6 months
Air	Consult specific analytical method		
Hexavalent Chromium (Cr^{+6})			
Liquids	250-ml polyethylene	Cool, ≤ 6°C	24 hours
Solids	Polyethylene, glass or zip-lock baggies	Cool, ≤ 6°C	1 mo. to extraction; 4 days after extraction
Air	Consult specific analytical method		
Mercury (2)			
Liquids	250-ml polyethylene	Total aqueous - unfiltered Dissolved aqueous - filter on-site HNO_3, pH<2	28 days
Solids	Polyethylene or glass jar	Cool, ≤ 6°C	28 days
Air	Consult specific analytical method		
Asbestos			
Solids	Polyethylene or glass jar or plastic ziplock bag	NA	365 days
Air	Filter stored in plastic ziplock	NA	365 days

‡Always consult the specific analytical method for special sample collection, handling, and storage requirements. Cool < 6°C implies samples are held above freezing and below 6°C.
(1) Collect duplicate containers on at least 5% of the water samples for matrix spike/matrix spike duplicate analysis.
(2) Methyl mercury - consult with the analytical laboratory.

2.2.1 Sampling Soil

Use a stainless steel spoon to collect samples from surface soils. Subsurface soils can be collected during the advancement of soil boring, during excavation of contaminated media, during the removal of USTs, during the excavation of test pits using a variety of equipment including the use of direct push technology, hollow stem, air rotary, or sonic drilling technology, excavation equipment or hand auger. Samples should be collected according to procedures outlined in the EPA's guidance document *A Compendium of Superfund Field Operations Methods* (EPA/540/P-87/001).

All soil samples will be discrete samples, unless a site-specific plan has been developed to collect

composite or incremental samples for a specified purpose. Soil samples should contain as few cobbles or stones as possible, unless the project manager wishes them to be included in the analysis. Composite sampling is achieved by collecting several roughly equal sub-samples and thoroughly mixing to form one sample. Soil sample compositing is not recommended at sites where VOCs are the contaminants of concern.

Incremental sampling methodology may be considered and is becoming a more common way to assess some sites. Incremental sampling methodology is a structured composite sampling and processing protocol that reduces data variability and provides a reasonable estimate of a chemical's mean concentration for the area/volume of soil being sampled. Representativeness is established by collecting numerous increments of soil (typically 30 to 100 increments) that are combined, processed, and sub-sampled according to specific protocols. For detailed information on ISM, see the ITRC (Interstate Technology & Regulatory Council). 2012. Incremental Sampling Methodology. ISM-1 (http://www.itrcweb.org/ism-1/)

For samples collected for VOC analysis, a sample of the soil should be collected following EPA Method 5035A using an extrusion tool. This procedure involves field extraction of approximately 5 grams of sample placed in a pre-tared vial containing preservative and with a septum-sealed screw cap. Once sealed, the sample is not exposed to the atmosphere until analysis is conducted.

> **Note:** Composite sampling, achieved by collecting several roughly equal sub-samples and thoroughly mixing in a jar to form one sample, is not acceptable for the analysis of volatile organics. Sampling for VOCs in soil is recommended to be completed by USEPA SW-846 Method 5035A, to prevent volatilization prior to analysis. Note that the ITRC incremental sampling (ISM) guidance discusses situations where ISM can be combined with Method 5035A if representative concentrations of VOCs are necessary for the project.

1) Hand Augers

Hand augers can be used to collect soil samples to depths of approximately 10 feet. The sample is extruded into an aluminum or stainless steel pan followed by immediate placement into appropriate sample containers. Samples may be obtained from discrete depths by forcing the soil core from the auger and collecting soil from the depth of interest. The project manager for DEQ or for the environmental contractor should assess whether a lined or stainless steel auger is necessary.

2) Test Pits, Excavations, UST Removals

Excavation activities include test pits, large excavations used to remove contaminated media, and the actions performed to remove an UST system (tanks and pipes). Excavation may occur by hand or more commonly with heavy equipment such as a backhoe or excavator. For excavations that may be safely entered by staff, samples are collected from the wall or floor of the excavated area after removing 1 inch of the exposed surface layer, and are placed directly into appropriate sample containers. For excavations that cannot be entered by staff, samples can are taken from an undisturbed volume of soil within a backhoe or excavator bucket.

3) Boreholes

Subsurface soil samples can be collected from boreholes using a sampler specific to the drilling technology (liners, split-spoon sampler) and transferred to appropriate lab-supplied jars. During drilling, cuttings or sample materials are sealed in a plastic bag and screened using a photoionization detector (PID), or a flame ionization detector (FID) to guide where samples should be collected. All soil classifications will be performed using the ASTM D2487 Soil Classification Method.

2.2.2 Sampling Sediment

There are many factors to consider when choosing sediment sampling equipment, such as: sample site access, sample volume requirements, sediment texture, and target depth for sediment collection. In general, piston samplers are best used for soft, fine-grained sediments at depth. Grab/dredge samplers are best for coarse, shallow sediments and where large volumes of sediment are required. More information on sediment sampling is available at: clu-in.org/download/contaminantfocus/sediments/methods-for-collection-epa-manual.pdf or www.epa.gov/sites/production/files/2015-06/documents/Sediment-Sampling.pdf

2.2.3 Sampling Sludge

Sampling of sludge could involve a variety of situations and sampling equipment will be site-specific. One of the more common sludge-sampling situations is for catch-basin materials. Equipment might include stainless steel trowels or spoons, hand augers, or dredges.

2.2.4 Sampling Water

Surface water samples are typically acquired from streams, brooks, drainage ways, and wetlands determined to be downgradient (or downstream) from contamination sources. Groundwater samples are typically collected from wells screened within the uppermost aquifer, but may also be collected from deeper aquifers, and from nearby residential, industrial, irrigation, or municipal/community wells, or from excavations.

Surface water and/or groundwater sampling events that are performed on a project-specific frequency require an approved site-specific SAP.

General procedures of the most common types of water sampling are described below. Additional sampling procedures may be found in the DEQ Water Quality Monitoring (WQM) section's *Mode of Operation Manual* (DEQ03-LAB-0036-SOP), which includes procedures for sampling rivers, streams, estuaries, lakes, groundwater wells, soil, shellfish, fish, and sediment.

1) Surface Water

Surface water samples are best collected using a stainless steel bucket. Before collecting a sample, the container should be rinsed out with water from the area to be sampled. Then collect a fresh sample. Avoid dipping sample bottles into the collection container, since residue from the outside surface of the bottle, or your hands, could contaminate samples and/or expose you to hazardous materials. Instead, pour from the collection container, with minimal agitation, into the sample bottle. If a stainless sampling container is not available, dip the sample bottle directly into the water, install a lid, and wipe off the outside of the container with a paper towel.

2) Groundwater (excluding Water-Supply Wells)

Monitoring wells may be sampled using dedicated pumps, disposable bailers, peristaltic pumps with new tubing, bladder pumps, foot-valve inertia pumps with polyethylene tubing, or 2-inch submersible pumps. DEQ staff performing the sampling may request disposable bailers or tubing from the Sample Tracker at DEQ's laboratory.

If collecting split samples, ensure they are homogeneous by filling a large clean container and gently swirling the contents before pouring into appropriate bottles. For VOC analytes, the sample containers will be filled directly from the sample source in the following manner: one from the primary sample bottle set, then one from the split-sample bottle set, and so forth. Samples used to measure field parameters (temperature, pH, DO, etc.), or samples collected in purge vials for VOC analyses, cannot be

split in this manner. They must be filled individually, directly from the tap or bailer. All samples from a given site should be representative of the water source from which they're collected.

All monitoring wells must be properly installed and developed in accordance with Oregon Water Resources Department (WRD) rules and regulations. Nonstandard wells or problems encountered during sampling should be noted in the field log and in subsequent reports.

Groundwater samples from soil borings may be collected by: 1) grab samples; or 2) temporary well points using a stainless steel or PVC screen. Groundwater samples can be obtained by using a small bladder pump, peristaltic pump, small stainless steel or Teflon bailers, or polyethylene or Teflon tubing and foot valve. All soil borings advanced must meet WRD rules and regulations regarding geotechnical holes.

3) Water-Supply Wells, including Drinking-Water Wells

Use the following procedures when sampling a water-supply well:

- Obtain permission to access property and obtain samples for analysis.
- Inspect the water system to locate the tap nearest the wellhead. Samples should be collected prior to any treatment units (UV units, reverse osmosis, *etc.*) if possible.

Before collecting samples from drinking water, irrigation, or industrial wells, purge the water lines for a few minutes to flush the plumbing and holding tanks -- so that the sample collected is as representative as possible. Remove any faucet aerators, and reduce water flow prior to collecting samples. Then fill the sample container directly from the tap (unless the sample is to be split, in which case the sample should be homogenized before distributing into the duplicate split containers). Collect all samples intended for VOC analyses according to SOPs in DEQ's Field Sampling Reference Guide (DEQ86-LAB-0002-QAG).

2.2.5 Sampling Porewater

Porewater is water within the upper few centimeters of sediments below surface water bodies. This zone is known as the *hyporheic zone*, and represents the groundwater/surface water interface. Sampling of this zone can be done with various equipment such as diffusion samplers, syringe and push-point porewater samplers. More information is available at: https://clu-in.org/programs/21m2/sediment/. Discharge of groundwater to surface water through the hyporheic zone is unlikely to be homogeneous; therefore, determining locations for sampling can involve additional investigative steps.

2.2.5 Sampling Air

Air sampling can consist of sampling indoor and outdoor ambient air, sub-slab air, crawlspace air, and soil gas. Ambient air sampling should always be approached with caution as the source of contamination is often not readily apparent, such as at operating dry cleaners or auto fueling/servicing facilities.

Air sampling equipment depends on sampling objectives, the nature of the site itself, the contaminants of concern, and analytical methods. Typical sampling containers include tedlar bags[1], stainless steel SUMA canisters, and glass sorbent traps used with sampling pumps. Indoor, outdoor, and crawlspace air is collected directly into sampling containers. Soil gas samples and sub-slab vapor samples are collected into sampling containers from subsurface soil gas sampling probes which may be permanent or temporary

[1] Verify that tedlar bags are appropriate for the specific analytes and data quality objectives.

installations. More information on air sampling and analysis to evaluate vapor intrusion from contaminated soil or groundwater is available in DEQ's *Guidance for Assessing and Remediating Vapor Intrusion in Buildings*.

2.3. Sample Handling and Custody

Custody procedures differ among laboratories. Custody procedures of the analyzing laboratory will be identified prior to field activities, including the DEQ laboratory.

Sample integrity must be maintained throughout the collection, transport, storage, and analysis process. Consequently all field activities must be fully documented, the samples must be clearly identified, and custody procedures followed in both field and laboratory operations.

The primary objective of chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection through completion of all required laboratory analyses. A sample is considered in custody when it is:

- In someone's physical possession;
- In someone's view; or
- Locked up or kept in a secured area that is restricted to authorized personnel.

All changes in sample possession must be fully and completely documented, with the date, time, and persons relinquishing and receiving the samples on the appropriate chain-of-custody record.

2.3.1 Field Documentation

The following types of field documentation should be maintained as part of the sample handling and custody record. Additional types of documentation may be relevant and should be identified in the site-specific SAP.

- Field notes or logbooks
- Site observations and photographs (with written descriptions)
- Names, titles, organization, and roles of sample collectors
- Date/time of sample collection
- Sample number
- Location of sampling station (include latitude/longitude)
- Number and type of samples shipped
- Number of shipping containers sent
- Equipment numbers and/or calibration information
- Sample collection forms
- Chain of custody / Analytical request form

2.3.2 Field Custody Procedures

To ensure proper custody while in the field, the following custody procedures will be followed:

- Sample bottles from containers that appear to have been compromised shall not be used;
- The sample collector will assume responsibility for the samples until transferred to another person following the appropriate chain-of-custody procedures;
- All sample data will be recorded in ink in a field notebook and on the appropriate field forms;
- A site team leader will assess if additional samples are required;

- All samples requiring thermal preservation must be shipped with an appropriate temperature blank (in each cooler), which will (at a minimum) consist of a 100-mL polyethylene bottle filled with clean water; alternatively, a random sample container will be used as the temperature blank.
- Each cooler (shipping container) in which samples are packed will be sealed and accompanied by one copy of the chain-of-custody record that is sealed in a zip-lock bag and taped to the inside lid of the shipping container;
- A separate chain-of-custody record will accompany each shipment of samples;
- Packaging, marking, labeling, and shipping of samples will comply with all regulations promulgated by the U.S. Dept. of Transportation, 49 CFR 171-177, and International Air Transport Association; and
- Freight bills and bills of lading will be maintained as part of the permanent project record.

2.3.3 Laboratory Custody Procedures

Transfer of the samples into laboratory custody will follow standard custody procedures and be fully documented on a Chain-of-Custody form. (The DEQ lab uses DEQ06-LAB-0054-FORM, available on Q-Net). The sample receiver shall note the condition of the shipping containers and the custody seals (i.e., broken, unbroken). The laboratory individual responsible for sample intake shall document the condition of individual samples in the shipping container as well as the temperature of the container upon receipt (recording the temperature of the temperature blank or if no temperature blank is present, recording the temperature of one of the samples in the cooler). If the shipping container, any individual sample containers, or the shipping temperature is out of control, the laboratory should contact their client for instructions on how to proceed with sample processing. The laboratory should follow the procedures documented in its Quality Manual for chain-of-custody sample handling.

2.3.4 Sub-sampling

Occasionally heterogeneous samples must be split into new containers after receipt at the laboratory. The laboratory or contractor should have documented procedures for taking sub-samples (or it may be described in the SAP). Project samples containing mixed media should not be split into different containers without first homogenizing the sample unless otherwise stated in the SAP. If it is determined during data review that the sample was mishandled the analytical results will be flagged.

2.4. Analytical Methods

All analytical methods used on samples from Brownfield projects must comply with relevant requirements of applicable federal or state programs for which they were collected (e.g., Comprehensive Environmental Response, Compensation, and Liability Act - CERCLA Clean Water Act - CWA, Safe Drinking Water Act - SDWA, Resource Conservation and Recovery Act - RCRA, Clean Air Act - CAA, etc.), or EPA-approved alternate methods. The current approved list of methods under the CWA and SDWA are promulgated in the *Code of Federal Regulations* (40 CFR Part 136, 40 CFR part 141) can be found at http://www.ecfr.gov/cgi-bin/ECFR?page=browse. The CFR is reviewed and updated annually by EPA as needed.

Current, approved methods under RCRA SW-846 can be obtained from the EPA website at https://www.epa.gov/hw-sw846/sw-846-compendium. Since the lists of approved analytical methods is subject to routine updates, contact the project manager or DEQ laboratory for a list of currently approved methods. SW-846 method updates occur on a periodic basis and there are no implementation dates assigned; it is satisfactory for a lab to be behind one version (e.g. 8270 D is the current version, it would be acceptable if labs were still referencing 8270C, though when the version is updated to 8270E, the labs

should be at least at 8270D). Table 2-2 below lists the classes of analytes that are typically of the greatest interest during Brownfield projects, as well as DEQ's preferred analytical methods. This table provides a starting point for selecting analytical methods for Brownfield projects. Additional methods may be available and appropriate; consult with the project manager for approval of alternate methods.

All results for analytical testing on soil and solid matrix samples for Organic and Inorganic analyses must be reported on a dry weight basis and identified as such in the final report, using the calculation below.

Wet weight result / % solids = Dry weight result [Equation 2-1]

Table 2-2 Preparation and Analytical Methods for Common Analytes of Interest

Analytes of Interest	DEQ Preferred Method
Inorganics - general	**Preparation Methods:** 1311 Rev 0 (7/92) - Toxicity Characteristic Leaching Procedure 3010A Rev 1 (7/92) - Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA or ICP Spectroscopy 3020A Rev 1 (7/92) - Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by GFAA Spectroscopy 3031 Rev 0 (12/96) - Acid Digestion of Oils for Metals Analysis by Atomic Absorption or ICP Spectrometry 3050B Rev 2 (12/96) - Acid Digestion of Sediments, Sludges, and Soils 3051A Rev 1 (2/07) - Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils
Metals	**Analytical Methods:** 6010D Rev 3 (7/2014) - Inductively Coupled Plasma-Atomic Emission Spectrometry 6020B Rev 1 (7/2014) - Inductively Coupled Plasma - Mass Spectrometry 7061A Rev 1 (7/92) - Arsenic (Atomic Absorption, Gaseous Hydride) 7062 Rev 0 (9/94) - Antimony and Arsenic (Atomic Absorption, Borohydride Reduction) 7741A Rev 1 (9/94) - Selenium (Atomic Absorption, Gaseous Hydride) 7742 Rev 0 (9/94) - Selenium (Atomic Absorption, Borohydride Reduction) 7470A Rev 1 (9/94) - Mercury in Liquid Waste (Manual Cold-Vapor Technique) 7471B Rev 2 (2/2007) - Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique) 7472 Rev 0 (12/96) - Mercury in Aqueous Samples and Extracts by Anodic Stripping Voltammetry (ASV) 7473 Rev 0 (2/2007) - Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry. 7474 Rev 0 (2/2007) – Mercury in Sediment and Tissue Samples by Atomic Fluorescence Spectrometry.
Mercury speciation (elemental vs. organic/methylmercury)	Contact the DEQ project manager and DEQ laboratory
Hexavalent Chromium (Cr+6)	**Preparation Methods:** 3060A Rev 1 (12/1996) - Alkaline Digestion for Hexavalent Chromium **Analytical Methods:** 7199 Rev 0 (12/1996) - Chromium Hexavalent , Ion Chromatography
Cyanide	**Preparation Methods:** 9010C Rev 3 (11/2004) - Total and Amenable Cyanide: Distillation 9013A Rev 1 (07/2014) - Cyanide Extraction Procedure for Solids and Oils 9013A Rev 1 (07/2014) - Cyanide Extraction Procedure for Solids and Oils **Analytical Methods:** 9012B Rev 2 (11/2004) - Total and Amenable Cyanide (Automated Colorimetric, with Offline Distillation) 9014 Rev 0 (12/96) - Titrimetric and Manual Spectrophotometric Determinative Methods for Cyanide 9213 Rev 0 (12/96) - Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode
Sulfides	9030B Rev 2 (12/96) Acid-Soluble and Acid-Insoluble Sulfides: Distillation 9034 Rev 0 (12/96) Titrimetric procedure for Acid-Soluble and Acid-Insoluble Sulfides 9215 Rev 0 (12/96) Potentiometric Determination of Sulfide in Aqueous Samples and Distillates with Ion-Selective Electrode

Analytes of Interest	DEQ Preferred Method
Organics - general	**Preparation Methods:** 3500C Rev 3 (2/2007) - Organic Extraction and Sample Preparation 3510C Rev 3 (12/96) - Separatory Funnel Liquid-Liquid Extraction 3511 Rev 1 (07/2014) - Organic Compounds in Water by Microextraction 3520C Rev 3 (12/96) - Continuous Liquid-Liquid Extraction 3535A Rev 1 (2/2007) - Solid-Phase Extraction (SPE) 3540C Rev 3 (12/96) - Soxhlet Extraction 3541 Rev 0 (9/94) - Automated Soxhlet Extraction 3542A Rev 1 (05/2005) or 3542A Rev 1 (5/2005) - Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5 Sampling Train) 3545A Rev 1 (2/2007) - Pressurized Fluid Extraction (PFE) 3550C Rev 3 (2/2007) - Ultrasonic Extraction 3560 Rev 0 (12/96) - Supercritical Fluid Extraction of Total Recoverable Petroleum Hydrocarbons 3561 Rev 0 (12/96) - Supercritical Fluid Extraction of Polynuclear Aromatic Hydrocarbons 3562 Rev 0 (2/2007) Supercritical Fluid Extraction of Polychlorinated biphenyls (PCBs) and Organochlorine Pesticides. 3580A Rev 1 (7/92) - Waste Dilution 3585 Rev 0 (12/96) - Waste Dilution for Volatile Organics **Analytical** 8000D (07/14) Determinative Chromatographic Separations
Volatile organics, including BTEX and MTBE	**Analytical Methods:** 8260B Rev 2 (12/96) or -8260C Rev 3 (8/2006) Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) 8021B Rev 3 (07/2014) - Aromatic and Halogenated Volatiles by Gas Chromatography Using Photoionization and/or Electrolytic Conductivity Detectors
Stoddard solvent or Mineral Spirits	**Analytical Methods:** 8015C Rev 3 (02/2007) - Nonhalogenated Organics by Gas Chromatography GC/FID 8260B Rev 2 (12/96) or -8260C Rev 3 (8/2006) Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)
Fuels	**Preparation and analytical methods** NWTPH – HCID - Hydrocarbon Identification Method for Soil and Water NWTPH – GX - Volatile Petroleum Products Method for Soil and Water Analyses NWTPH – DX - Semivolatile Petroleum Products Method for Soil and Water Analyses
Semivolatile organics	**Analytical Methods:** 8270D Rev 5 (7/2014) - Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) 8275A Rev 1 (12/96) - Semivolatile Organic Compounds (PAHs and PCBs) in Soils/Sludges and Solid Wastes Using Thermal Extraction/Gas Chromatography/Mass Spectrometry (TE/GC/MS)
Chlorinated phenols	**Analytical Methods:** 8041A Rev 1 (2/2007) - Phenols by Gas Chromatography

Analytes of Interest	DEQ Preferred Method
Dioxins/furans	**Analytical Methods:** 8280B Rev 2 (2/2007) - The Analysis of Polychlorinated Dibenzo-*p*-Dioxins and Polychlorinated Dibenzofurans by High Resolution Gas Chromatography/Low Resolution Mass Spectrometry (HRGC/LRMS) 8290A Rev 1 (2/2007) - Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/-High-Resolution Mass Spectrometry (HRGC/HRMS) 1613B Rev 2 (10/94) - Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS
PCBs/Aroclors and PCB/congeners	**Analytical Methods:** 8082A Rev 1 (2/2007) - Polychlorinated Biphenyls (PCBs) by Gas Chromatography 1668B Rev 2 (11/2008) Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS
Pesticides & herbicides (chlorinated and organophosphorus)	**Analytical Methods:** 8081B Rev 2 (2/2007) - Organochlorine Pesticides by Gas Chromatography 8141B Rev 2 (2/2007) - Organophosphorus Compounds by Gas Chromatography: Capillary Column Technique 8151A Rev 1 (12/96) - Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzylation Derivatization 8270D Rev 4 (2/2007) - Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). 1699 Rev 0 (12/2007) Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS.
Asbestos	**Analytical Methods:** EPAl600/R·93/116 (07/1993)- Method for the Determination of Asbestos in Bulk Building Materials (used for solid matrices) NIOSH 7200 – (Issue 2, 08/1994) Asbestos and other Fibers by Phase Contract Microscopy (used for air particulates)

The *DEQ Field Sampling Reference Guide* (FSRG) (DEQ86-LAB-0002-QAG) documents the analytical methods currently used by DEQ's laboratory.

2.5. Quality Control

DEQ recognizes that regulatory actions and environmental decision-making requires data and information of the highest possible quality. Consequently, DEQ has implemented an Agency-wide Quality Management System, which is documented in the DEQ Quality Management Plan. (DEQ03-LAB-0006-QMP). Every procedural aspect, from project planning, sample collection, laboratory analysis, to data assessment, imparts a significant and often critical bearing on environmental decisions.

2.5.1 Project Planning

DEQ employs a team-based project planning approach that draws together diverse interests and participants to define the scope and framework of a project before actual work begins. This QAPP describes and defines the general quality objectives of the Brownfield program. Site-specific quality objectives are often further defined by individual project managers in SAPs. This "graded" approach to quality system management ensures that quality activities are conducted throughout the project, but allows for the flexibility to tailor quality-related activities to individual projects.

2.5.2 Field QC Requirements

1) Training Field Personnel

DEQ has a training program for DEQ personnel that addresses acceptable sampling techniques, sample collection, preservation and handling procedures, and field instrument operation and documentation procedures. This is coordinated through DEQ's Quality Assurance Officer and the Watershed Assessment Section at DEQ's laboratory.

2) Field QC Samples

Field transport (trip) blanks will be submitted for each Brownfield project that involves sampling for VOCs. These blanks are prepared by the analyzing laboratory using distilled, de-ionized water, shipped with the other sample bottles to the field, and then returned to the analyzing laboratory with the samples for analysis. Field transport blanks are not separated from other samples, but are packaged with the environmental samples collected during the sampling event.

These other field blanks may be used, depending on site-specific circumstances and project DQO needs:

> Transfer blanks consist of sample containers filled at the site with purified water, and are used to assess the potential for airborne contamination at a site. Transfer blanks are most beneficial when sampling for VOCs or if there are significant particulates in the air (blowing dust) and sampling is for metals.
>
> Rinsate (equipment) blanks are generated by pouring purified water over decontaminated equipment and collecting the rinsate. They are used to assess potential contamination of samples resulting from improperly decontaminated sampling equipment. Rinsate blanks are strongly recommended for most Brownfield projects.

Field duplicates will be collected at a rate of one per 20 samples in each media, with a minimum of one duplicate within each media per sampling event. Field duplicates are taken within five minutes of collecting the original samples, and include all sub-samples. These samples are shipped back with the other sample bottles for analysis. The use of matrix spikes and matrix spike/duplicates are described in the *DEQ Field Sampling Reference Guide* (DEQ86-LAB-0002-QAG).

2.5.3 Laboratory QC Requirements

Routine laboratory QA activities are documented in the analyzing laboratory's *Quality Manual (however named).* Laboratory quality manuals must adhere to consensus standards adopted by the National Environmental Laboratory Accreditation Program (NELAP), which include at a minimum the following elements:

Routine quality control procedures must be outlined in the analyzing laboratory's *Quality Manual* and are used for all samples that are submitted for this project. Routine procedures must follow the most recent standards adopted under the National Environmental Laboratory Accreditation Program (NELAP), which include:

1) Daily instrument calibration or calibration verification prior to analysis of any samples.
2) Calibrations must be verified according to the analytical methods using a standard source other than the source used for the instrument calibration.
3) Method blank analysis daily or at a frequency of 1/20 samples, whichever is greater.
4) Analysis of a Laboratory Control Sample (LCS) or a certified reference material (CRM) at a frequency of 1/ per batch of 20 or fewer samples This sample is sometimes referred to a blank spike.

5) Analysis of a matrix spike at a frequency of 1/20 samples, or as the matrix changes, to assess accuracy and identify possible matrix interferences.
6) Analysis of laboratory sample duplicates or matrix spike/matrix spike duplicates (MS/MSD) on a frequency of 1/20 samples to assess the precision of the analysis.
7) Determination of the minimum reporting limit based on detection limit studies and the concentration of the lowest calibration standards.

The expectations for analytical precision and accuracy fall within the overall expectations for precision and accuracy as described in Table 1-2 or in a site-specific SAP approved by DEQ. Precision and accuracy will vary with the analytical method and laboratory procedures. The laboratory must qualify any results that do not meet the acceptance criteria on the analytical reports. The analyzing laboratory must make precision and accuracy statements available upon request.

Most projects will only require the information necessary for a Stage 2A validation as defined in EPA-540-R-08-005 (*Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*) to be submitted. This means the analyzing laboratory must include, in addition to sample results, sample receipt conditions and sample-related QC results (method blanks, LCS, matrix spikes and laboratory duplicate). If additional validation is required for a specific project, it should be defined in a QA plan or sampling and analysis plan.

2.5.4 Data Assessment

Data processing, verification, and validation are the quality management tools used to determine if project data meet the planned DQOs and requirements defined in this QAPP and in site-specific SAPs. During data assessment and validation, project data should be evaluated for completeness, correctness, and compliance against the method, procedural, or contractual requirements of the project. In the event that the analytical data is compromised in some way, data qualifying flags must be used to explain the variance. If unsure, the DEQ project manager will ask DEQ LEAP staff to assist in the analytical data assessment.

Laboratories must qualify all results that are affected by QC exceptions, as noted above, or other events that affect the interpretation of the analytical results. Laboratories all use different qualifiers so the lab must unambiguously define each flag they use in the analytical report.

The following data qualifying flags are standard USEPA validation flags that can be used by analytical laboratories and contractors providing services for Brownfield projects. The "Q" flag should be used to identify QC issues that may be relevant to interpretation of the analytical data and are not identified using one of the other flags. All "Q" flags must have explanatory statements.

- **J** - the result is an estimate because the measured sample concentration is less than the laboratory's method reporting limit (QL) but greater than the method detection limit (MDL), or laboratory QC criteria were not satisfied.
- **J+** - the result is an estimate (see "J"), and may be biased high.
- **J-** - the result is an estimate (see "J"), and may be biased low.
- **B** - the blank was contaminated with the analyte being reported.
- **U** - the measured sample concentration is less than the laboratory's reported quantitation limit (QL).
- **N** - the analysis indicates the presence of an analyte for which there is sufficient evidence to make a "tentative identification."

- **R** - the data are unusable due to serious QC failures. The presence or absence of an analyte cannot be verified. Resampling and/or reanalysis is required for verification.
- **UJ** - the analyte was analyzed for but not detected at the reported quantitation limit. Result is also estimated because of QC failures.
- **NJ** - the analysis has indicated the presence of an analyte that has been "tentatively identified" and the associated value represents its approximate concentration.
- **Q** - not all quality control criteria were satisfied.

Data validation and assessment are done by evaluating data against six Quality Assurance elements:

- Sensitivity
- Precision;
- Accuracy;
- Representativeness;
- Comparability; and
- Completeness

Verified data can then be validated against performance measures and DQOs established in this QAPP and in site-specific SAPs. The generic data assessment criteria for project data is discussed and defined below in items 1 – 6.

1) Sensitivity

Brownfield projects require analytical data sufficient to satisfy the DQOs which depend on the intended site use. The QLs developed for a SAP should be 5-10x below any action level where possible. It should be note that there are some RBCs where this is not possible. For the very low RBCs it may be necessary to report data below the laboratory's QLs for those parameters (report to their MDL). Values less than the laboratory's QL must be reported as an estimate.

Blanks should be less than ½ the QL for each analyte listed in the SAP. Laboratory Method Blanks (MB) will be prepared along with each LCS. The MB will be used to assess the sensitivity of the method. If corrective action measures fail to resolve MB errors, results batched with the MB will be flagged with the appropriate data qualifier.

2) Precision

Precision is a measure of the scatter of the data when more than one measurement is made on the same sample. Scatter is commonly attributed to sampling activities and/or chemical analysis. Duplicate samples are collected in the field to assess precision attributable to sampling activities. Replicate analyses are performed with each test to assess data variability in laboratory analysis. Precision will be expressed as relative percent difference (RPD). Project managers should indicate their preference as to what sample should be duplicated.

Site-specific SAPs may request tighter control limits for the initiation of corrective action. For concentrations well above the reporting limit, 20% RPD is acceptable. If concentrations are low, precision will be assessed by evaluating the actual difference between the values. The analyzing laboratory must determine its own control limit. Until the analyzing laboratory has collected sufficient data, it is acceptable to arbitrarily set the control limit to that presented in the cited method. When requested, the DEQ QA section will review agency sampling events with duplicate samples and prepare a QA report. The DEQ laboratory routinely splits a sample to perform replicate analyses. Site-specific SAPs may specify the frequency of sample splitting, and indicate which samples are to be replicated. Also see Table 1-2.

3) Accuracy

Accuracy is a measure of the difference between observed test results and true sample concentrations. Inasmuch as true concentrations are not known, accuracy is inferred from recovery data determined from standard reference materials (SRM) or laboratory control samples (LCS) and from matrix spikes.

SRM and/or LCS are used to assess laboratory performance using a particular method. The SRM is a sample of known composition in a relatively clean matrix similar that being tested and LCS are known concentrations of a standard spiked into a clean matrix (reagent water, or Ottawa sand, or clean air, etc). Accuracy is expressed as percent recovery of the known concentration. Some methods specify control limits. For those methods that do not, the analyzing laboratory should determine its own control limits however it is expected they should generally be within the limits expressed in Table 1-2.

Matrix spike/matrix spike duplicates (MS/MSD) are used to evaluate the performance of the analytical method on the specific sample matrix (not an evaluation of laboratory control). Laboratories spike one sample from each preparation batch however, unless specified, samples that are collected for this particular project may not be spiked. Because of this, a site-specific SAP should require a sample from the project to be spiked. Some organic methods require surrogate spikes on each sample, from which accuracy is assessed. The analyzing laboratory must determine its own control limit; limits should be similar to those listed in Table 1-2. Until the analyzing laboratory has collected sufficient data, it is acceptable to set the control limit to that presented in the cited method or in Table 1-2.

4) Representativeness

Representativeness is a measure of how closely observed test results for a given sample matrix reflect actual site conditions. Sampling design and sampling procedures must be developed so that results represent the matrix being measured. Sample handling protocols for storage, preservation, and transportation have been developed to preserve the representativeness of collected samples. Proper documentation will establish that protocols have been followed and sample identification and integrity assured. Trip blanks, rinsate blanks, and field duplicates will be used to assess field and transport contamination and method variation. Laboratory method blanks will be run on a daily basis. If it is determined that sample integrity has been compromised, data will be flagged with the appropriate data qualifier.

Samples not representative of the population often occur in judgmental sampling because not all the sample locations are equal. The rationale for selecting sampling locations should be described in the SAP.

Since special or unusual sample conditions might affect the accuracy of an analysis, it is helpful to have information about the sample matrix. Results of such matrix tests may give additional insight into the representativeness of the analyses. Tests describing the sample matrix may be requested on a site-specific basis. When appropriate, other QA tools such as ion balance reports, solid balances, conductivity-dissolved solid comparisons, etc., will be used to establish the representativeness of the data.

Quality analytical measurements with poor field duplicate precision may point to sampling problems or heterogeneous samples that are not necessarily representative of site conditions. To ensure the representative data quality indicator is correct, field duplicates must be collected. Evaluation of field duplicate, lab duplicate, and accuracy data will provide information if there is error in the hypothesis that the sample is homogeneous. If field duplicate data exceeds precision limits but lab duplicate and accuracy data is acceptable, the sampling design may be in error and the data may not represent the environmental conditions for which it was collected. If field duplicate data indicates Representativeness is acceptable, data users may assume other project data meet Representativeness objectives.

If data obtained from a sample location is not indicative of the normal ambient conditions and the variances are attributable to anomalous environmental conditions, the data from that sample location will qualified and assigned a DQL of “F”.

5) Comparability

The objective of this parameter is to assure that data developed during the investigation are either directly comparable, or comparable with defined limitations, to literature data or other applicable criteria. Comparability of the data will be maintained by using EPA-approved procedures. The analyzing laboratory must list analytical methods used in its Quality Systems Manual. If a site-specific SAP requires a new method, it should indicate how the method compares to other methods. The analyzing laboratory must measure comparability of test methods not cited in EPA or agency documentation by evaluating inter-laboratory splits and/or alternate test procedures.

6) Completeness

Completeness measures the amount of valid data obtained from the analytical measurement system compared to the amount expected to be obtained. Completeness is defined as the total number of samples taken for which valid analytical data are obtained, divided by the total number of samples collected, multiplied by 100. For Brownfield projects, at least 90% of all samples tested (for each analyte) should yield valid data[1].

2.6. Instrument/Equipment Testing, Inspection, and Maintenance

All field and laboratory analytical instruments and equipment will be tested, inspected, and maintained according to the manufacturer's guidelines and recommendations. Data collected from improperly functioning equipment will not be used. The equipment testing, inspection, and maintenance logs for all contractor equipment must be made available to the DEQ project manager or his/her representative upon request.

2.7. Instrument/Equipment Calibration and Frequency

All field and laboratory instruments and equipment used for measurement data will be operated and calibrated according to manufacturer's guidelines and recommendations. Calibration records must include the following information (whenever available and appropriate for the specific instrument or equipment):

- calibration date
- test method
- instrument
- analysis date
- each analyte's name
- analyst's initials or signature
- concentration and response
- calibration curve or response factor

[1] This definition may be updated based on project specific DQOs that are defined in a site specific SAP.

Only personnel properly trained in these procedures should operate and calibrate the instruments. Calibration records must be made available to the DEQ project manager or his/her representative upon request.

2.8. Inspection/Acceptance of Supplies and Consumables

All supplies and consumables should be examined for damage or other characteristics that would otherwise compromise data quality. Contractors and laboratories must have written procedures for inspecting and accepting supplies and consumables in their Quality Management Plans or Quality System Manuals.

2.9. Non-Direct Measurements

Data from non-measurement sources, such as computer databases, computer programs, or scientific publications, must be approved for use by DEQ in this QAPP, or in a site-specific SAP, that complies with the requirements of OAR 340-122-0250.

2.10. Data Management

Field data from Brownfield projects, such as sample ID and latitude/longitude coordinates, are recorded on field data sheets or hand-held computers. Field data is reported to the project manager through submission of field notebooks or field sampling data sheets, if used, by DEQ or contractor field staff. Laboratory analytical data should be submitted to the DEQ project manager in both printed and electronic form. Rapid turnaround laboratory data is reported to the project manager, if requested, but rapid turnaround is generally not required for Brownfield projects. The project manager or his/her designee will update the ECSI database. Alternatively, the project manager or his/her designee may record analytical data from Brownfield projects in DEQ LEAP's LIMS database, or in other DEQ databases that may be designed to store analytical data from specified locations.

3. Assessment and Oversight

3.1. Assessment and Response Actions

For long-term sampling projects, the DEQ project manager will meet at least weekly with field crews to discuss any problems, and ensure that all planned samples are being collected. For such sites, the project manager will review data weekly, observe sampling, and arrange re-sampling as needed. Contract laboratories will participate in Performance Evaluation studies twice yearly and satisfy NELAP requirements. Personnel responsible for data assessment will check the results of every sampling event for precision and completeness. Technical and/or quality system audits of environmental or laboratory contractors may be initiated on a prescribed schedule or on an as-needed basis in response to identified or suspected problems. Assessment and response actions will be documented and submitted to the DEQ project manager. Identified deficiencies will be followed up by written corrective action plans.

3.2. Reports to Management

Project managers are responsible for reporting Brownfield activities to program managers in their respective regions. Procedures for preparing these reports may vary between regions.

4. Data Validation and Usability

4.1. Data Review, Verification, and Validation

Data review, verification, and validation procedures and requirements are discussed in Section 2.5 - Quality Control.

4.2. Verification and Validation Methods

The most commen source of validation criteria is the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines (NFGs) for Organic Data Review* and *USEPA Contract Laboratory Program (CLP) National Functional Guidelines (NFGs) for Inorganic Data Review.* The functional guidelines were written for use with the EPA Contract Laboratory Program, and have very specific critieria. Some of the CLP critieria is not applicable to other EPA analytical methods or extended analyte lists and therefore the validator has to use professional judgement when using the functional guidelines.

Qualification of analytical results during the validation process usually use the flags listed in section 2.5.4. If other sources of data validation criteria are to be used, they must be identified in the project SAP.

If the DEQ LEAP is incorporating the data into their database:

DEQ validates the data against performance measures and DQOs established in this QAPP and in site-specific SAPs, may assign QC data quality levels of A, B, C, D, E, and F following the criteria detailed in DEQ guidance document; *Data Validation and Qualification* (DEQ09-LAB-0006-QAG) used by DEQ's QA section, which is specific to the analytical method, sample matrix, and the analyte of interest:

- **A** – **Data of known Quality**; meets QC limits established in a DEQ approved QAPP.
- **B** – **Data of known but lesser quality**; Data may not meet established QC but is within marginal acceptance criteria; or data value may be accurate, however controls used to measure Data Quality Objective (DQO) elements failed (e.g., batch failed to meet blank QC limit); the data is generally usable for most situations or in supporting other, higher quality data. (**Equivalent to the "J+"/"J-" (estimated) qualifiers used by EPA see above**)
- **C** – **Data of unacceptable quality**; Generally due to QC failures but may be related to other known information about the sample. Data should not be used for quantitation purposes but may have qualitative use. (**Equivalent to the "R" (rejected) validation qualifier used by EPA**)
    - **Note**: In rare instances, a project manager may still be able to use some "C" data (mostly Field generated) in their project if the data can still support the decisions that need to be made. In these cases, the project manager should document in their project report the basis as to why the "C" data was found to be acceptable.
- **D** – **No data available**; No sample collected or no reportable results. Samples are either voided or canceled.
- **E** – **Data of unknown quality**; Insufficient QA/QC or other information available to make determination. Data could be acceptable; however, no evidence is available to prove either way. Data is provided for Educational Use Only.
- **F** – **Exceptional Event**; "A" quality data (data is of known quality), but not representative of sampling conditions as required by project plan (e.g., an air particulate sampler fails to sample the full time period because adverse conditions such as a forest fire overloaded the sampling equipment).

DEQ uses the validation criteria found in *Data Validation and Qualification* (DEQ09-LAB-0006-QAG) as guidance for applying DQLs to the data. The DEQ QA section should be contacted when developing DQL criteria for site-specific SAPs that are different than that found in this QA Plan.

4.3. Reconciliation with User Requirements

The project manager will ensure that data collected during Brownfield projects address the agency's needs for evaluating that site. Moreover, the project manager will ensure that all environmental and laboratory contractors satisfy requirements specified in this QAPP, in site-specific SAPs, and in any binding contracts between parties. The laboratory conducting sample analyses will submit all QC data identified in this plan (Section 2) with its analytical data.

Data review, verification, and validation procedures and requirements are discussed in Section 2.5 and section 4.2. For the purposes of this QA Plan, analytical data with DQLs of A, or B (or non – 'R' flagged if using the scheme in section 2.5.4) will normally be acceptable for use. If the DEQ project manager feels that data with the Quality level of "C" or "R" is satisfactory for their needs it must be clearly documented in their final report as to how the DQOs can still be met.

5. Version History

Revision	Date	Changes	Editor
2.0	10/10/2011	General changes to reflect restructure of Cleanup Program and updates to make document current throughout. A7 – Requirement for laboratories to have a NELAP-like quality system A9.2 – Added language on sample acceptance policies B1 – Clarified language on sampling plan expectations B2 – Update method references Table B2-1 Updated container and preservation and holding time requirements, added asbestos, Cr+6 Table B4-1 Updated method references. Added Cr+6, Sulfides, Chemical Agents and Asbestos B5.2.2 – Added blanks to be consistent to QA policy B5.4 – Added requirement for data qualification for exceptions B5.4.2 – better differentiated SRM, LCS, and Matrix Spike in Accuracy discussion.	AD, SH
3.0	11/30/2016	Reformatted and renumbered document to new agency format. 1.11.2 - added information re: lab reports 2.2 - added reference to LQ soil VOC sampling policy 2.2.1- added references to ISM and added note on composite samples. Table 2-2 - removed chemical agents and added fuels, updated method references 2.3 - added extensive custody procedure detail (field and laboratory) 2.4.3 – updated laboratory QC requirements 2.4.4 – added more information re: Representativeness 4.2 – rewrote validation information 4.3 – added discussion on usability Editorial edits throughout.	SCH, KR, MC, GW

Addendum 3: MWINA Remedial Action Objectives from *Remedial Design Optimization Report. Prepared by DEQ October 2021.*

Selected Remedial Objective*

Contaminant	Remedial Objective	Recommended Remedial Design
Total PCBs	100 ppb	Isolation cap or amended sand cover for concentrations in sediment exceeding Remedial Objective
Calcium	100,000 ppm	Isolation cap or amended sand cover for concentrations in sediment exceeding Remedial Objective

**Based on Surface Area Weighted Concentration Analysis to meet Target cleanup concentration for PCBs only (green highlighted screening level value below)*

Table 1
Screening Level Values for Riverbank Soil and In-water Sediment
Pacific Carbide
Oregon Department of Environmental Quality
Portland, Oregon

	Riverbank Soil					In-Water Sediment				
Contaminant/Pathway (All concentrations in ppm)	Maximum concentration detected in riverbank soil	Soil Resid[1] (Direct Contact)	Soil Occup[1] (Direct Contact)	Soil LowestTerrestrial Eco RBC	Lower Columbia Slough Source Control	Maximum concentration detected in sediment	Human Health, Sediment (Direct Contact)[5]	Benthic[2] toxicity	Bioaccum[3] (Human Health Fish ingestion)[5]	Lower Columbia Slough Baseline
Benzo(a)pyrene	8.3	0.015	2.1	0.55	0.032	51.5	8.8	0.032	0.0083	0.11
Benzo(a)pyrene equivalents (total cPAHs)		0.11	2.1				8.8		0.0083	
Total PAHs								1.61		
Total LPAH				29				0.076		
Total HPAHs				0.55				0.193		
PCBs (total aroclors or congeners)	1.14	0.23	0.59	0.073	0.01	1.14		0.034	0.01 [4]	0.045
Mercury	0.98	23	350	0.05	0.23	2.03		0.002	0.07 [3]	0.1
Zinc	337			120	123	780		123		244
Lead	130	400	800	23	795	741		35	17 [3]	41
Nickel	64.7	1,500	22,000	21	475	3,750		18		20
Calcium	365,000				8,500	596,000				8,500

Notes:
CPAHs = carcinogenic polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls
RBC = Risk based concentration
[1]DEQ Risk-Based Concentrations (http://www.oregon.gov/deq/FilterDocs/RBDMTable.pdf)
[2] DEQ Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment (DEQ, 2007a)
[3] MRL
[4] Background Metals Concentrations for Portland Basin
[5] DEQ 12/18 "Sediment and Water Screening Levels for cPAHs" (developed for Port of St. Helens, ECSI #959)
Target concentration for cleanup.