FOURTH FIVE-YEAR REVIEW REPORT FOR MCCORMICK & BAXTER CREOSOTING COMPANY SUPERFUND SITE MULTMOMAH COUNTY, OREGON

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LIST OF ABBREVIATIONS & ACRONYMS

ACB	articulated concrete block
ACL	alternate concentration limit
ACZA	ammoniacal copper zinc arsenate
ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
bgs	below ground surface
BNSF	BNSF Railway Co.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
City	City of Portland
COC	constituents of concern
CPA	central processing area
cPAH	carcinogenic PAH
DEQ	Oregon Department of Environmental Quality
DGT	diffusive gel transport
DNAPL	dense non-aqueous phase liquid
E&E	Ecology & Environment, Inc.
EES	Easement and Equitable Servitude
EPA	U. S. Environmental Protection Agency
ESD	Explanation of Significant Difference
f_{oc}	fraction organic carbon
f_{om}	fraction organic matter
FWDA	former waste disposal area
FYR	Five-Year Review
GSI	GSI Water Solutions, Inc.
HDPE	high density polyethylene
HI	Hazard Index
IC	institutional control
LDPE	low density polyethylene
LNAPL	light non-aqueous phase liquid
M&B	McCormick & Baxter Creosoting Company
MCL	maximum contaminant level
MDL	method detection limit
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
ng/L	nanogram per liter
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum
NCP	National Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
NW Natural	Northwest Natural

LIST OF ABBREVIATIONS & ACRONYMS CONTINUED

O&F	operational and functional
O&M	operation and maintenance
ODSL	State of Oregon Department of State Lands
OHW	ordinary high water
ORS	Oregon Revised Statute
OSU	Oregon State University
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCP	pentachlorophenol
PDMS	polydimethylsiloxane
PM	Project Manager
PSD	passive sampling device
RAO	remedial action objective
RCM	reactive core mat
RCRA	Resource Conservation and Recovery Act
RDL	reported detection limit
RNA	Regulated Navigational Area
ROD	Record of Decision
RPM	Remedial Project Manager
SAP	sampling and analysis plan
Site	McCormick & Baxter Creosoting Company Superfund Site
SOP	Standard Operating Procedure
SPME	solid phase micro-extraction
SSC	Superfund State Contract
TBC	To be considered
TEF	toxic equivalency factor
TFA	tank farm area
TOC	total organic carbon
TRM	Turf Reinforcement Mat
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
UU/UE	unlimited use/unrestricted exposure

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA) prepared this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 Code of Federal Regulations [CFR] § 300.430(f)(4)(ii)), and considering EPA policy. This former McCormick & Baxter Creosoting Company (M&B) Site (Site) FYR was led by Sarah Miller, Oregon DEQ and Anne Christopher, EPA Region 10 and was supported by DEQ's Contractors, Hart Crowser, Inc., and GSI Water Solutions, Inc. (GSI).

This is the fourth FYR for the M&B Site. The triggering action for this statutory review is the third FYR, which was issued on September 26, 2011. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three (3) Operable Units (OUs), all of which will be addressed in this FYR. OU1, OU2, and OU3 address the soil, sediment, and groundwater remedies, respectively. Integration of the OUs and site-wide protectiveness will also be addressed in this FYR.

Site Background

The Site includes the former M&B wood-treating facility located on the east bank of the Willamette River at 6900 Edgewater, in Portland, Oregon (see Figure I-1). The Site sits on a terrace of imported sand fill (dredged material placed in the early 1900s) within the historic flood plain of the Willamette River and encompasses approximately 41 acres of land and an additional 23 acres of contaminated river sediments. A detailed description of the Site setting, history, and regulatory history can be found in Appendix B and a chronology of major Site events is provided in Table I-1.

The Site is currently vacant except for a paved parking area, small shop building, two field office trailers, and associated utilities. DEQ is currently in the process of decommissioning the field trailers. Figure I-2 shows the current Site layout and features from an aerial photograph. Figure I-3 depicts the current Site layout and features on a topographic map of the sediment and terrestrial surface elevations.

University of Portland property borders the Site to the southeast which is currently vacant with future plans of sports fields, and a residential area is located above the Site on the adjacent bluff. A BNSF Railway Co. (BNSF) track crosses the northwest portion of the Site, and Union Pacific Railroad tracks border the Site to the southeast below the bluff. The perimeter of the M&B Property is fenced and posted with warning signs.

Redevelopment Potential

As discussed in the Second FYR and reiterated in the Third FYR, a Site Reuse Assessment was conducted between February 2000 and June 2001 by the City of Portland (City), Bureau of Planning, under a grant from EPA. In developing reuse recommendations, the City analyzed the Site's redevelopment potential and engaged stakeholders and the interested public in learning about,

proposing, and jointly considering what uses would best fit the Site. The City's findings were presented in a final report dated June 2001 and endorsed by the Portland City Council on July 25, 2001. The City concluded that the Site is best suited for recreational use. University of Portland's 2013 Master Plan includes the possibility of obtaining the property for future redevelopment primarily associated with athletic fields and other, similar land use (University of Portland, 2013).

FOURTH FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: McCormick & Baxter Creosoting Company		
EPA ID: ORD009020603		
Region: 10	**State:** OR	**City/County:** Portland/Multnomah
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes.	
REVIEW STATUS		
Lead agency: State Oregon Department of Environmental Quality (DEQ)		
Author name (Federal or State Project Manager): Sarah Miller (State) /Anne Christopher (EPA)		
Author affiliation: Oregon DEQ		
Review period: 9/27/2011 - 9/26/2016		
Date of Site inspection: 7/21/2016		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/27/2011		
Due date: 9/26/2016		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Site was created by the placement of dredged material in the early 1900s when a sawmill operated on the southeast portion of the property. M&B Creosoting Company was founded in 1944 to produce treated wood products, including lumber, piling, timbers, and railroad ties and continued operation until October 1991. Subsequent Site investigations have revealed many releases of wood-treating chemical compounds to soils, groundwater, and sediments as a result of these operations and spills. Contaminants detected include polynuclear aromatic hydrocarbons (PAHs, comprising 85 percent of the creosote), pentachlorophenol (PCP), arsenic, chromium, copper, zinc, and dioxins/furans. Additionally,

remedial investigations identified two large non-aqueous phase liquid (NAPL) plumes migrating west to the river and impacting surface water and sediments. Subsequent monitoring identified another NAPL plume migrating north under the BNSF right-of-way toward Willamette Cove. A detailed description of the company's operation history, documented spills, identified chemicals of concerns, and regulatory history is included in Appendix B.

Site Receptors and Pathways

Human health receptors and pathways prior to remediation included:

- Direct contact with contaminated surface soil through incidental ingestion, inhalation, and dermal contact for future Site residents, workers, visitors or trespassers;
- Incidental ingestion of and dermal contact with contaminated sediment related to recreational uses of the beachfront;
- Consumption of fish and crayfish caught by recreational anglers in the area of contaminated sediment; and
- Potential exposure to groundwater as a drinking water source.

Ecological receptors include crayfish, clams, and numerous fish species; shorebirds; and mammals. Pathways prior to remediation included contact with contaminated sediment, interstitial porewater, and the water column. Major exposure routes for aquatic receptors included dermal exposure, exposure through respiratory structures and ingestion, as well as exposure through ingestion of contaminated prey by higher trophic level species.

Regulatory History

M&B began environmental investigations of its property in 1983. DEQ began the Remedial Investigation and Feasibility Study in 1990 and issued a public notice of a proposed cleanup plan in January 1993. EPA added the Site to the National Priorities List) (NPL) on June 1, 1994 and DEQ completed a revised Feasibility Study in 1995. In 1996 the DEQ and EPA entered into a Superfund State Contract (SSC), which was last updated in 2005.

In September 2005, the McCormick & Baxter Superfund Site achieved the construction completion milestone. This designation means that all remedial action required by the Record of Decision (ROD), the ROD Amendment, and the Explanation of Significant Difference (ESD) were implemented, completed, and documented in a Preliminary Close-Out Report. Since that time, the soil and sediment OUs have been determined to be operational and functional (O&F). The O&F determination has not been made for the groundwater OU. A complete outline of the regulatory history can be found in Appendix B.

Response Actions

Removal Actions

Removal actions were completed by DEQ under State of Oregon cleanup regulations prior to listing on the NPL and under CERCLA authority between Site listing and issuance of the ROD. A list of these removal actions is provided in the document titled Preliminary Close-Out Report (EPA, 2005). A summary of the response actions is included in Appendix B.

Remedy Selection and Modifications

In March 1996, EPA and DEQ issued one ROD for the Site to address several different media: contaminated soil, groundwater, stormwater, and Willamette River sediment. The selected remedy required the following media-specific actions to mitigate the principal threats at the Site:

- Excavation, consolidation, and biological treatment/stabilization of the most highly contaminated soils
- Soil capping
- Enhancement of the existing groundwater and NAPL extraction and treatment system
- As a contingent remedy, installation of a vertical subsurface barrier wall in the event that mobile NAPL cannot be reliably controlled
- Sediment capping
- Monitoring
- Institutional controls (ICs) (Table II-2)

The ROD was amended in 1998 and a ESD was issued in 2002 to implement the contingent remedy for groundwater. Detail of the remedy selection and performance goals are included in Appendix B.

Remedial Action Objectives (RAOs) and Cleanup Levels

The Site was divided into three OUs to facilitate and manage remedy costs, implementation, and construction. The overall remedy is designed to function as an integrated containment system. The entire Site is capped; the combined upland capping extends to the riparian area along the shoreline where it meets the sediment cap. The capping works in conjunction with the barrier wall, as a complementary system, to meet the Site Remedial Action Objectives (RAOs) and prevent contaminated groundwater from adversely impacting the Willamette River. A summary of the RAOs for each OU is provided below and a table listing the associated cleanup levels by media and analyte at the time of the ROD is provided as Table II-1 and are also provided in the text of Appendix B along with non-numeric goals.

OU 1: Soil Remedy

The soil remedy is composed of three primary components: removal of highly contaminated soil within 4 feet of the ground surface, capping, and ICs[1]. The RAOs for the soil remedy are:

- Prevent human exposure through direct contact (ingestion, inhalation, or dermal contact) to contaminated surface and near-surface soil that would result in an excess lifetime cancer risk above $1x10^{-6}$ for individual compounds, above $1x10^{-5}$ for additive carcinogenic compounds, or above a Hazard Index (HI) of 1 for noncarcinogenic compounds in an industrial land use scenario.
- Prevent stormwater runoff that contains contaminated soil from reaching the Willamette River.

OU 2: Sediment Remedy

The sediment remedy is composed of two primary components: ICs and a sediment cap. The RAOs for the sediment cap are:

- Prevent humans and aquatic organisms from direct contact with contaminated sediments.

[1] To improve readability in this Five-Year Review, the ICs for the soil, sediment, and groundwater remedies have been consolidated and will be described later in this section.

- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of federal and state ambient water quality criteria[2].

The first RAO is designed to prevent human exposure under a recreational scenario from direct contact with contaminated sediments and to prevent exposure of benthic organisms to sediment contamination above known toxicity levels[3].

OU 3: Groundwater Remedy

The groundwater remedy has four components: ICs, a subsurface barrier wall, NAPL recovery, and evaluation of innovative technologies for NAPL recovery. The RAOs for the groundwater remedy are:

- Prevent human exposure to or ingestion of groundwater with contaminant concentrations in excess of federal and state drinking water standards or protective levels.
- Minimize further vertical migration of NAPL to the deep aquifer.
- Prevent groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations[4] or in excess of water quality criteria for aquatic organisms.
- Minimize NAPL discharges to the Willamette River beach and adjacent sediment.
- Remove mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and the potential for discharge to Willamette River sediment.

ROD Cleanup Goals

Table II-1 ROD Cleanup Goals by Media

Soil Remedy Cleanup Goals	
Analyte	**Cleanup Goal (mg/Kg)**
Arsenic	8
Pentachlorophenol	50
Total Carcinogenic PAHs	1
Dioxin/Furans	0.00004

[2] During meetings in August 2007 between stakeholders (DEQ, EPA, National Oceanic and Atmospheric Administration (NOAA), Warm Springs Tribe, and Yakama Nation), it was agreed that for comparison purposes, five criteria would be included in analytical results summary tables in the 2008 and subsequent operation and maintenance (O&M) reports including:

- Two ambient water quality criteria's (AWQCs) in effect at the time the ROD was issued (1996 criteria for chronic effects to aquatic life and for human health based on fish consumption)
- Two 2007 and 2011 National Recommended Water Quality Criteria's (NRWQCs) (one for chronic effects to aquatic life and one for human health [consumption of organisms])
- Current maximum contaminant levels (MCLs)

[3] At the time of the ROD, no state or federal sediment quality criteria existed. However, bioassay results indicated that a substantial area of near-shore sediment contamination was toxic to sedentary benthic invertebrates (bioassay testing measured organism survival and weight, see Sediment Cap Basis of Design). These areas coincided with areas that exceeded human risk-based goals. Sediment with concentrations above levels protective of human health or toxic to benthic organisms (based on sediment bioassay tests resulting in impaired survival and growth (i.e., weight)) were capped.

[4] There is an issue associated with this RAO that relates to Alternate Concentration Limits (ACLs) defined in the ROD. This issue is further discussed in Sections VIII and IX of the 2006 Second Five-Year Review Report.

Sediment Remedy Cleanup Goals for Sediment	
Analyte	**Cleanup Goal (mg/Kg)**
Arsenic	12
Pentachlorophenol	100
Total Carcinogenic PAHs	2
Dioxin/Furans	0.00008
Sediment Remedy Cleanup Goals for Water[5]	
Analyte	**Cleanup Goal (µg/L)**
Arsenic	190
Chromium III	210
Copper	12
Zinc	110
Pentachlorophenol	13
Acenaphthene	520
Fluoranthene	54
Naphthalene	620
Total Carcinogenic PAHs	0.031
Dioxin/Furans	$1x10^{-5}$ ng/L
Groundwater Remedy	
Analyte	**Cleanup Goal (µg/L)**
Arsenic	1,000
Chromium III	1,000
Copper	1,000
Zinc	1,000
Pentachlorophenol	5,000
Total PAHs	43,000
Dioxin/Furans	0.2 ng/L
Abbreviations: PAHs = polynuclear aromatic hydrocarbons Mg = milligram Kg = kilogram L = liter µ = microgram ng = nanogram	

IC Summary Table

Table **II-2**: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	Soil Operable Unit	Physical restrictions, warning signs, and safety measures until completion of the remedies to prevent contact with Site.	Fence surrounds the perimeter of the M&B property with warning signs, and restricts public access to the Site.

[5] These values represent the AWQCs at the time of the ROD in 1996.

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Sediment	Yes	Yes	Sediment Operable Unit	Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup	State of Oregon Department of State Lands Easement No. 31530-EA to the Oregon DEQ, May 2004 (ODSL 2004)
Sediment	Yes	Yes	Sediment Operable Unit	Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup	Docket No. USCG-2008-0121: McCormick & Baxter Regulated Navigation Area, Willamette River, Portland, Or
Soil	Yes	Yes	Soil Operable Unit	Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup	March 2005; License between DEQ and BNSF
Soil, Groundwater	Yes	Yes	Soil and Groundwater Operable Units	Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup	Two Easement and Equitable Servitudes (EES) to be implemented with BNSF and McCormick & Baxter expected 2016/2017

Status of Implementation

The Site was divided into three OUs to facilitate and manage remedy costs, implementation, and construction. The overall remedy is designed to function as an integrated containment system. The entire Site is capped; the combined upland capping extends to the riparian area along the shoreline where it meets the sediment cap. The capping works in conjunction with the barrier wall, as a complementary system, to meet the Site RAOs and prevent contaminated groundwater from adversely impacting the Willamette River. In September 2005, the McCormick & Baxter Superfund Site achieved the construction completion milestone. Since that time, the soil and sediment OUs have been determined to be O&F. The O&F determination has not been made for the groundwater OU. A detailed description of the soil, groundwater and sediment remedies, as well as engineering and institution controls specified in the ROD is presented in Appendix B.

Systems Operations/Operation and Maintenance

DEQ conducted Site activities in accordance with the Final Operation and Maintenance (O&M) Plan (DEQ/EPA, 2014), prepared by DEQ and approved by EPA. The O&M Manual (last revised Hart Crowser/GSI, 2016) specifies the sampling and monitoring procedures, quality assurance and quality control, and technical information needed to implement the Final O&M Plan. Site O&M activities completed since the Third FYR (DEQ/EPA, 2011) are summarized in Table II-3. Performance comparison criteria for the soil, sediment and groundwater remedies are presented in Table II-4 and included in Appendix B.

Soil Remedy

The soil remedy consists of contaminated soil removal and construction of an upland soil cap on approximately 40 acres of the Site and ICs. The soil cap remedy was completed in September 2005. Long-term monitoring is necessary because soils beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL.

Ongoing monitoring activities for the soil cap (including the riparian zone) include visual inspections of the cap surface, stormwater conveyance system, security fencing, and warning signs. The soil cap is designed to be generally maintenance free, except for maintaining the native vegetation. Routine maintenance includes semi-annual manual removal of invasive plants and targeted application of herbicides. Non-routine maintenance may include repairs of the fence, replacement of warning signs, repairs of the gravel roads, filling of potential animal burrows, removal of sediment from manholes, and replanting of unsuccessful trees and shrubs.

Sediment Remedy

The sediment remedy consists of a 23-acre cap over contaminated sediments within the Willamette River and ICs. The sediment cap remedy was completed in September 2005. Long-term monitoring and maintenance are necessary because sediments beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL.

Monitoring activities for the sediment cap in the past five years included quarterly visual inspections of near-shore areas and in 2015 collection and analysis of 12 surface water, 12 inter-armoring and 4 sub-armoring water samples within the footprint of the sediment cap and upgradient and downgradient surface water samples. This was the 11th sampling event since the sediment cap was installed in 2004/2005. In addition, sampling of sediment cap bulk organophilic clay was conducted in 2015 to determine whether the organoclay continues to function as designed to eliminate potential creosote NAPL seeps into the River. Bulk sediment samples are not collected because the sediment cap physically isolates riverbed contaminants and also prevents migration of potentially mobile contaminants within the riverbed sediment and NAPL seep areas to the Willamette River. Although the sediment cap is designed to be generally maintenance free, unplanned or non-routine maintenance included the replacement of one of the permanent warning buoys in February 2015 that was missing during several quarterly inspections.

Northwest Natural Gas Line Abandonment (2014)

Northwest Natural (NW Natural) abandoned in place approximately 600 feet of a 16-inch steel high pressure gas line, which existed in the BNSF right-of-way and formerly supplied the Site (Figure IV-4). Construction occurred between September 11 and November 24, 2014, which cut and capped both ends of the line and filled the entire length of the steel pipe with concrete slurry. NW Natural submitted a

work plan for DEQ approval prior to performing the work and Hart Crowser personnel observed backfill of the excavation located on the cap.

To access the gas line, two excavation pits were dug; excavation #1 was located within the Union Pacific right-of-way. Excavation #2 was approximately 4 feet wide, 5 feet long and 10 feet deep within the McCormick & Baxter 2-foot-thick soil cap. Approximately 30 yards of Site soils were segregated and stockpiled on Site, placed and covered in plastic during construction. The sub soils, demarcation boundary and cap material were backfilled after construction. NW Natural restored the construction area to pre-construction conditions by grading, planting native grass seed and installing new fencing.

Groundwater Remedy

The groundwater remedy consists of groundwater monitoring, NAPL recovery[6], a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap, and ICs. Long-term monitoring is necessary because groundwater both inside and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL.

Site activities in the past five years for the groundwater remedy have included NAPL presence and thickness monitoring, groundwater elevation monitoring, and groundwater sampling of MW-59s, which monitors groundwater downgradient of the stormwater infiltration pond. Since MW-59s is monitoring the potential for mobilization of Site contaminants due to the infiltration of stormwater, groundwater monitoring was conducted. Other monitoring wells were analyzed for Site contaminants in 2010. Concentrations are primarily detected in areas where residual NAPL is present and these concentrations are not expected to change over short periods of time. Additional groundwater monitoring for Site contaminants is scheduled for 2020 prior to the Fifth FYR in 2021. Routine maintenance of equipment and providing for Site utility service are also included as elements of groundwater O&M.

[6] NAPL recovery inside and outside the barrier wall was discontinued April 20, 2011 after an investigation that demonstrated that the NAPL outside the barrier wall was primarily in residual NAPL and not expected to migrate to the River (DEQ/EPA, 2011). NAPL occurrence monitoring inside the barrier wall was also discontinued; however, because the barrier wall prevents NAPL migration, no additional investigation was conducted.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** FYR as well as the recommendations from the **last** FYR and the current status of those recommendations.

Table III-1: Protectiveness Determinations/Statements from the 2011 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1 – Soil	Short-term Protective	The remedy for the soil OU is currently protective of human health and the environment because the upland soil cap and engineering controls required by the ROD have been implemented, and are working as intended. However, in order for the remedy to be protective in the long-term, DEQ and EPA need to implement the ICs required by the ROD for the soil cap remedy.
2 – Sediment	Protective	The remedy for the sediment OU is protective of human health and the environment because the remedy required by the ROD has been implemented and is working as intended.
3 - Groundwater	Short-term Protective	The remedy for the groundwater OU is currently protective of human health and the environment, because the soil, sediment, and groundwater remedies have been implemented and the RAOs in the ROD have been met. However, the EPA determined that ACLs as calculated at this Site are not appropriate as substitutes for MCLs in groundwater (this issue was identified in the 2006 Five-Year Review originally). Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy. Also, ICs have not been implemented, so in order to ensure that the remedy remains protective in the long-term and all applicable or relevant and appropriate requirements (ARARs) are achieved, a ROD Amendment that establishes new cleanup goals needs to be completed and the ICs required by the ROD for the groundwater remedy need to be implemented.
Sitewide	Short-term Protective	The remedies at these operable units are designed to work as an integrated system to meet the RAOs and cleanup goals established for the Site. The remedies for soil, sediment, and groundwater currently are protective of human health and the environment, because the soil and sediment caps, barrier wall, sediment ICs, and engineering controls required by the ROD have been implemented. However, in order for the remedies to be protective of human health and the environment in the long-term, a ROD Amendment that establishes new cleanup goals and points of compliance needs to be completed for the groundwater remedy and the ICs required by the ROD for the soil and groundwater remedies need to be implemented.

Table III-2: Status of Recommendations from the 2011 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
3- Groundwater	Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy.	1. Prepare a ROD Amendment to replace ACLs with revised cleanup goals and identify associated points of compliance.	Under Discussion	The ACLs have not been replaced with revised groundwater cleanup goals. Replacing ACLs with revised groundwater cleanup goals will be revisited once the Portland Harbor ROD is released (anticipated December 2016).	Upon completion of Portland Harbor ROD.
1/3- Soil/Groundwater	ICs have not been implemented as required by the ROD for the Site groundwater and soil cap remedies.	2. Establish and implement an IC Implementation and Assurance Plan.	Under Discussion	ICs for Soil and Groundwater implementation under discussion with BNSF and property owners.	Upon completion of IC negotiations or sale of property.

The following issues do not affect overall protectiveness, but were identified in the last FYR and were expected to require additional follow-up actions:

- Articulated concrete block (ACB) Unconformity in Willamette Cove – there is a need to continue to monitor pore water in areas where the sand cap is thinner than the specified design thickness.
- NAPL Recovery Termination – additional communication with the Tribes and NOAA if requested, to discuss the findings of the dense NAPL (DNAPL) Data Gap Investigation Report and then proceed with the implementation of the report recommendations.
- Soil Cap Subsidence – Soil cap subsided by approximately 1 foot between the cap emplacement and 2009.
- ACB Gravel – Contact National Marine Fisheries Service (NMFS) to discuss the possibility of filling the ACB voids with gravel to prevent the accumulation of sharp objects and debris.

Summary of Implemented Actions and Results

Recommendation 1

There has been some change in status to recommendation #1: Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy. It is anticipated that after the Portland Harbor ROD is final (anticipated December 2016), that EPA and DEQ will determine the next steps to address changes to ROD goals.

As stated in the 2006 Five Year Review, on July 19, 2005, EPA issued guidance restricting the use of ACLs in Superfund cleanups (Use of Alternate Concentration Limits in Superfund Cleanups, OSWER 9200.4-39, July 19, 2005). This guidance clarifies that ACLs are not

appropriate as substitutes for MCLs in groundwater at any site where groundwater may be used as drinking water. Because groundwater at McCormick and Baxter is a potential source of drinking water and discharges to surface water that is a potential source of drinking water, the EPA determined that ACLs are not appropriate for this site and that new cleanup goals need to be established.

The 2011 Third Five Year Review repeated this recommendation and stated that the EPA would document new cleanup levels in a ROD Amendment; however, a ROD Amendment may not be the appropriate administrative mechanism to document the necessary changes to the selected remedy as there is no change to the scope, performance or cost of the selected remedy. Replacing ACLs with revised groundwater cleanup goals in either a ROD Amendment or ESD will be revisited once the Portland Harbor ROD is released. The McCormick & Baxter Superfund Site is located along the banks of the Willamette River and is surrounded by the Portland Harbor Superfund Site. Consistency in the two cleanups will support a comprehensive cleanup of the Willamette River watershed

Recommendation 2

There has been no change in status to recommendation #2: ICs have not been implemented as required by the ROD for the Site groundwater and soil cap remedies. DEQ and EPA are currently discussing implementation of the ICs with the site owner and BNSF, respectively. The ICs will be implemented upon negotiations with property owners or sale of the property. The property is currently under the control of Oregon DEQ; land use over the past five years was consistent with IC restrictions.

Issues that do not affect protectiveness but were expected to require potential action:

ACB Unconformity: During the passive sampling event in fall 2015, the area where ACB buckling was observed in 2009 was exposed in Willamette Cove. The buckling observed in 2015 appeared similar to that observed in 2009 when an investigation was conducted to determine whether the buckling compromised the sediment cap. Based on that study and the recent passive sampling, the buckling of the ACB is not compromising the integrity of the sediment cap.

NAPL Recovery Termination: DEQ and EPA discussed the findings of the DNAPL Data Gap Investigation and the rationale for their decision to discontinue NAPL recovery outside the barrier wall with affected tribes and natural resource trustees during the August 2011 annual meeting. No objections were raised to discontinue the NAPL recovery. DEQ will continue to monitor NAPL thickness outside the barrier wall to confirm this decision. NAPL presence and monitoring is an ongoing component of operations and maintenance monitoring and is conducted semi-annually.

Soil Cap Subsidence: Upland soil cap subsidence near wells EW-1s and MW-23d is currently stable. This area will continue to be monitored quarterly for five years by taking inner and outer casing measurements at well MW-23d; by monitoring stormwater flow at the outfall during quarterly inspections; and by collecting and reviewing transducer data from EW-1s that measures groundwater temperature and elevation. The decision to monitor will be revisited during the Fifth FYR.

ACB Gravel: EPA contacted NMFS in July 2012 regarding filling the ACB voids with gravel to prevent the accumulation of sharp objects and debris. Rounded gravel (1-½-inch minus) was placed within the ACB voids along a large portion of the shoreline and Willamette Cove in October 2012. The gravel has largely remained in place through 2015; however, some has washed down steeper shorelines and has settled onto lower ACB surfaces as shown in Appendix C Photographs 1 and 2.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification & Involvement

Since the Third FYR, there have been limited community involvement activities associated with this Site because all components of the remedy are in place and the main focus of the Site work has been on long-term maintenance and monitoring. Both DEQ and EPA respond to public records requests and inquiries through phone calls and e-mails. In general, during the past several years, the number of inquiries from the local community has been very low. Therefore, no interviews were specifically scheduled for this review. EPA published a public notice on *The Oregonian's* webpage (Oregon Live) on August 12, 2016 with links to EPA and DEQ's websites and emailed the Portland Harbor listserve to inform the public that a FYR Report at the McCormick & Baxter Superfund Site will be released. This notice informs the public that there is an opportunity to contact EPA with information or questions. The results of the review and the report will be made available at the Site information repository located at the St. Johns Library,7510 N. Charleston Avenue, Portland, OR 97203. The FYR and other key documents will also be available on the McCormick & Baxter EPA website:

http://yosemite.epa.gov/r10/cleanup.nsf/sites/mccormick_baxter

Data Review

Sampling conducted in the past five years was associated with O&M activities as outlined in the 2014 Final O&M Plan and the 2016 O&M Manual and based on outstanding issues described in the 2011 Third FYR. The inspections and resolution of the outstanding issues are summarized in Section III Progress Since Last Review. Data collected as part of the O&M activities are summarized below. Data provided in Tables IV-1 through IV-4 along with Site inspections demonstrate that the upland soil cap, the subsurface barrier wall, and the sediment cap work as an integrated system to contain contamination on-Site and prevent contaminants from adversely impacting the Willamette River. Further interpretation of these data is carried forward in Section V. A summary of key activities relevant to the recommendations noted in the table above are provided below.

Groundwater Flow Direction and Gradient Assessment (2011-2016)

Site-wide manual measurements of static groundwater levels were collected semi-annually from 2011 through 2016. Figure IV-1 shows the locations of groundwater monitoring wells. Groundwater levels also were measured continuously using pressure transducers in select monitoring wells surrounding the barrier wall. Results of these activities are documented in Annual O&M Reports (Hart Crowser/GSI, 2012, 2013, 2014, 2015 and 2016).

Observations based on the groundwater monitoring data include:

- Shallow groundwater elevations and gradients since the barrier wall was installed in 2003 have remained generally consistent.
- Horizontal gradients outside the barrier wall are the greatest during periods of high precipitation and decrease during periods of low precipitation.
- Groundwater gradients inside the barrier wall remain flat and generally to the west (except when peak river stage causes a reversal in gradient), while outside and upgradient of the wall, shallow groundwater flow is diverted around the barrier wall to the northwest and south.
- While most of the monitoring wells mimic the stage variations in the Willamette River, the oscillations in the shallow interior wells are delayed and muted and likely the result of changes in pressure at depth rather than a significant hydraulic connection to the river allowing contaminants to move to the River. The barrier wall is completed into a silt (aquitard) in most areas with the exception of the northwest corner of the barrier wall area. There is no aquitard in

this area. The groundwater levels in the deep wells mimic the river; however, the net movement in these wells at the base of the barrier wall is near zero. Therefore, while contaminants within the barrier wall may move with tidal flux, the net movement is minimal to zero and therefore, contaminants will not reach the river from within the barrier wall as long as the integrity of the wall remains intact.

- Under stable river conditions, vertical groundwater gradient figures indicate that gradients are generally downward inside the barrier wall in the former waste disposal area (FWDA) and former tank farm area (TFA), with the exception of an upward gradient during high tide in the former TFA.

Based on the observations made through the 2015 reporting period, it appears that the barrier wall and impermeable soil cap are functioning as designed: groundwater flow and rainwater infiltration are diverted around source areas contained within the barrier wall, and NAPL contained within the barrier wall is prevented from migrating to the Willamette River.

Infiltration Pond, MW-59s Groundwater Quality Assessment (2011-2015)

The soil cap remedy was completed in 2005. A component of the soil cap is the infiltration pond at the southwestern corner of the Site, which was constructed to collect surface water runoff from a portion of the upland cap. A groundwater monitoring well, MW-59s, was installed downgradient from the infiltration pond in 2005 to monitor changes in contaminant levels in groundwater. Figure IV-1 shows the location of the infiltration pond and monitoring well MW-59s. As specified in the 2014 O&M Plan (Hart Crowser/GSI 2014), four quarters of groundwater samples were to be collected from MW-59s to evaluate the potential for subsurface contaminants to be mobilized by the upland cap infiltration pond. A total of seven samples were collected from MW-59s through 2010 and analyzed for PAHs and total metals including arsenic, chromium, copper, iron, and zinc. Following the 2010 sampling, the O&M plan prescribed sampling every five years. As prescribed, the well was sampled for metals and PAHs in 2015 and results are presented in Table IV-1. Metals and PAH concentrations appear to have stabilized at low levels; while arsenic concentrations have increased slightly since 2006. As part of the Third FYR, groundwater was sampled in 10 wells and arsenic was detected in all 10 wells. The 2010 sampling results indicate Sitewide arsenic concentration remain relatively consistent with arsenic concentrations at the Site consistently above the maximum contaminant level (MCL) of 0.01 milligram per liter (mg/L). There does not currently appear to be a risk of subsurface contaminant mobilization by the infiltration pond, but monitoring should continue every five years to determine whether arsenic continues to increase downgradient of the infiltration pond.

NAPL Gauging and Monitoring Assessment

Between February 1993 and April 2011, approximately 6,550 gallons of NAPL were extracted from Site wells. Because recovery was slow and there was uncertainty about the benefits of ongoing recovery, a NAPL investigation in the FWDA outside the barrier wall (the remaining area with active NAPL recovery) was conducted in 2011. Based on the findings from the NAPL investigation (DNAPL Data Gap Investigation; Hart Crowser/GSI, 2011a) and extensive monitoring of the sediment cap (described in the Third FYR Report [DEQ/EPA, 2011]), the DEQ and EPA decided to discontinue NAPL extraction on April 20, 2011. Subsequent monitoring of the post-extraction NAPL thickness in the FWDA was conducted in 2011 (Hart Crowser/GSI, 2011a), and the results supported the regulatory decision and confirmed that the residual NAPL in the FWDA is isolated and stable and does not pose a risk to the Willamette River. To confirm that this remains the case and to continue to evaluate the functional performance of the barrier wall and soil cap, NAPL presence and thickness continues to be monitored during the semiannual monitoring events.

NAPL is observed routinely outside of the barrier wall next to the northwest corner of the enclosure that corresponds to the FWDA (Figure IV-1). Between 2011 and 2015, measureable, but small and non-recoverable quantities of NAPL were observed in four wells (EW-10s [DNAPL], MW-20i [DNAPL], MW-Ds [DNAPL], and MW-Gs [DNAPL]) in this area. NAPL thicknesses in these wells has remained stable and are consistent with historical observations. These data support the conclusion that NAPL observed in the FWDA is localized and stable. LNAPL and/or DNAPL is detected in eight wells within the barrier wall. The thicknesses of NAPL in these wells has remained stable with seasonal changes based on water levels. Overall, both LNAPL and DNAPL appear to be stable and there is no evidence of their mobility either across the barrier wall or to the Willamette River.

Organophilic Clay Capping Material Evaluation

As a component to the sediment cap remedy, a foot of AquaTechnologies ET-1 granular organophilic clay (ET-1 organophilic clay) was placed in two locations where there was the potential for creosote seeps. After installation in 2004, ebullition was observed in the area overtop of the bulk organophilic clay footprint within the sediment cap. The rates of ebullition were higher overtop of the areas capped using granular organophilic clay than overtop of the surrounding sand cap or outside of the sediment cap footprint. This observation led to investigation of the organophilic clay. Creosote was not observed in any of the organophilic clay cores from studies conducted in 2008 or 2009. Low level PAHs detected in the organophilic clay were consistent with low levels of PAHs detected in groundwater. These PAH concentrations were well below the 2 mg/kg criteria for carcinogenic PAHs in the sediment. However, based on organic matter analysis and a study measuring the gas produced from the organophilic clay (2008, 2009 Annual Reports), it was concluded that the organophilic clay was degrading at a half-life of approximately 6.6 years. Samples of the organophilic clay were collected again in 2015. These recent results showed that the organoclay is continuing to degrade at a half-life between 6 and 7 years. This is also noted by reduced thickness of the organophilic clay layer within the sediment cap and may be related to some observable buckling in the ACB within the organophilic clay footprint.

The 2015 PAH, total solids, total organic carbon (TOC), fraction organic carbon (f_{oc}), and fraction organic matter (f_{om}) results for the organophilic clay samples are provided in Table IV-2. Locations of the 2 cores from the organophilic clay footprint within Willamette Cove are shown on Figure IV-3. No evidence of creosote (NAPL) was observed in the organophilic clay cores. The results are summarized below.

Low-level PAHs were detected at concentrations that typically fell between the method detection limit (MDL) and reported detection limit (RDL). The summation of carcinogenic PAHs ranges from 0.03 mg/kg to 0.4591 mg/kg for the four organophilic clay samples collected from the two cores from the sediment cap. These carcinogenic PAH concentrations are well below the risk-based cleanup goal of 2 mg/kg.

Since the PAH concentrations within the organophilic clay are very low and there are no other significant sources of organic carbon expected to sorb to the organophilic clay within the sediment cap, the primary source of organic matter observed in the clay layer is within the structure of the organophilic clay itself. As discussed above, the estimated half-life for the organic matter degradation was estimated to be 6.6 years based on the data collected after the clay had been in place for four years. Using the first order half-life equation with a 6.6-year half-life and a starting percent organic matter of 24 percent, the estimated f_{om} now should be approximately 7.6 percent (after 11 years in place). The f_{om} results from the recent work were:

- OC-1 1 to 3.5 feet = 8.04 percent
- OC-1 3.5 to 6 feet = 8.57 percent
- OC-2 0.5 to 3.5 feet = 7.78 percent
- OC-2 3.5 to 6.5 feet = 9.85 percent

The average percent organic matter from the four stations is 8.56 percent. Using the average, the estimated half-life after 11 years is 7.4 years. These results indicate that the ET-1 organophilic clay is continuing to break down.

Microbial degradation of the organic matter is likely also causing the thickness of the organophilic clay layer to decrease as the organic mass decreases. If in its original state it contained 24 percent organic matter and it currently contains approximately 8.5 percent organic matter, then it has lost 15.5 percent of its original mass. This loss may have caused some of the buckling in the ACB armoring that is observable in the areas where organophilic clay was placed. However, there is not a large amount of remaining organic matter and therefore, additional buckling, if this is the cause, is not anticipated.

Multiple lines of evidence indicate that the loss in carbon content and organic matter is ongoing. The low PAH levels observed within the organophilic clay layer indicate that this adsorptive component of the remedy was overly conservative and that large-scale creosote migration into the sediment cap was abated by installation of the barrier wall. Thus, there is no evidence that the observed reduction in organic matter in the ET-1 organophilic clay samples will result in creosote release through the sediment cap in the future. Therefore, even if the organophilic clay ET-1 reverts back to bentonite, the remedy will continue to be effective and protective.

Surface, Inter-Armoring, and Sub-Armoring Water Assessment

Sediment cap porewater and surface water sampling was conducted in fall 2015 to comply with the long-term monitoring objectives and inform this Fourth FYR Report. The passive sampling approach and methodology was developed in conjunction with the DEQ, EPA, and Oregon State University (OSU) with assistance from GSI. Upon agreement regarding the specifics of the passive sampling approach and target sampling depths within the sediment cap and the overlying surface water, GSI prepared a Surface Water, Inter-armoring Water, and Sub-armoring Water Sampling and Analysis Plan (SAP) that has been incorporated into the 2016 O&M Manual as Chapter 4. Unless otherwise noted, the fall 2015 passive sampling event followed the procedures set forth in that updated SAP.

The 2015 target sample locations and analytical program includes collection of 12 compliance monitoring stations, 4 early-warning stations, and an upstream and downstream reference location. Actual sampling locations are shown on Figure IV-3. Surface water and inter-armoring water was sampled at all of the compliance monitoring and early warning stations. The early warning stations also included a sample from the sub-armoring layer. The upstream and downstream reference stations assess concentrations in surface water only.

The passive samplers[7] equipped with Passive Sampling Devices (PSDs) were developed by Dr. Kim Anderson at OSU. Two PSDs were employed including 1) inert low density polyethylene (LDPE) tubing, which essentially acts as a carbon sink so that PAHs and PCP will sorb to the LDPE and

[7] The term "passive sampler" is used in this report to refer to the sampling hardware (either sediment probes or surface water cages) that the passive sampling media is placed inside of and deployed in. Note that this term is used to distinguish it from the term Passive Sampling Device (PSD), which is used in the OSU Standard Operating Procedures (SOPs) to refer to the prepared sampling media (either the LDPE or DGT) that is ready to deploy in the field, but has not yet been placed in the "passive sampler".

approach equilibrium with freely dissolved concentrations in porewater, and 2) diffusive gradients in thin film (diffusive gel transport [DGT]) technology to measure freely dissolved metals in porewater. Temperature loggers (TidbiTs ®) were also deployed in a large subset of the samplers. To facilitate the measurement of porewater concentration from the mass of chemical that sorbs to the LDPE and allow for a shorter deployment period than would be required if a chemical needed to reach equilibrium with the LDPE, performance reference compounds (PRCs) were impregnated into the LDPE.

Passive samplers were deployed on September 15 and 16, 2015 and were retrieved on October 6, 2015. Samples were processed and analyzed at the OSU laboratory for PAHs, PCP, and dissolved metals (arsenic, chromium, copper, and zinc).

OSU performed all data quality checks and converted the LDPE and DGT results into associated water concentrations and provided the final results to DEQ/GSI electronically. EPA's dive report and OSU's laboratory reports are provided in the 2015 Annual Report (Hart Crowser/GSI, 2016). The current results are provided in Tables IV-3 and the statistical summary information in Table IV-4. Analytical results for COCs identified in the ROD (EPA 1996) for the Site were compared to the 1996 ROD ambient water quality criteria (AWQC), the most recent EPA National Recommended Water Quality Criteria (NRWQC), the most recent EPA National Primary Drinking Water Regulations, and the DEQ 2011 EPA-approved Aquatic Water Quality Criteria for Aquatic Life (chronic) and Human Health (consumption of organism only). These comparison criteria and their sources are provided in Table II-4.

The comparison criteria allow for Site-specific adjustments to their standard table values. PCP can be adjusted for Site-specific pH; and chromium, copper, and zinc can be adjusted for hardness. Comparison criteria presented in Tables IV-3 and IV-4 reflect adjustments to the PCP comparison criteria to reflect Site pH (using a pH of 7.2), but the metals criteria have not been revised to reflect Site-specific hardness. The hardness of the Willamette River water is approximately 25 mg/L, while the hardness in the sub-armoring zone ranges from 70 to 190 mg/L. Hardness of the inter-armoring zone has not been measured. Therefore, until the water quality point of compliance is resolved, the comparison criteria calculated on the basis of a hardness of 50 mg/L is used (per an email from Rob Burkhart/DEQ Water Quality Specialist).

The criteria listed above for total carcinogenic PAHs (cPAHs) is based on AWQCs in place in 1996. In 1996, AWQCs for metals were based on total metal concentrations. The criteria listed above for arsenic, chromium, copper, and zinc are based on the lowest of either the 2015 NRWQCs or the 2011 AWQCs, which were developed for dissolved metals.

Surface Water

During the fall 2015 sampling event, 14 surface water samples and one duplicate sample were collected. The total PAH concentrations in Table IV-3 are calculated by summing only detected values unless there are no detected values for a given analyte group (such as cPAHs), then half the detection limit of each analyte in the analyte group is summed. Only the 12 locations collected overlying the sediment cap were used in calculating the summary statistics presented in Table IV-4. Half the detection limit is used for calculating summary statistics.

Of the 12 surface water samples collected overlying the sediment cap, dissolved arsenic was detected in one sample at 0.001 mg/L at Location A. Dissolved arsenic was detected in both the upstream and downstream surface water samples at 0.00074 and 0.00077 mg/L, respectively. These concentrations exceed the lowest comparison criteria of 0.00014 mg/L, as does the detection limit for other samples of 0.0015 mg/L. The lowest criteria is based on the 2015 NRWQC human health consumption of organism

only value. However, the promulgated DEQ 2011 EPA-Approved AWQC for human health consumption of organism only is 0.0021 mg/L. None of the surface water samples exceeded the DEQ 2011 AWQCs. The lower 2015 NRWQC human health consumption of organism only value of 0.00014 mg/L was exceeded in surface water at Location A and surface water from background locations 1 and 27. The detection limit at other locations (0.0015 mg/L) was above the 0.00014 mg/L 2015 NRWQC human health consumption of organism only value.

Chromium was not detected in any of the 11 sediment cap locations, where chromium was measured, or in the two background (upstream and downstream) locations. The detection limit of 0.002 mg/L is well below the lowest comparison criteria of 0.053 mg/L.

Copper was detected in 11 locations overlying the sediment cap, where copper was analyzed, and in the one background location where chromium was measured. The highest concentration detected was 0.00019 mg/L which is well below the lowest comparison criteria of 0.0049 mg/L. The background concentration was 0.00016 mg/L which is similar to the maximum concentration overlying the sediment cap.

Zinc was analyzed for in 11 locations overlying the sediment cap and one background location. It was detected in 82 percent of the samples overlying the sediment cap with a maximum concentration of 0.0038 mg/L which is an order of magnitude below the lowest criteria of 0.066 mg/L. The background concentration was 0.01 mg/L which is also below the lowest comparison criteria but above the maximum concentration detected in surface water overlying the sediment cap.

PCP was not detected in surface water at any of the 14 locations sampled overlying the sediment cap or the two background locations. The detection limit of 0.00043 microgram per liter (μg/L) is well below the lowest comparison criteria of 0.04 μg/L.

PAHs were detected in all samples from the 14 locations analyzed overlying the sediment cap and the two background locations, at concentrations well below the lowest comparison criteria.

Inter-Armoring Water

Inter-armoring water samples were collected from 14 locations as shown on Figure IV-3. At locations B, D, E, G, H, I, and L, the DGT samplers for copper, chromium, and zinc were fouled and the analysis could not be conducted. The DGT samplers for arsenic were fouled at Locations D, E, G, K, and L. The samplers fouled with sediment adhering to the gel and thus compromising the sampler which is thought to have occurred during deployment. Based on surface water samples and inter-armoring samples that were not fouled, the sediment cap appears to be protective and functioning as designed. At the sub-armoring sample locations 5, 12, 13, and 16, metals were not analyzed for since the PAHs and PCP serve as the early warning indicators.

Arsenic was detected at 0.00096 mg/L in one of the five locations (Location I) where arsenic was analyzed. This concentration is above 2105 NRWQC criteria of 0.00014 mg/L but below the 2011 DEQ AWQC updated 2015 of 0.0021 mg/L. While arsenic concentrations (or detection limit) were above the lowest comparison criteria, arsenic concentrations detected from the inter-armoring layer between 2006 and 2010 were generally higher (max concentrations between 0.002 mg/L and 0.0078 mg/L with one event Spring 2008 where the max concentration was lower at 0.00078 mg/L) than both the 2015 detection limit and the detected concentration of 0.00096 mg/L. Chromium, copper, and zinc were detected in two of the three locations analyzed, at concentrations below the lowest comparison criteria. Concentrations of chromium, copper and zinc were also generally lower than previous sampling events.

PCP was not detected in any of the 14 locations analyzed and the detection limit was well below the lowest comparison criteria of 0.04 µg/L.

Of the PAHs, benzo(a)pyrene and dibenzo(a,h)fluoranthene were not detected in any of the 14 locations. Other PAHs were detected in two or more of the locations at concentrations below the lowest comparison criteria. The 95 percent upper confidence level (UCL), where sufficient detections were present to calculate, were also below the lowest comparison criteria.

Sub-Armoring Water

PAHs and PCP were measured from within the sub-armoring layer of the sediment cap at the four early warning locations. PCP was not detected. PAHs were detected at concentrations below the comparison criteria.

Summary

Passive water sampling from the surface water and from porewater within the sediment cap, using either the solid phase micro-extraction (SPME) with polydimethylsiloxane (PDMS) or the LDPE for organics is an appropriate method to measure the protectiveness of the sediment cap. A change in approach for the DGT type and/or deployment methodology will be considered in future sampling events to limit fouling of the DGT sampling windows. Recommendations to improve future DGT results include using a 'stick' format which is more durable or create a suspension system within the passive sampler to limit the DGT's direct contact during deployment. The 2015 PAH detected results for the inter-armoring layer are consistently lower in concentration than the surface water layer and both are consistently below comparison criteria. Based on the 2015 passive sampling results, the sediment cap continues to be functioning as designed and is protective of human health and the environment.

Site Inspection

The inspection of the Site was conducted on July 21, 2016. In attendance were Anne Christopher (EPA Remedial Project Manager [RPM]), Sarah Miller (DEQ Project Manager [PM]), and DEQ consultants Phil Cordell (Hart Crowser) and Erin Carroll Hughes (GSI). The purpose of the inspection was to assess the protectiveness of the remedy. The inspection included a walk around the perimeter of the Site starting at Willamette Cove, along the western shoreline and finally along the southern and eastern fence line of the Site. Navigational and warning signs along with the perimeter fence remain in place. Little ebullition was observed above the granular organoclay along the Willamette River shoreline and in Willamette Cove during the inspection; however, moderate ebullition was observed in the Willamette River later in the day when the river level was lower. Reddish staining along the extreme southern portion of the Willamette River shoreline continues to be observed (Appendix D - Photograph 14). In 2009, sheen in the stained area was analyzed and contained iron. The shoreline staining was assumed to be associated with the iron, likely from upland subsurface decomposing wood waste that comes in contact with groundwater, rather than Site COCs. Vegetation across the Site generally appeared healthy. Groundwater well locations were also observed and cap subsidence was measured. The stormwater drainage system within the Resource Conservation and Recovery Act (RCRA)-style soil cap is functioning as designed. No significant animal burrows in the soil cap were observed. The inspection also included viewing the NW Natural gas line Excavation #2 which appeared to be in pre-construction conditions.

V. TECHNICAL ASSESSMENT

According to the data reviewed and Site inspection results, the remedy is functioning as intended by the ROD, as modified by the Amended ROD and the ESD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Two issues that could affect long term protectiveness were identified and are presented in Section III. ARARs for soil contamination cited in the ROD have been met. There have been no changes in the toxicity factors for the constituents of concern (COCs) that were used in the baseline risk assessment with the exception of dioxin/furans for human health which affects the risk-based levels for the commercial/industrial and residential exposures, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. As described below, the changes to the toxicity factors for dioxin/furans, do not affect remedy protectiveness because the remedy is based on capping and ICs. There is no other information that calls into question the protectiveness of the remedy.

QUESTION A: Is the remedy functioning as intended by the decision documents? **YES**

Question A Summary: The soil remedy, sediment remedy, groundwater remedy, and engineering and ICs are functioning as intended by the ROD, as modified by the Amended ROD and the ESD. Section II summarizes the soil, sediment, and groundwater components of the remedy, and a detailed description is presented in Appendix B. This section presents the lines of evidence that demonstrate that the remedy is functioning as intended and meeting the RAOs defined in the ROD and the performance standards defined in the Final O&M Plan.

Soil Remedy

The soil cap, DEQ's temporary control of the Site, and future ICs[8] achieve the RAOs to eliminate potential exposures to contaminated soil and minimize the potential for stormwater to infiltrate through contaminated soils to groundwater. Regular inspections and maintenance activities are performed to ensure that the cap continues to function as designed. The following lines of evidence support the determination that the soil cap is functioning as intended:

- The soil cap provides physical separation between contaminated soil and Site receptors and effectively eliminates the potential for humans or ecological receptors to be exposed to contaminants. Ongoing inspections (results described in Section III) demonstrate that the soil cap and its associated stormwater conveyance system are intact and functioning as intended.
- Potential exposure is minimized by restricting access to authorized personnel and controlling potential Site trespassing with chain-link security fences and gates. The security fence around the McCormick & Baxter Property is intact and in good repair, and warning signs are in place.
- Long-term access and land use will be controlled through engineering and ICs, including future environmental easements with M&B and BNSF to ensure the integrity and protectiveness of the cap are maintained.
- Stormwater runoff is prevented from coming into contact with contaminated soil. Stormwater from the clean impermeable cap is collected and conveyed directly to the Willamette River for discharge. Stormwater from the remaining cap is conveyed via stormwater swales to an on-Site vegetated infiltration pond. Groundwater monitoring, downgradient from the pond, demonstrates stormwater infiltration has not resulted in subsurface contaminant mobilization.

O&M annual costs are consistent with original estimates.

[8] While EESs are needed to complete the soil cap ICs, the Site is under DEQ control. Until future ICs are in place, DEQ's control of the Site provides some assurance that RAOs are met.

Potential O&M issues with the soil remedy are described below:

- A few small areas showed evidence of small animals burrowing into the soil cap. The burrows are repaired and are not believed to have fully penetrated the soil cap, and therefore do not affect protectiveness. The task of soil cap inspection and repair of small animal burrows will be included in future O&M activities.
- A small area of cap subsidence was in a localized area near extraction well EW-1s. Soil cap subsidence was not measureable between 2011 and 2015. The lack of additional subsidence is believed to be the result of the placement of an airtight seal on well EW-1s and the stabilization of water levels within the barrier wall. The impermeable cap stormwater drainage system continues to operate effectively following rain events. The subsidence most likely was associated with subsurface degradation of wood chips, and the decrease in groundwater elevation within the barrier wall. The observed subsidence has not affected the effectiveness or protectiveness of the soil cap. Based on the data from the last five years, the degree of upland soil cap subsidence near wells EW-1s and MW-23d is currently stable. This area will continue to be monitored during quarterly Site inspections between 2016 and 2020 by taking inner and outer casing measurements at well MW-23d; by monitoring stormwater flow at the outfall during quarterly inspections; and by collecting and reviewing transducer data from EW-1s that measures groundwater temperature and elevation.

System optimization does not apply to this remedy. Quarterly inspection and maintenance of the soil cap is sufficient to maintain its integrity and protectiveness.

DEQ is in control of the McCormick & Baxter Property at the Site and is prohibiting groundwater use and other unacceptable uses consistent with IC requirements in the ROD. Formal ICs through proprietary restrictions in the form of an EES will be recorded for the McCormick & Baxter Property. These restrictions will prohibit development within the 6-acre riparian zone along the riverbank as required by the Endangered Species Act Biological Opinion issued by the NMFS, prohibit use of Site groundwater as specified by the ROD, and limit disturbance of Site soils. In the event of transfer of any part of the property owned by McCormick & Baxter to a future owner, for DEQ to agree to release its lien on the property, DEQ will require proprietary ICs in the form of an EES to be recorded.

In October 2009, construction activities conducted by the BNSF, disturbed the upland soil cap in the BNSF right-of-way. BNSF failed to notify DEQ of the construction activities as required by the License that provided DEQ access to install the soil cap in the right-of-way. EPA took an enforcement action against BNSF to address BNSF's violations of RCRA regulations relating to handling and transportation of soil contaminated with RCRA hazardous waste. In April 2012, EPA settled with BNSF. The Consent Agreement and Final Order memorialized the settlement which required payment of $37,500 by BNSF. This EPA enforcement action as well as communication by DEQ to BNSF is expected to reduce the likelihood that this type of failure to comply with the terms of the License will recur. In addition, an EES that pertains to BNSF property filed with the county real property records office is also expected to help ensure that the remedy will remain effective on the BNSF right-of-way property.

Sediment Remedy

The sediment cap and ICs effectively achieve the RAOs to eliminate potential exposures to contaminated sediment beneath the cap and minimize the potential for contaminants to be released to the Willamette River. Quarterly inspections and maintenance activities are performed to ensure that the cap continues to function as designed. The following lines of evidence support that the sediment cap is functioning as intended and meeting RAOs and performance standards:

- The sediment cap provides physical separation between contaminated sediment and effectively eliminates potential contaminant exposures to human or ecological receptors. The cap over contaminated sediments in the Willamette River is intact and operating as intended and has survived several high flow events.
- The sediment cap was designed to chemically isolate site contaminants in groundwater discharging through sediments and NAPL. Sediment cap monitoring (i.e., post-cap construction surface, inter-armoring, and sub-armoring water sampling) has been conducted since the sediment cap was completed in 2005 to verify design assumptions and cap effectiveness. Analytical results were compared to AWQCs referenced in the 1996 ROD, as well as current NRWQCs and MCLs established by the EPA. These criteria and recommended values are collectively referred to as comparison criteria. COC concentrations in surface water and inter-armoring water are consistently below comparison criteria, with the exception of arsenic for which the comparison criterion is below the MDL for arsenic. The inter-armoring metal results for the DGT samplers that were not fouled were well below comparison criteria and provide assurance that concentrations are protective. COC concentrations in the sub-armoring water are generally below comparison criteria. COC concentration trends are stable or decreasing. Based on water sampling from the surface water, inter-armoring, and sub-armoring, the sediment cap appears to be protective and functioning as designed.
- Visible discharges of NAPL to the river have been effectively eliminated through:
    - The installation of the barrier wall. The barrier wall contains primary NAPL source areas and reduces groundwater migration from upland source areas to the river thereby reducing contaminant flux to the river. No NAPL seeps have been observed since installation of the barrier wall.
    - NAPL extraction from wells located outside the barrier wall, permanently reducing the volume and potential mobility of NAPL.
    - Supplementing the cap by placing OrganoclayTM reactive core mats (RCMs) in ebullition-induced sheen areas and bulk organophilic clay in potential seep areas to minimize the potential for contaminant migration.
- Sediment cap inspections confirmed the cap is intact and stable and did not identify significant indications of any difficulties with the remedy. Minor armoring repairs were conducted in the past five years as presented in Table II-2. It was observed that sand, deposited by both natural riverine processes and placed during cap construction, covers a portion of the ACB armoring over some areas of the shoreline, and significant amounts of large driftwood regularly move through the Site to help create wildlife habitat. The sand and woody debris do not affect the protectiveness of the remedy.
- Additional investigations (described in Appendix B) have been performed to evaluate the effectiveness and overall protectiveness of the cap including:
    - Bulk organophilic clay Core Study
    - DNAPL Investigation
    - Crayfish Sampling Assessment
    - Bathymetric Differencing Images
    - Willamette Cove ACB
    - Ebullition Investigation
    - Sheen Investigations

Annual costs for sediment cap activities are consistent with original estimates.
The only sediment cap issue identified was the reduced sand cap thickness in areas of uneven ACB (unconformities) that were observed in Willamette Cove. This issue was investigated by conducting a

historical review of relevant data, a diver inspection survey, and sediment cap coring and porewater sampling within the two observed areas with ACB unconformities. The results of pore water sampling within the sand portion of the sediment cap beneath the unconformities were consistent with the results of sub-armoring sampling in other areas of the sediment cap. Core sampling documents more than 2 feet of sand cap in one location, but less than 1 foot of sand cap in the second location. Analysis of PAHs at the second location indicated that the cap functions as designed. Despite the reduced thickness in that area, the cap remains protective. Additional monitoring of this area, where the sediment cap is thinner than design thickness, is recommended for the long-term monitoring plan.

The ICs include implementing dredging restrictions and notifying U.S. Army Corps of Engineers (USACE) and State of Oregon Department of State Lands (ODSL). Warning buoys are in place to prevent damage to the sediment cap. A Regulated Navigational Area (RNA) in and around the sediment cap pursuant to CFR Title 33, Part 165 was established in March 2009. No additional ICs are warranted on the basis of current conditions.

Groundwater Remedy

The groundwater remedy and DEQ control of the McCormick & Baxter Property effectively achieve the RAOs to eliminate potential exposures to contaminated groundwater and minimize the potential for groundwater contaminants and NAPL to be released to the Willamette River. Regular inspections and maintenance activities are performed to ensure that the cap continues to function as designed. Based on observations made between 2006 and 2010, the barrier wall, impermeable soil cap, sediment cap, and ICs are functioning in conjunction with one another as intended, and are meeting the goal of minimizing the migration of groundwater contaminants and NAPL into the Willamette River, as follows:

- NAPL recovery efforts have been successful and have permanently reduced the mass, volume and potential mobility of NAPL. The thickness of NAPL is not increasing in any of the monitoring wells inside or outside the barrier wall (with the exception of well EW-1s inside the barrier wall where DNAPL entered the well in the past five years). NAPL recovery was discontinued in 2011 and therefore, no NAPL was recovered during this last five-year period.
    - Presence of creosote along the shoreline has not been observed since construction of the barrier wall was completed.
    - LNAPL was not recovered from any wells at the Site since 2006 because the criteria for recovery was not met. Although the thickness of LNAPL varies seasonally with groundwater elevation, the accumulated volume is not increasing, either inside or outside the barrier wall. DNAPL continued to be extracted through 2011 from wells that met the criteria for DNAPL extraction.
    - Approximately 6,500 gallons of NAPL (LNAPL and DNAPL) have been extracted from Site wells through April 2011 when NAPL recovery was discontinued. No NAPL was recovered during the last five-year period.
- NAPL source areas are contained within the barrier wall and NAPL is prevented from migrating to the Willamette River.
- Shallow groundwater within the barrier wall is isolated from groundwater outside the barrier wall based on the independent groundwater elevations, flow directions, and gradients.
- Groundwater samples, collected from 11 wells in May 2010, were analyzed for total metals, PCP, and PAHs. In general, the 2010 sample results are consistent with historical data, and show either less or similar contaminant concentration compared to the 2006 results. Additional groundwater sampling is scheduled for 2020.
- Stormwater runoff is prevented from coming into contact with contaminated soil or NAPL source areas and leaching contaminants to groundwater. Stormwater from the clean impermeable

cap is collected and conveyed directly to the Willamette River for discharge. Stormwater from the remaining cap is conveyed via stormwater swales to an on-Site vegetated infiltration pond.

- Additional investigations (as described in the Third FYR) were performed between 2005 and 2010 to evaluate the effectiveness and overall protectiveness of the groundwater remedy including:
  - DNAPL Investigation
  - Ebullition Investigation
  - Sheen Investigations

Annual costs for groundwater remedial activities are consistent with original estimates. No issues have been identified with the groundwater remedy.

DEQ is in control of the McCormick & Baxter Property at the Site and is prohibiting groundwater use and other Site uses consistent with IC requirements in the ROD. Although institutional controls are not yet in place, contaminated groundwater in the shallow water-bearing zone is not used for human consumption or for any industrial purpose. The fencing around the McCormick & Baxter Property at the Site restricts access to most of the upland capped areas where residual contamination is being managed in place. All access points to the McCormick & Baxter Property are secured with locking gates and signs. In addition, a Site Health and Safety Plan is in place, is properly implemented, and is sufficient to protect Site workers from potential Site risks during routine Site activities. Groundwater beneath the McCormick & Baxter Property and beneath the property owned by BNSF north of the McCormick & Baxter property will require restrictions to ensure long-term protectiveness consistent with the ROD. DEQ and EPA plan to complete groundwater ICs.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? **No.**

Question B Summary:

The RAOs and cleanup goals for soil and sediment are still valid and are protective of current and anticipated future land use. However, in the Second FYR, EPA determined that ACLs were not appropriate as substitutes for MCLs in groundwater at this Site. The Site is surrounded by the Portland Harbor Superfund area. EPA anticipates selecting new groundwater cleanup goals after the Portland Harbor ROD is issued. EPA is also considering amending criteria for the sediment OU in conjunction with a ROD amendment or ESD for the groundwater OU.

Changes in Standards and To Be Considered's (TBCs)

The ROD identifies Site-specific ACLs for the Site. EPA has determined that the ACLs calculated for this site are not appropriate in groundwater. EPA will evaluate the changes needed to clean up goals selected for this Site after completion of the Portland Harbor ROD. Based on the data collected and analyzed during the past five years, DEQ and EPA plan to move forward with a ROD Amendment or ESD that will establish new groundwater cleanup goals for the Site. DEQ has revised and adopted new water quality criteria for human consumption of fish based on a fish consumption rate that is 10 times higher than the rate used by EPA to develop national AWQC. EPA approved DEQ's new water quality criteria in 2011. These criteria will be addressed in the decision document along with the selection of new groundwater cleanup goals for the Site.

In 2011, more stringent AWQCs for human health were adopted by DEQ and approved by EPA. The O&M Plan specifies that the 2011 criteria include the EPA-approved 2011 AWQCs for human health and other applicable AWQCs at the time of sediment cap water sampling. The 2011 AWQCs were

updated by DEQ in 2015. The above criteria, including the 2011 AWQCs, were used as comparison to analyze the data and other that background locations for arsenic, were less than these criteria during the 2015 sampling event. It should be noted that although the above criteria have been included in the O&M Reports for comparison purposes, the 1996 AWQC values are the regulatory criteria for the Site until a ROD Amendment or ESD is issued.

Changes in Toxicity and Other Contaminant Characteristics

Since the last FYR, EPA established a reference dose for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). On February 17, 2012, EPA released the final human health non-cancer dioxin reassessment, publishing an oral non-cancer toxicity value, or reference dose (RfD), of $7x10^{-10}$ mg/kg-day for 2,3,7,8- TCDD in EPA's Integrated Risk Information System (IRIS). The dioxin cancer reassessment is expected to follow. The dioxin RfD was approved for immediate use at Superfund sites to ensure protection of human health. However, because the remedy is intended to prevent exposure through capping and ICs and the remedy is performing as intended, this change does not affect the protectiveness of the remedy.

The entire property is capped and fenced. Off-site soils above the 1996 ROD cleanup goal of 40 ppt TCDD/F TEQ were placed on the property prior to capping. In addition, 35,000 cubic yards of soil above action levels from the central processing area were removed as hazardous waste prior to capping. The barrier wall is expected to contain the potentially mobile residual dioxin below action levels.

Changes in Risk Assessment Methods

There have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Changes in Exposure Pathways

There have been no changes in physical conditions of the Site that would affect the exposure pathways, assumptions, or the protectiveness of the remedy. The majority of the McCormick & Baxter Property is currently vacant and access-controlled by DEQ. In the event of changes in ownership or land use related to the McCormick & Baxter Property, future land and groundwater use will be controlled through an institutional control to ensure the remedy is protective.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?
No. No new information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU 2 (Sediment Remedy*)*

Issues and Recommendations Identified in the Five-Year Review:

OU-3 (Groundwater Remedy):	**Issue Category: Other** ***Revision of Cleanup Goals***			
	Issue: Need to formally revise the groundwater cleanup goals at this Site.			
	Recommendation: Prepare a ROD Amendment or ESD to revise cleanup goals and identify associated points of compliance.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/31/2017

OU-1 (Soil Remedy) and OU-3 (Groundwater Remedy)	**Issue Category: Institutional Controls**			
	Issue: ICs have not been implemented as required by the ROD for the Site groundwater and soil cap remedies			
	Recommendation: Establish and implement an IC Implementation and Assurance Plan and record EES's with property owners			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA/State	12/31/2017

OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR and may require continued monitoring or additional follow-up actions, but do not affect current or are expected to affect future protectiveness:

- ACB Unconformity in Willamette Cove – While the sampling in 2015 showed these areas to be protective, there is a need to continue to monitor pore water in areas where the sand cap is thinner than the specified design thickness; DEQ will conduct this monitoring in October 2020 in order for the results to be incorporated into the Fifth FYR. Significant additional settling is not expected because the organophilic clay has already lost approximately 16 percent of the carbon through degradation and there is only approximately 8 percent remaining to degrade. A decision as to continued monitoring beyond 2020 will be determined in the Fifth FYR.
- Soil Cap Subsidence and Small Animal Burrows – DEQ will conduct quarterly monitoring through December 2020.
- Sediment Cap Monitoring – DEQ will improve future DGT sampling for metals by using a 'stick' format which is more durable or create a suspension system within the passive sampler to limit the DGT's direct contact during deployment, which fouled multiple 2015 samples.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU 1 (Soil)	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy for the soil OU is currently protective of human health and the environment because the upland soil cap and engineering controls required by the ROD have been implemented, and are working as intended. However, in order for the remedy to be protective in the long-term, DEQ and EPA need to implement the ICs required by the ROD for the soil cap remedy.	

Protectiveness Statement(s)	
Operable Unit: OU 2 (Sediment)	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy for the sediment OU is protective of human health and the environment because the remedy required by the ROD has been implemented and is working as intended.	

Protectiveness Statement(s)	
Operable Unit: OU 3 (Groundwater)	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy for the groundwater OU is currently protective of human health and the environment, because the soil, sediment, and groundwater remedies have been implemented and the RAOs in the ROD have been met. However, the EPA determined that ACLs as calculated at this Site are not appropriate as substitutes for MCLs in groundwater (this issue was identified in the previous two Five-Year Reviews). In order for the remedy to be protective in the long term, the following actions need	

to be taken: formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy in a ROD Amendment or ESD, and implement ICs required by the ROD for the groundwater remedy.

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedies for soil, sediment, and groundwater currently protect human health and the environment, because the soil and sediment caps, barrier wall, sediment ICs, and engineering controls required by the ROD have been implemented. However, in order for the remedies to be protective in the long-term, the following actions need to be taken: evaluate the cleanups goals for consistency with the Portland Harbor ROD and issue a ROD Amendment or ESD that establishes new cleanup goals and points of compliance for the groundwater remedy, and implement the ICs required by the ROD for the soil and groundwater remedies.

VIII. NEXT REVIEW

The next FYR report for the M&B Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

DEQ/EPA, 2001. *First Five-Year Review Report*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, ORD009020603. Prepared by Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA). September 2001.

DEQ/EPA, 2006. *Second Five-Year Review Report*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, ORD009020603. Prepared by Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA). September 2006.

DEQ/EPA, 2011. *Third Five-Year Review Report*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, ORD009020603. Prepared by Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA). September 2011.DEQ, 2007. *Draft Operation and Maintenance Plan*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Oregon, ORD00020603. Oregon Department of Environmental Quality, October 2007.

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Ecology & Environment, Inc. (E&E), 1999. *Phase 1 Soil Remedial Action Summary Report*: McCormick & Baxter Creosoting Company, Portland, Oregon. Ecology & Environment, Inc., November 1999.

E&E, 2004. *Remedial Action Construction Summary Report; Combined Sheet Pile and Soil-Bentonite Barrier Wall*: McCormick & Baxter Creosoting Company, Portland, Oregon. Ecology & Environment, Inc., April 2004.

E&E, 2006. *Remedial Action Construction Summary Report; Upland Cap Construction Summary Report*: McCormick & Baxter Creosoting Company, Portland, Oregon. Ecology & Environment, Inc., May 2006.

EPA, 2005. *Preliminary Close Out Report*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Oregon. U.S. Environmental Protection Agency, September 2005.

EPA/DEQ, 1996. *Record of Decision*: McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon. U.S. Environmental Protection Agency and Oregon Department of Environmental Quality, March 1996.

EPA/DEQ, 1998. *Amended Record of Decision*: McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon. U.S. Environmental Protection Agency and Oregon Department of Environmental Quality, March 1998.

EPA/DEQ, 2002. *Explanation of Significant Difference (OU3 – Final Groundwater)*: McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon. U.S. Environmental Protection Agency and Oregon Department of Environmental Quality, August 2002.

Hart Crowser/GSI, 2011a. *Operation and Maintenance Report, January 1, 2010, to December 31, 2010*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., June 27, 2011.

Hart Crowser/GSI, 2012. *Operation and Maintenance Report, January 1, 2011, to December 31, 2011*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., May 23, 2012.

Hart Crowser/GSI, 2013. *Operation and Maintenance Report, January 1, 2012, to December 31, 2012*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., May 6, 2013.

Hart Crowser/GSI, 2014. *Operation and Maintenance Report, January 1, 2013, to December 31, 2013*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., April 9, 2014.

Hart Crowser/GSI, 2015. *Operation and Maintenance Report, January 1, 2014, to December 31, 2014*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., July 6, 2015.

Hart Crowser/GSI, 2016a. *Operation and Maintenance Report, January 1, 2015, to December 31, 2015*: McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., June 3, 2016.

Hart Crowser/GSI, 2016b. *Operation and Maintenance Manual:* McCormick & Baxter Superfund Site, Portland, Oregon. Hart Crowser, Inc. and GSI Water Solutions, Inc., June 17, 2016.

NOAA, 2004. *Endangered Species Act – Section 7 Consultation Biological Opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation*, McCormick & Baxter Creosoting Company Site, Willamette River Remediation Sediment Cap, Multnomah County, Oregon. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Region, March 15, 2004.

NW Natural, 2015. 16-Inch Pipeline Abandonment- Post Construction Report. 6900 N. Edgewater Ave. Portland, Oregon. Northwest Natural January 22, 2015.

State of Oregon Department of State Lands (ODSL) Easement No 31530-EA to the Oregon Department of Environmental Quality, May 2004

University of Portland, 2013. 2013 Master Plan; approved by City of Portland Hearings Officer. Effective May 14, 2013. http://www.up.edu/facilitiesplanning/default.aspx?cid=10244&pid=5130

U.S. Coast Guard (USGS) Regulated Navigation Area Final Rule 33 CFR Part 165, February 2009

APPENDIX B – BACKGROUND INFORMATION

Site History

Much of the Site was created from dredged materials in the early 1900s. At that time, a sawmill operated in the southeast portion of the property. McCormick & Baxter Creosoting Company (M&B) was founded in 1944 to produce treated wood products, including lumber, piling, timbers, and railroad ties during World War II. The wood-treating operations continued until October 1991.

Four retorts were located in the central processing area (CPA) at the Site and were used for various pressure treating processes, which included the use of creosote, pentachlorophenol (PCP), chromium, ammoniacal copper arsenate, ammoniacal copper zinc arsenate (ACZA), and Cellon (PCP in diesel oil, liquid butane, and isopropyl ether). Also present at the Site were a 750,000-gallon creosote product storage tank and a tank farm area (TFA) with several additional tanks for storing wood-treatment chemicals.

From 1950 to 1965, waste oil containing creosote and/or PCP was applied to the Site soil for dust suppression in the CPA. Liquid process wastes reportedly were discharged to a low area near the TFA before 1971.

Between 1945 and 1969, the plant's wastewater from the retorts' oil/water separators, along with the boiler blowdown and condenser cooling water were directly discharged to the Willamette River. Three stormwater outfalls were also present along the river. Two of the outfalls were permitted under the National Pollutant Discharge Elimination System. Following plant shutdown, Oregon Department of Environmental Quality (DEQ) placed earthen berms around stormwater collection sumps at the Site as an early response action to minimize off-Site discharge. The stormwater outfalls were removed as part of the first phase of the soil remedial action in 1999.

Two major spills reportedly occurred at the Site: a 50,000-gallon creosote release in the TFA in approximately 1950; and a large spill of an unspecified volume of creosote from a tank car near the TFA in 1956.

Sludge from on-Site processes was disposed of at an unknown off-Site location until 1968. From 1968 to at least 1973, residues from the retorts, oil/water separators, and evaporators were disposed of on-Site in the former waste disposal area (FWDA) in the western portion of the Site. Beginning in 1972, wood preservative sludge was placed in metal containers that were stored on Site in the FWDA. After 1978, wood preservative sludge was shipped to Chem-Security System, Inc., a permitted hazardous waste disposal facility near Arlington, Oregon. In 1981, the hazardous waste storage area was secured with a fence and lock, and a manifest system was implemented to comply with hazardous waste regulations.

Concrete walls and slabs were built around the ACZA process and storage facilities in 1980 to prevent spills from entering the soil. The retorts and retort openings were lined with concrete, but the integrity of the concrete was not verified. The creosote lines and other pipelines passed through a concrete underground walkway that extended from the TFA to the retort building. In 1985, 2 feet of soil and

sludge were excavated from the TFA and were shipped to a hazardous waste landfill. Visibly contaminated soil remained at the TFA.

Chemicals of Concern and Affected Media

Site investigations have revealed many releases of wood-treating chemical compounds to soils, groundwater, and sediments as a result of these operations. Contaminants detected include polynuclear aromatic hydrocarbons (PAHs; comprising 85 percent of the creosote), PCP, arsenic, chromium, copper, zinc, and dioxins/furans. Three main contaminant sources existed at the Site: the FWDA, which was located in the western corner of the Site adjacent to the Willamette River and was characterized by a large depression where waste oils, retort sludges, and wastewater were disposed of over a period of several years; the CPA, which was located in the center portion of the Site and was where retorts, PCP mixing shed, and ACZA storage areas formerly were located; and the TFA, which was located in the south-central portion of the Site and was the former location of the main tank farm, creosote storage tank, and several other wood treatment process-related tanks or process areas. Releases from these source areas (particularly in the TFA and FWDA) in the form of insoluble wood-treating contaminants or non-aqueous phase liquids (NAPL) have significantly impacted subsurface soils, groundwater, and sediment. Remedial investigations identified two large NAPL plumes migrating to the river and impacting surface water and sediments. Subsequent monitoring identified another NAPL plume migrating under the BNSF Railway Company (BNSF) right-of-way toward Willamette Cove. An additional investigation was conducted in the northern corner of the Site to determine the nature and extent of NAPL associated with monitoring well MW-1s. This investigation found only trace amounts of NAPL apparently composed of weathered crude or bunker oil.

Regulatory History

M&B began environmental investigations of its property in 1983. Based on those investigations, DEQ entered into a Stipulated Order with M&B in 1987 requiring the implementation of corrective actions. Corrective actions included the installation and operation of a groundwater extraction and treatment system, construction of drip pads in retort areas, construction of covered storage areas for treated wood, and collection and treatment of stormwater. In December 1988, the M&B filed for Chapter 11 bankruptcy; and, in 1990 DEQ assumed responsibility for completing the investigations and cleanup activities at the Site. In October 1991, the M&B ceased operations.

DEQ began the Remedial Investigation and Feasibility Study in 1990 and issued a public notice of a proposed cleanup plan in January 1993. DEQ elected not to finalize the proposed remedial actions at the Site due to the proposed addition of the Site to the National Priorities List (NPL) by U.S. Environmental Protection Agency (EPA) in June 1993. The Site was added to the NPL on June 1, 1994. DEQ completed a revised Feasibility Study in 1995.

DEQ and EPA entered into a Superfund State Contract (SSC) in May 1996. The SSC documents the responsibilities of DEQ as the lead agency and EPA as the support agency during the remedial action. Among other items, the SSC specifies cost sharing between DEQ and EPA. The SSC was most recently amended in February 2005.

Construction Completion

In September 2005, the M&B Superfund Site achieved the construction completion milestone. This designation means that all remedial action required by the Record of Decision (ROD), the ROD Amendment, and the Explanation of Significant Difference (ESD) were implemented, completed, and

documented in a Preliminary Close-Out Report. Since that time, the soil and sediment Operable Units (OUs) have been determined to be operational and functional (O&F). The O&F determination has not been made for the groundwater OU.

Additional regulatory background information on the M&B Superfund Site can be found in the following documents:

- *Record of Decision*, McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon, EPA and DEQ, March 1996.
- *Amended Record of Decision*, McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon, EPA and DEQ, March 1998.
- *First Five-Year Review Report,* McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, September 2001.
- *Second Five-Year Review Report,* McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, September 2006.
- *Third Five-Year Review Report,* McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, September 2011.
- *Explanation of Significant Difference (OU3 – Final Groundwater),* McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, EPA and DEQ, August 2002.

Response Actions

Removal Actions

Removal actions were completed by DEQ under the State of Oregon cleanup regulations prior to listing on the NPL and under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority between Site listing and issuance of the ROD. A list of these removal actions is provided in the document titled Preliminary Close-Out Report (EPA, 2005).

These actions included:

- Installation of a fence around the M&B Property to control access.
- Placement of warning buoys along the river and posting or warning signs on the fence.
- Mitigation of potential off-Site migration of contaminated airborne particulates through dust control measures, such as grass seeding and limitation of Site traffic.
- Stormwater containment through diversion and collection or stormwater in retort sumps.
- Maintenance, sale, and transfer of remaining wood-treating chemicals.
- Demolition and off-Site disposal of several Site structures and materials, including the sale and removal of salvageable equipment and materials from the Site.
- Removal of asbestos material from retorts and buildings and recycling or disposal of chemicals stored in the laboratory.
- Disposal of 151 drums of wood-treating process waste.
- Treatment of approximately 400,000 gallons of stormwater collected from retort sumps and discharge to the Willamette River.
- Collection and analysis of approximately 650 soil samples to identify the most highly contaminated areas for initial removal actions.

- Excavation and off-Site disposal of approximately 377 tons of contaminated soil from three "hot spot" areas.
- Installation of an interceptor trench downgradient of the TFA to recover light NAPL (LNAPL).
- Dismantling of chemical storage tanks, retorts, and several buildings, and off-Site disposal of sludges.
- Installation and monitoring of 21 new wells to further delineate the extent of NAPL contamination.
- Recovery of NAPL from monitoring and extraction wells. Starting in 1989, creosote was purged every week from five monitoring wells at the Site. Approximately 450 gallons were recovered between July 1989 and November 1991. By February 1995, more extraction wells had been added to the system and approximately 1,800 additional gallons of creosote had been removed.
- Installation of a fully automated pilot-scale wastewater treatment system to separate NAPL and treat groundwater removed through total fluid extraction efforts in the TFA. Wells in the FWDA were used for pure-phase NAPL extraction and were not connected to this treatment system. The treatment system in the FWDA consisted of an oil/water separator, an in-line anthracite/clay filter, two granulated activated carbon units, and a metals treatment unit.
- Modification in 1994 of the fully automated TFA system to a 40-hour per week system. The fully automated system required constant monitoring and temporary shutdown of the extraction system to minimize recovery of groundwater. Field data collected between 1992 and 1994 indicated that weekly pumping yielded as much NAPL as the fully automated system.

Status of Implementation

The Site was divided into three OUs to facilitate and manage remedy costs, implementation, and construction. The overall remedy is designed to function as an integrated containment system. The entire Site is capped; the combined upland capping extends to the riparian area along the shoreline where it meets the sediment cap. The capping works in conjunction with the barrier wall, as a complementary system, to meet the Site Remedial Action Objectives (RAOs) and prevent contaminated groundwater from adversely impacting the Willamette River.

Soil Remedy

The soil remedy is composed of three primary components: removal of highly contaminated soil within 4 feet of the ground surface, capping, and institutional controls (ICs)[9]. The RAOs for the soil remedy are:

- Prevent human exposure through direct contact (ingestion, inhalation, or dermal contact) to contaminated surface and near-surface soil that would result in an excess lifetime cancer risk above 1x10-6 for individual compounds, above 1x10-5 for additive carcinogenic compounds, or above a Hazard Index (HI) of 1 for noncarcinogenic compounds in an industrial land use scenario.
- Prevent stormwater runoff that contains contaminated soil from reaching the Willamette River.

[9] To improve readability in this FYR, the ICs for the soil, sediment, and groundwater remedies have been consolidated and will be described later in this section.

The purpose of the soil remedy was to eliminate the potential for future human contact with soil less than 4 feet in depth that has contaminant concentrations above removal action levels. Removal action levels for contaminated soils were defined for excavation and off-Site disposal for arsenic, PCP, and total carcinogenic PAHs. These action levels indirectly address the removal of dioxins/furans because of their presence predominantly in areas where elevated concentrations of PCP or PAHs were found in soil.

Soil excavation activities were performed from February through May 1999, and effectively eliminated the presence of the contaminated soils above removal action levels in the surficial 4 feet. In several major source areas, excavation proceeded to depths of 8 to 10 feet; although, large volumes of deeper soil still contain NAPL and high concentrations of Site contaminants. Approximately 32,604 tons of contaminated soil and debris were excavated and disposed of off-Site at permitted landfills. A total of 33,128 tons of clean sand was imported from an off-Site quarry to backfill the excavation pits.

Documentation, record drawings, and a detailed summary of the soil removal construction activities are provided in the document titled Phase 1 Soil Remedial Action Summary Report (Ecology & Environment, Inc. [E&E], 1999).

The selected soil remedy requires capping upland areas where residual soil contamination remains above human health and ecological risk-based protective levels. Documentation, record drawings, and a detailed summary of the upland soil cap construction activities are provided in the document titled Upland Cap Construction Summary Report (E&E, 2006).

Construction activities for the upland soil cap were performed between March and September 2005 and included the following major components: demolition and off-Site disposal of existing structures and infrastructure; reinstallation of key support facilities; construction of a 15-acre impermeable cap within the perimeter of the subsurface barrier wall; and construction of an earthen soil cap outside of the impermeable cap.

Demolition and removal were conducted from May through June 2005 and included the removal of all remaining structures and disposal of the generated waste in a State-approved disposal facility. All existing water, gas, and electrical utilities were removed or abandoned. Most fire hydrants were removed, any associated piping was grouted to prevent preferential flow paths, and water lines were capped. Demolition items were salvaged, scrapped, or disposed of as nonhazardous waste or hazardous waste. Concrete, creosote-contaminated steel, and asbestos-containing water pipe also were buried on-Site. All on-Site burial locations were surveyed. Twenty groundwater monitoring wells were abandoned.

Support facility construction was conducted from March to July 2005 and included the reinstallation of a 1-acre paved entrance road and parking area, construction of a 25-foot by 40-foot shop building, and reinstallation of electrical, telephone, and water services.

A 15-acre Resource Conservation and Recovery Act (RCRA)-type impermeable cap was constructed within the 18-acre area inside of the barrier wall. The only part of the 18-acre area within the barrier wall that does not have a RCRA-type cap is the riparian zone that borders the river. Capping of the riparian zone with an earthen cap was completed in 2004 as part of the sediment cap construction.

The purpose of the impermeable cap is to minimize infiltration of rainwater into the contaminated areas within the wall. The impermeable cap is composed of the following materials, listed in order from bottom to top and is shown on Figure II-1.

- 8,000 cubic yards of sand used as a leveling layer about 4 inches thick.
- 72,000 square yards of high density polyethylene (HDPE) geomembrane liner, which prevents water from flowing vertically into the contaminated aquifer.
- 72,000 square yards of a geocomposite plastic 'fabric' drainage layer that allows water to flow to the stormwater drainage system.
- 47,000 cubic yards of sand of varying depths to allow for drainage.
- 12,000 cubic yards of 4"-minus crushed rock, forming a screened biotic barrier layer approximately 6 inches thick.
- 72,000 square yards of geotextile filter fabric.
- 24,000 cubic yards of topsoil placed approximately 9 to 12 inches in depth.
- 20 species of native grasses to provide a diverse and sustainable herbaceous cover, thus minimizing surface erosion.

The impermeable cap has a minimum thickness of 29 inches; the thickness varies because of varying subgrade and the final grade of the Site. The sand drainage layer increases in depth to create the grades necessary to achieve Site drainage. The maximum thickness of the cap is approximately 7 feet, which includes a 4-inch-thick sand leveling layer, a 62-inch-thick sand drainage layer, a 6-inch-thick rock biotic barrier, and 12 inches of topsoil.

The impermeable cap also consists of a subsurface drainage system above the HDPE liner to collect stormwater percolating through upper soil, rock, and sand layers of the cap. Stormwater is collected in the geocomposite fabric and perforated piping and conveyed by gravity flow through conveyance piping to an outfall structure, which daylights at approximately the ordinary high water (OHW)[10] level of the Willamette River.

An earthen soil cap, consisting of a 2-foot-thick layer of imported topsoil, was installed over 19 acres of the Site outside of the barrier wall area, excluding the gravel entrance road and parking area (1 acre). An additional 6 acres of earthen cap were installed over the riparian zone during construction of the sediment cap. The total area of earthen cap is 25 acres, and includes some of the BNSF right-of-way. The purpose of the earthen cap is to prevent direct contact with low-level contamination remaining in the soils throughout the rest of the Site. The soil layer is underlain with a demarcation layer consisting of orange HDPE safety fencing to provide a distinction between the clean soil cap and contaminated soil. The earthen soil cap was seeded with native herbaceous vegetation.

A stormwater management system was constructed to minimize stormwater runoff from the Site to neighboring properties and the Willamette River. This system consists of a swale that conveys stormwater directly to an on-Site retention/infiltration pond. Except for the 6-acre riparian zone, the surface of the upland soil cap (including both the earthen and impermeable caps) is constructed with sloped surfaces (approximately 1 percent slope) to direct surface water runoff toward the drainage swale. Rainwater falling onto the riparian zone, which generally has a slope of 25 percent, flows overland toward the river and/or infiltrates into Site soil and groundwater.

A 6-foot-high, chain-link fence topped with barbed wire also was reinstalled along the McCormick & Baxter Property perimeter. Along the riverfront, the fence is located 35 feet inland from the top of bank. Gravel access ways and roads were constructed around the perimeter of the McCormick & Baxter Property (except along the north side where the drainage swale is located), with spurs that cross the

[10] OHW at the Site is +20 feet NAVD. OHW is defined at Oregon Revised Statute (ORS) 274.005.

interior area to allow monitoring and maintenance of the Site in those locations. Warning signs were placed along the perimeter of the McCormick & Baxter Property.

Several thousand native trees and shrubs were planted throughout the drainage swale and riparian zone in February 2006, and a temporary, aboveground irrigation system was installed in May 2006. No trees are planted overtop the impermeable cap within the barrier wall. The purpose of this vegetation, along with the native grasses, is to help stabilize the soil against stormwater erosion and river flood erosion, and to reduce rainwater percolation into groundwater by evapotranspiration.[11] See Appendix B Photographs for current vegetative cover and recent aerial photograph.

Sediment Remedy

The sediment remedy is composed of two primary components: ICs and a sediment cap. The RAOs for the sediment cap are:

- Prevent humans and aquatic organisms from direct contact with contaminated sediments.
- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of federal and state ambient water quality criteria.

The first RAO is designed to prevent human exposure under a recreational scenario from direct contact with contaminated sediments and to prevent exposure of benthic organisms to sediment contamination above known toxicity levels[12].

The selected sediment remedy consists of capping areas that contain contaminant concentrations above human health and ecological risk-based protective levels or that exhibit significant toxicity to benthic organisms within the upper sediments. Construction of the sediment cap occurred in two separate phases: June through November 2004[13] and August through October 2005. Documentation, record drawings, and a detailed summary of the sediment cap construction activities are provided in the documents titled Remedial Action Construction Summary Report Sediment Cap (June 2004 through November 2004) and Remedial Action Construction Summary Report Sediment Cap Completion (August 2005 through October 2005), both prepared by E&E for DEQ and EPA in May 2006.

Construction activities in 2004 consisted of the following major components:

- Removal of approximately 1,630 pilings, bulkhead, dock remnants, in-water debris, a derelict barge in Willamette Cove, and other Willamette Cove features
- Construction of a multi-layer sediment cap using sand, organophilic clay, and armoring
- Monitoring well abandonment and modification
- Bank regrading and capping
- Disposal and demobilization

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[11] Restoration and maintenance of the riparian zone is required by the Biological Opinion issued by the National Marine Fisheries Service, pursuant to Section 7 of the Endangered Species Act.

[12] At the time of the ROD, no state or federal sediment quality criteria existed. However, bioassay results indicated that a substantial area of near-shore sediment contamination was toxic to sedentary benthic invertebrates (bioassay testing measured organism survival and weight, see Sediment Cap Basis of Design). These areas coincided with areas that exceeded human risk-based goals. Sediment with concentrations above levels protective of human health or toxic to benthic organisms (based on sediment bioassay tests resulting in impaired survival and growth (i.e., weight)) were capped.

[13] This phase of the sediment cap construction also included regrading and capping of the riverbank to create the 6-acre riparian zone. Although construction of the riparian bank cap is described as part of the sediment cap remedy, long-term operation and maintenance of the riparian zone will be conducted as part of the upland soil cap.

The sediment cap footprint constructed in 2004 encompassed approximately 22 acres. Its shoreward boundary extends along the shoreline from the south end of the property downstream into Willamette Cove to the north. Its riverward boundary at the farthest offshore location extends into the Willamette River to an approximate elevation of -40 feet North American Vertical Datum (NAVD), outside of the limits of the U.S. Army Corps of Engineers (USACE) designated navigational channel, and to -16 feet NAVD in Willamette Cove. The cap consists of a 2-foot-thick layer of sand over most of the cap footprint with a 5-foot-thick layer of sand over several more highly contaminated areas. Approximately 131,000 tons of sand were placed from July 7 through October 28, 2004.

Within the cap footprint were areas of known NAPL migration (e.g., seep areas). In the Willamette Cove and TFA NAPL seep areas, the cap incorporated 600 tons of organophilic clay to prevent breakthrough of NAPL through the cap. Organophilic clay is bentonite or hectorite clay that has been modified to be hydrophobic and to have an affinity for organic compounds. The AquaTechnologies ET-1 organophilic clay (ET-1) was applied in bulk and in the form of Organoclay™ reactive core mats (RCMs).

The sediment cap incorporated different types of armoring to prevent erosion of the sand and organophilic clay layers. The specific armoring material and where it was installed depended on the expected hydraulic and physical environments (e.g., currents, wave energy, erosive energies, etc.). Articulated concrete block (ACB) mats were installed along the shore and in shallow water where erosive forces would be the greatest because of wave action. ACB is composed of individually formed, interlocking concrete blocks. Rock armor included 6”-minus, 10”-minus, and riprap. All shallow water 10”-minus and ACB armoring layers were underlain with a woven geotextile fabric and a 4-inch-thick layer of 3”-minus filter rock. This fabric and rock layer was installed to hinder the migration of the sand through the larger and more porous armoring layer or layers. A cross-sectional view of the sediment cap is shown on Figure II-2.

ACB installation began on July 7, 2004, and proceeded from the downstream end of the Site in Willamette Cove to the upstream work limits. Installation of ACB mats was allowed only after the subgrade, including sand cap and gravel filter layer, was verified by DEQ’s construction oversight contractor. ACB installation was completed on October 28, 2004.

The 6”-minus rock was basalt and/or andesite. Approximately 23,250 tons of 6”-minus cobble were placed over the sand cap and as edge treatment where the 6”-minus cobble areas abutted the ACB. The 10”-minus rock used as armoring also is composed of angular basalt and/or andesite. Approximately 23,300 tons of 10”-minus rock were placed in the near-shore embayment. The riprap material used for construction of the boulder clusters and the rock mound is composed of durable angular boulders less than 3 feet in diameter.[14] Approximately 558 tons of riprap were placed along the shoreline and on an offshore shoal between the embayment and the river at the Site. Each boulder cluster consisted of six to seven boulders.

Eighteen monitoring wells located within the 6-acre riparian zone were abandoned (e.g., boreholes were overdrilled and grouted with bentonite), and 36 monitoring wells were modified in accordance with Oregon Water Resources Department requirements (e.g., well casing added to and surface casing raised to accommodate soil cap thickness).

[14] The boulder clusters are intended to provide aquatic habitat diversity while the rock mound is intended to lower hydraulic energy within the shallow water embayment area.

The 6-acre riparian zone was created by regrading of the riverbank, placement of a demarcation layer, placement and grading of a 2-foot-thick layer of imported clean fill (topsoil), placement of a turf reinforcement mat, and hydroseeding with native grasses.

During initial construction of the sediment cap, two City of Portland (City) pressurized sewer lines were found exposed within the sediment capping area. The City was informed of the situation, and a no-work zone was established along a 120-foot swath of the sewer lines. These lines were stabilized by the City in July 2005. Construction of this remaining 1-acre sediment cap was resumed in August 2005, completed in September 2005, and consisted of placement of the following major components[15]: 8,950 tons of sand; 460 tons of 3"-minus filter rock; 1,711 tons of riprap; 2,850 tons of 6"-minus rock; and 1,240 tons of 10"-minus rock. The riprap material was used in place of the ACB to provide stability against wave action along steep portions of the shoreline, between elevations of approximately +8 NAVD and -2 NAVD.

Construction activities in 2005 also included the installation of 24,150 square feet of Organoclay™ RCMs as a corrective measure to address releases of NAPL sheens discovered during weekly inspections following cap construction in 2004. The Organoclay™ RCMs were placed in three areas along the shoreline: under the BNSF Bridge (6,000 square feet); downstream of the previously Organoclay™-capped TFA seep (150 square feet); and upstream of the previously Organoclay™-capped TFA seep (18,000 square feet). The Organoclay™ RCMs were covered with sand and rock armoring.

Groundwater Remedy

The groundwater remedy has four components: ICs, a subsurface barrier wall, NAPL recovery, and evaluation of innovative technologies for NAPL recovery. The RAOs for the groundwater remedy are:

- Prevent human exposure to or ingestion of groundwater with contaminant concentrations in excess of federal and state drinking water standards or protective levels.
- Minimize further vertical migration of NAPL to the deep aquifer.
- Prevent groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations[16] or in excess of water quality criteria for aquatic organisms.
- Minimize NAPL discharges to the Willamette River beach and adjacent sediment.
- Remove mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and the potential for discharge to Willamette River sediment.

Creosote Recovery

Creosote (i.e., NAPL) recovery began in 1989 as a Removal Action. Approximately 450 gallons were recovered between July 1989 and November 1991. By February 1995, more extraction wells had been added to the system, and approximately 1,800 additional gallons of NAPL had been removed. Since the issuance of the ROD in March 1996, NAPL recovery continued through July 2011. Approximately 6,500 gallons have been recovered from the Site since 1989.

Since the M&B ceased operations in 1991, various extraction methods have been attempted to optimize NAPL recovery. The goal of extraction is to remove and deplete NAPL pools to residual levels to

[15] These quantities include construction associated with the corrective measures performed in August and October 2005 as discussed in the following paragraph.

[16] There is an issue associated with this RAO that relates to Alternate Concentration Limits (ACLs) defined in the ROD. This issue is further discussed in Sections VIII and IX of the 2006 Second FYR Report.

minimize or prevent migration into the Willamette River. Key NAPL extraction activities are summarized below:

- 1998: The treatment system in the TFA was modified again. Previously, total fluids extracted from three wells were conveyed to the former pilot treatment system and treated by a dissolved air flotation system. This system required extensive oversight and was expensive to operate (e.g., chemical costs). The system operated 40 hours per week (Monday through Friday) when a technician was on-Site to perform operation and maintenance activities. To allow for continuous operation and to reduce costs and operator requirements, the system was replaced with one resembling that employed in the FWDA; this consisted of an oil/water separator, an in-line anthracite/clay filter, two granulated activated carbon units, and a metals treatment unit.
- 1999 and 2000: The volume of NAPL extracted by the automated systems was found to be similar to the volume removed via manual extraction using skimmers. In addition, it was determined that manual extraction could be conducted for approximately half the cost of operating the automated systems. Therefore, the FWDA and TFA NAPL extraction systems were shut down in September 2000, and NAPL extraction was continued manually.
- 2004 – 2011: Select wells inside and outside the barrier wall were monitored weekly for the presence and thickness of NAPL. NAPL was extracted weekly from these wells if the NAPL thickness within the well was sufficient for recovery (i.e., 0.4 foot for LNAPL and 1.5 feet for dense NAPL [DNAPL]).

Subsurface Barrier Wall

As required by the ESD, a fully encompassing, impermeable subsurface barrier wall was designed and installed to meet the RAO of minimizing NAPL discharges to the Willamette River. More specifically, the barrier wall was designed to cut off much of the upgradient sources of DNAPL and LNAPL in the TFA and FWDA, and to reduce NAPL migration from these areas to the river. The subsurface barrier wall was designed to surround as much of the TFA, former CPA, and FWDA as practical. Before construction began, the wall had to be moved to avoid the City's high-pressure sewer main along the BNSF right-of-way and the location of the Willamette River resulting in an area with subsurface mobile creosote in the FWDA being stranded outside the barrier wall. With respect to the Willamette River, the barrier wall was placed as close to the river as possible while not resulting in an (aboveground) bulkhead or an overly steep bank treatment when grading and capping the riverbank to cover the barrier wall. On average, following grading and capping of the riverbank, the river-front segment of the barrier wall is located at approximately 30 feet landward from OHW. The top elevation of the barrier wall along the river-front segment is approximately 23 feet NAVD (3 feet above OHW and 2 feet below the 10-year flood elevation).

The subsurface barrier wall was constructed from April through September 2003, with the exception of eight sheet piles that met refusal before achieving design depth. The resulting gaps were pressure grouted in July 2004. The construction of the barrier wall is documented in the report titled *Remedial Action Construction Summary Report; Combined Sheet Pile and Soil-Bentonite Barrier Wall* (E&E, 2004).

The barrier wall was constructed to fully encompass 18 acres of NAPL-impacted groundwater and the main contaminant source areas at the Site, including the TFA and FWDA. The total length of the wall is 3,792 linear feet, and the depth varies from approximately -25 to -45 feet NAVD (45 to 80 feet below ground surface [bgs]) to account for differences in the topography and soil profile at the Site. This depth (-45 feet NAVD) is below the depth of the Willamette River adjacent to the Site.

A 1,440-foot-long segment of the barrier wall along the bank of the Willamette River was constructed using steel sheet piles. Installation methods involved a panel-driving technique, which consisted of setting and partially driving six to eight sheet pile pairs (a panel).

A 2,355-foot-long segment of soil-bentonite barrier wall was installed to depths of up to 80 feet bgs to the side and upgradient of the primary contaminant source areas. The excavated trench was held open using a slurry mix of bentonite and water, which was later displaced by the denser soil-bentonite mixture. The mixing operation occurred concurrently with excavation within the wall's perimeter. The soil-bentonite mixture consisted of soil excavated from the trench, slurry from the trench, imported clayey soil, and dry bentonite. The mixing and placement were accomplished by an excavator and bulldozer.

The segment of wall between the Willamette River and the TFA (approximately 900 linear feet) is keyed into a silt aquitard and extends to a depth of approximately 70 to 80 feet bgs. The segment of barrier wall between the Willamette River, Willamette Cove, and the FWDA (approximately 1,100 linear feet) is a "hanging wall" because deeper soil in this area consists of interbedded sand and silt lenses with no continuous, competent aquitard to key into. This segment of the wall extends to a depth of 70 to 80 feet bgs. The segment of the wall located upgradient and cross-gradient of the TFA and FWDA (1,800 linear feet) is keyed into the silt aquitard and has a depth of 45 feet bgs.

Although the barrier wall segment located downgradient of the FWDA does not key into a continuous, competent aquitard, the depth of this segment of the wall serves to increase the distance between the DNAPL source and the river, thereby reducing the potential for continued flow of mobile NAPL.

Engineering and Institutional Controls

The ROD specifies ICs for the soil, groundwater, and sediment remedies:

- Physical restrictions[17] (e.g., fencing), warning signs, and safety measures until completion of the remedies
- Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup
- Prohibition on any use of the shallow and intermediate aquifers and prohibition on drinking water use of the deep water aquifer
- Prohibition on disturbance of the sediments

DEQ currently maintains a perimeter fence around the McCormick & Baxter Property and warning signs, and restricts public access to the upland portion of the Site. Public access to the beach is not restricted. Although not all monitoring wells are located within the fence, all wells have locked, steel monuments. These physical Site restrictions will be maintained into the foreseeable future. DEQ also has obtained a permanent easement for the sediment cap from the Oregon Department of State Lands (ODSL). This easement prohibits the anchoring and grounding of non-recreational vessels and the use of all motor propelled vessels, and specifies that the sediment cap may be closed to all public uses if DEQ determines that the area poses a threat to public health or the environment.

DEQ initially placed temporary buoys along the perimeter of the sediment cap warning boaters of navigational hazards. Permanent buoys were installed in August 2011. DEQ worked with the U.S. Coast Guard (USCG) to establish a Regulated Navigational Area (RNA) in and around the sediment cap

[17] EPA has since clarified that physical restrictions are considered engineering controls.

pursuant to Code of Federal Regulations (CFR) Title 33, Part 165 (USGS 2009). On February 4, 2009, the USCG published the final rulemaking formally establishing the RNA for the McCormick & Baxter Site sediment cap (docket number USCG-2008-0121; Attachment 1 to the Third FYR). This rule became effective on March 6, 2009.

Restrictions through proprietary control are planned to be completed. These restrictions will prohibit development within the 6-acre riparian zone along the riverbank as required by the Endangered Species Act Biological Opinion issued by the National Marine Fisheries Service (NMFS); prohibit use of Site groundwater as specified by the ROD; and limit excavation of Site soils unless authorized by DEQ. Conditions to prohibit future uses of the Site will be completed to achieve the level of long-term remedy protectiveness required by the ROD.

A License or Access Agreement, completed in March 2005 between DEQ and BNSF, requires BNSF to notify DEQ in the event planned construction or maintenance activities in the right-of-way that could potentially cause damage to the portion of the upland soil cap located in the BNSF right-of-way. The License is a contract between DEQ and BNSF that is expected to restrict BNSF's activities in the right-of-way, and serve as one of the layers of ICs for protection of the soil cap remedy. The License does not restrict groundwater use or contain provisions to protect any wells installed for the McCormick & Baxter Site in the BNSF right-of-way. DEQ and EPA plan to complete the required IC for groundwater beneath the BNSF property.

Systems Operations/Operation and Maintenance

The DEQ conducted Site activities in accordance with the Final Operational and Maintenance (O&M) Plan (DEQ/EPA, 2014), prepared by DEQ and approved by EPA. The O&M Manual (last revised Hart Crowser/GSI, 2016b) specifies the sampling and monitoring procedures, quality assurance and quality control, and technical information needed to implement the Final O&M Plan. Site O&M activities completed since the Third FYR (DEQ/EPA, 2011) are summarized in Table II-3.

Soil Remedy

The soil remedy consists of contaminated soil removal and construction of an upland soil cap on approximately 40 acres of the Site and ICs. The soil cap remedy was completed in September 2005. Long-term monitoring is necessary because soils beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the soil cap are specified in the Final O&M Plan and are as follows:

- Maintain contaminant concentrations in surface soil below the following risk-based clean-up goals, as specified in the ROD (EPA/DEQ, 1996):
  - Arsenic – 8 milligrams per kilogram (mg/kg)
  - PCP – 50 mg/kg
  - Total carcinogenic PAHs (cPAHs) – 1 mg/kg
  - Dioxins/furans – 0.00004 mg/kg
- Maintain the topsoil layer to within 50 percent of its design specification:
  - Area over impermeable geomembrane cap – maintain thickness of at least 6 inches
  - All areas, except over impermeable geomembrane cap – maintain thickness of at least 12 inches
- Minimize infiltration of rainwater within the subsurface barrier wall by maintaining a subsurface stormwater conveyance system.

- Minimize stormwater erosion and surface water ponding by maintaining Site grading, surface stormwater conveyance, and native vegetation.
- Maintain native vegetation within the 6-acre riparian zone for compliance with the NMFS Biological Opinion (National Oceanic and Atmospheric Administration [NOAA], 2004).

Monitoring activities for the soil cap (including the riparian zone) include visual inspections of the cap surface, stormwater conveyance system, security fencing, and warning signs. The soil cap is designed to be generally maintenance free, except for maintaining the native vegetation. Routine maintenance includes semi-annual manual removal of invasive plants and targeted application of herbicides. Non-routine maintenance may include repairs of the fence, replacement of warning signs, repairs of the gravel roads, filling of potential animal burrows, removal of sediment from manholes, and replanting of unsuccessful trees and shrubs.

Sediment Remedy

The sediment remedy consists of a 23-acre cap over contaminated sediments within the Willamette River and ICs. The sediment cap remedy was completed in September 2005. Long-term monitoring and maintenance are necessary because sediments beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the sediment cap, specified in the Final O&M Plan, are as follows:

- Maintain contaminant concentrations in surface sediments below the following risk-based cleanup goals, as specified in the ROD (EPA/DEQ, 1996):
  - Arsenic – 12 mg/kg, dry weight
  - PCP – 100 mg/kg, dry weight
  - cPAHs – 2 mg/kg, dry weight
  - Dioxins/furans – $8x10^{-5}$ mg/kg, dry weight
  - Protection of benthic organisms based on sediment bioassay tests, resulting in impaired survival and growth (i.e., weight)
- Prevent visible discharge of creosote to the Willamette River.
- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of the following federal and state ambient water quality criteria (AWQCs) in effect at the time of the ROD, 1996:
  - Arsenic (III) – 190 micrograms per liter (µg/L)
  - Chromium (III) – 210 µg/L
  - Copper – 12 µg/L
  - Zinc – 110 µg/L
  - PCP – 13 µg/L
  - Acenaphthene – 520 µg/L
  - Fluoranthene – 54 µg/L
  - Naphthalene – 620 µg/L
  - Total cPAHs – 0.031 µg/L
  - Dioxins/furans – $1x10^{-5}$ nanogram per liter (ng/L)
- Maintain the armoring layer to within 50 percent of the design specification:
  - 6-inch rock armoring – maintain thickness of at least 6 inches
  - 12-inch rock armoring – maintain thickness of at least 7.5 inches
  - 24-inch rock armoring – maintain thickness of at least 12 inches
- Maintain uniformity and continuity of ACB armoring.
- Maintain at least 20 percent excess sorption capacity of the organophilic clay cap.

The AWQCs listed above are the surface water criteria in effect at the time of the ROD; however, since completion of the ROD, additional recommended EPA water quality criteria have been published. During meetings in August 2007 between stakeholders (DEQ, EPA, NOAA, Warm Springs Tribe, and Yakama Nation), it was agreed that for comparison purposes, five additional criteria would be included in analytical results summary tables in the Annual O&M Reports:

- Two AWQCs in effect at the time the ROD was issued:
  - 1996 criteria for chronic effects to aquatic life
  - 1996 criteria for human health, based on fish consumption
- Two 2007 (or most recent during each FYR) National Recommended Water Quality Criteria (NRWQCs):
  - 2007 and 2011 criteria for chronic effects to aquatic life
  - 2007 and 2011 criteria for human health (consumption of organisms)
- Current maximum contaminant levels (MCLs).

The comparison criteria are listed in Table II-4.

Monitoring activities for the sediment cap in the past five years included quarterly visual inspections of near-shore areas and in 2015 collection and analysis of 12 surface water, 12 inter-armoring and 4 sub-armoring water samples within the footprint of the sediment cap and upgradient and downgradient surface water samples. This was the 11th sampling event since the sediment cap was installed in 2004/2005. In addition, sampling of sediment cap bulk organophilic clay was conducted in 2015 to determine whether the organoclay continues to function as designed to eliminate potential creosote NAPL seeps into the River. Bulk sediment samples are not collected because the sediment cap physically isolates riverbed contaminants and also prevents migration of potentially mobile contaminants within the riverbed sediment and NAPL seep areas to the Willamette River. Although the sediment cap is designed to be generally maintenance free, unplanned or non-routine maintenance included the replacement of one of the permanent warning buoys that was missing during several quarterly inspections.

Groundwater Remedy

The groundwater remedy consists of groundwater monitoring, NAPL recovery[18], a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap, and ICs. The barrier wall was completed in July 2004. Long-term monitoring is necessary because groundwater both inside and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL. The performance standards for the subsurface barrier wall and NAPL recovery, as stated in the Final O&M Plan, are as follows:

- Continue to recover NAPL from outside the subsurface barrier wall until recovery rates become minimal, alternative pumping strategies have been examined and/or field tested with poor results, and remaining NAPL does not pose a threat to the Willamette River and its sediments.
- Maintain contaminant concentrations in shallow, downgradient compliance wells (or sediment pore water) below ACLs set forth in the ROD:
  - Arsenic (III) – 1,000 µg/L
  - Chromium (III) – 1,000 µg/L
  - Copper – 1,000 µg/L

[18] NAPL recovery was discontinued April 20, 2011 after an investigation that demonstrated that the NAPL outside the barrier wall was primarily in residual NAPL and not expected to migrate to the River (DEQ/EPA, 2011).

    - Zinc – 1,000 µg/L
    - PCP – 5,000 µg/L
    - Total PAHs – 43,000 µg/L
    - Dioxins/furans – 0.2 ng/L
- Minimize the transport of NAPL and communication of groundwater zones across the subsurface barrier wall.
- Minimize further vertical migration of creosote to the deep groundwater aquifer.
- Minimize visible discharge of creosote to the Willamette River.
- Maintain contaminant concentrations in the Willamette River below background concentrations or less than the sediment cap performance standards for surface water.

The ROD specified Site-specific ACLs for the Site. In the Second FYR, EPA determined that ACLs were not valid as substitutes for Maximum Contaminant Levels (MCLs) in groundwater. Invalidation of ACLs also affects whether the groundwater RAOs derived from the provisions in CERCLA for using ACLs remain valid for the Site. As a result of this determination, DEQ and EPA anticipate that amended groundwater cleanup goals for the Site will be established in a ROD Amendment to be consistent with CERCLA and the National Contingency Plan (NCP).

Site activities in the past five years for the groundwater remedy have included NAPL presence and thickness monitoring, groundwater elevation monitoring, and groundwater sampling of MW-59s. Routine maintenance of equipment and providing for Site utility service are also included as elements of groundwater O&M.

APPENDIX C – Photograph Documentation

Photograph 1 – Typical habitat gravel within ACB armoring along the Willamette River.

Photograph 2 – Typical habitat gravel within ACB armoring in Willamette Cover.

Photograph 3 – Buoy number 4 replacement.

Photograph 4 – Mulch placed beneath TRM during December 2015 shoreline repairs.

Photograph 5 – Willamette Cove sediment cap ACB blocks (bright orange) replaced following September 2015 organoclay sampling.

Photograph 6 – Typical setup for surface water sampling equipment during 2015 sediment cap performance monitoring.

Photograph 7 – Recovered sub-armoring, inter-armoring, and surface water sampler from early warning sample location number 12 during September 2015 sediment cap performance monitoring.

Photograph 8 - Overview of the Site during Northwest Natural gas line decommissioning in 2014. Photograph taken facing south.

Photograph 9 - MW-58 well cluster repairs completed in 2013 without making modifications to the existing well casing heights.

Photograph 10 – ACB gravel replacement in 2012.

Photograph 11 – 2015 irrigation system decommissioning.

Photograph 12 – Riparian area vegetation – December 2015.

Photograph 13 – Driftwood deposited on shoreline observed July 2016.

Photograph 14 – Iron staining on shoreline observed along the Willamette River during July 2016 site inspection. Photograph taken looking north-down river.

Photograph 15 – April 2Photograph 15 - Aerial photograph showing current vegetation coverage.

APPENDIX D – Soil and Sediment Cap Inspection Forms 2011 through July 2016

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/9/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	58°F
Low temp (weekly)	46°F
Wind (daily)	14 MPH (SSW)
Precipitation (weekly)	0.68 inches
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Significant flow, Approximately 30 GPM
Flow in collection piping	Significant flow, Approximately 30 GPM
Outfall and Spillway	
Note approx. flow volume	Significant flow, Approximately 30 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/8/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	78°F
Low temp (weekly)	59°F
Wind (daily)	Light wind 5 to 7 MPH.
Precipitation (weekly)	0.01 inches
Erosion	Good
Around Manholes	Minor erosion observed: Ground squirrel burrows
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Good
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Minimal flow
Flow in collection piping	Minimal flow
Outfall and Spillway	
Note approx. flow volume	Minimal flow, approximately 5 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Osprey, ground squirrels
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	**No**

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

8/5/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	84°F
Low temp (weekly)	61°F
Wind (daily)	Light, 5 MPH
Precipitation (weekly)	None
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	No Flow
Flow in collection piping	No Flow
Outfall and Spillway	
Note approx. flow volume	No Flow
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

12/13/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	50°F
Low temp (weekly)	35°F
Wind (daily)	Slight wind 5 to 7 mph
Precipitation (weekly)	0.04 inches
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Moderate flow, Approximately 8 GPM
Flow in collection piping	Moderate flow, Approximately 8 GPM
Outfall and Spillway	
Note approx. flow volume	Moderate flow, Approximately 8 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	Upland fence damaged and sign damaged.
Follow Up Inspection	☐ Yes ☐ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/9/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations	
Category	**Observation**
gate conditions (weekly)	All locked and secure.
high temp (weekly)	58°F
low temp (weekly)	46°F
wind (weekly)	14 MPH (SSW)
precipitation (weekly)	0.68 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Two of five buoys remaining, one tangled with wood debris
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/8/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations	
Category	**Observation**
gate conditions (weekly)	All locked and secure.
high temp (weekly)	78°F
low temp (weekly)	59°F
wind (weekly)	Light wind 5 to 7 MPH
precipitation (weekly)	0.01 inches
Sheen Observations (see table below)	None Observed
Size and Location	N/A
Source (gas bubble, debris, etc.)	N/A
ACB and Riprap Armoring	High Water, not exposed
Changes in Location	N/A
Displaced blocks	N/A
Vandalism	None Observed
River relative to top of ACB	Above ACB
Organoclay Mats (extreme low water)	N/A
Edges of mats visible?	N/A
Overlying Armoring conditions	N/A
Evidence of movement?	N/A
WC OC/Seep Area	N/A
TFA OC/Seep Area	N/A
Wildlife	
Fish / Crayfish / clams	None Observed
Other	Geese
Warning Signs Condition	Good
Buoy Condition / Location	No buoys remain in place
cove shoreline (general)	High River/Good
FWDA shoreline (general)	High River/Good
bulkhead shoreline (general)	High River/Good
TFA shoreline (general)	High River/Good
observations or notes	Extremely high river levels, entire ACB underwater
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

8/5/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations	
Category	**Observation**
gate conditions (weekly)	All locked and secure.
high temp (weekly)	84°F
low temp (weekly)	61°F
wind (weekly)	Light, 5 MPH
precipitation (weekly)	None
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	No buoys remain in place
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)
slight sheen observed in sand along southern shoreline of site	iron-related sheen	small areas in sand	no odor

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

12/13/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations	
Category	**Observation**
gate conditions (weekly)	All locked and secure.
high temp (weekly)	50°F
low temp (weekly)	35°F
wind (weekly)	Light wind 5 to 7 MPH
precipitation (weekly)	0.04 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys in place and in good condition
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/22/2012

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations	
Category	**Observation**
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	64°F
Low temp (weekly)	44°F
Wind (daily)	Light wind 7 to 10 MPH
Precipitation (weekly)	1.56 inches
Erosion	None Observed
Around Manholes	None Observed
Headway retention pond	None Observed
Eastern edge of property	None Observed
Spillway area	None Observed
Outfall area	Fair
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	No debris, significant flow, greater than 30 GPM
Flow in collection piping	Significant flow, greater than 30 GPM
Outfall and Spillway	
Note approx. flow volume	Significant flow, greater than 30 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	☐ **Yes** ☐ **No** **Date:**

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/19/2012

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations	
Category	**Observation**
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	71°F
Low temp (weekly)	55°F
Wind (daily)	Light wind 5 to 7 MPH
Precipitation (weekly)	1.01 inches
Erosion	None Observed
Around Manholes	None Observed
Headway retention pond	None Observed
Eastern edge of property	None Observed
Spillway area	None Observed
Outfall area	Fair
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	No debris, moderate flow, approximately 5 GPM
Flow in collection piping	Moderate flow, approximately 5 GPM
Outfall and Spillway	
Note approx. flow volume	Moderate flow, approximately 5 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection and Low Tide Monitoring
Obsevations or notes	
Follow Up Inspection	☐ **Yes** ☐ **No** **Date:**

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

10/22/2012

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations	
Category	**Observation**
Gate Conditions (weekly)	All locked but the main gate to the site could be opened without unlocking. The post could be pulled out of the ground and the gate swung open. This was repaired the same day.
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	55°F
Low temp (weekly)	44°F
Wind (daily)	Light wind 7 to 10 mph
Precipitation (weekly)	1.13 inches
Erosion	None Observed
Around Manholes	None Observed
Headway retention pond	None Observed
Eastern edge of property	None Observed
Spillway area	None Observed
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	No debris, low flow, less than 1 GPM
Flow in collection piping	Low flow, less than 1 GPM
Outfall and Spillway	
Note approx. flow volume	Low flow, less than 1 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, Geese
Daily activities	Site Inspection and Low Tide Monitoring
Obsevations or notes	
Follow Up Inspection	☐ **Yes** ☐ **No** **Date:**

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/22/2012

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	64°F
low temp (weekly)	44°F
wind (weekly)	Light wind 7 to 10 MPH
precipitation (weekly)	1.56 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	12 to 30 plus feet (10 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of five buoys visible, one tangled with wood debris
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/19/2012

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations	
Category	**Observation**
gate conditions (weekly)	All locked and secure.
high temp (weekly)	71°F
low temp (weekly)	55°F
wind (weekly)	Light wind 5 to 7 MPH
precipitation (weekly)	1.01 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	12 to 30 plus feet (10 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys visible, two tangled with wood debris
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

10/22/2012

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	55°F
low temp (weekly)	44°F
wind (weekly)	Light wind 7 to 10 MPH
precipitation (weekly)	1.13 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus feet. (7 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys in place and in good condition
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/14/2013

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	63°F
Avg. Low temp (week of observation)	48°F
Wind Speed (day of observation)	Light wind 8 to 18 mph
Total Precipitation (week of observation)	0.05 inches
Erosion	None Observed
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, significant flow, greater than 30 gpm
Flow in Collection Piping	Moderate flow, approximately 10 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Significant flow, greater than 30 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐ **Yes** ☒ **No** **Date:**

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/28/2013

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	78°F
Avg. Low temp (week of observation)	60°F
Wind Speed (day of observation)	Light wind 3 to 9 mph
Total Precipitation (week of observation)	0.48 inches
Erosion	None Observed
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, moderate flow, approximately 5 gpm
Flow in Collection Piping	Moderate flow, approximately 5 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Moderate flow, approximately 5 to 10 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily Activities	Site Inspection and Low Tide Monitoring
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

10/16/2013

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and in good condition.
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	67°F
Avg. Low temp (week of observation)	42°F
Wind Speed (day of observation)	Light wind 3 to 7 mph
Total Precipitation (week of observation)	0.00 inches
Erosion	None Observed
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair, needs more rock placement
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, moderate flow, approximately 5 gpm
Flow in Collection Piping	Moderate flow, approximately 5 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Moderate flow, approximately 5 to 10 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, Geese, Crawdad
Daily Activities	Site Inspection and Low Tide Monitoring
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/14/2013

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure.
Avg. High Temp (week of observation)	63°F
Avg. Low Temp (week of observation)	48°F
Wind Speed (day of observation)	Light wind 8 to 18 mph
Total Precipitation (week of observation)	0.05 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet (8 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys visible
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/28/2013

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	78°F
Avg. Low Temp (week of observation)	60°F
Wind Speed (day of observation)	Light wind 3 to 9 mph
Total Precipitation (week of observation)	0.48 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	12 to 30 plus feet (13 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys visible
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

10/16/2013

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	67°F
Avg. Low Temp (week of observation)	42°F
Wind Speed (day of observation)	Light wind 3 to 7 mph
Total Precipitation (week of observation)	0.00 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus feet. (7 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Crayfish and Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys in place and in good condition
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

01/29/2014

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked an04/16/2014d secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	47°F
Avg. Low temp (week of observation)	36°F
Wind Speed (day of observation)	Light wind 15 mph
Total Precipitation (week of observation)	0.70 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, moderate flow, approximately 10 gpm
Flow in Collection Piping	Moderate flow, approximately 10 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Moderate flow, approximately 20 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, geese
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

04/16/2014

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	63°F
Avg. Low temp (week of observation)	44°F
Wind Speed (day of observation)	Light wind 7 mph
Total Precipitation (week of observation)	0.46 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, moderate flow, approximately 5 gpm
Flow in Collection Piping	Moderate flow, approximately 5 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Moderate flow, approximately 5 to 10 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Osprey, geese, kingfisher, hawks
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

07/28/2014

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and in good condition.
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	90°F
Avg. Low temp (week of observation)	62°F
Wind Speed (day of observation)	Light wind 6 mph
Total Precipitation (week of observation)	0.00 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, low flow, approximately 5 gpm
Flow in Collection Piping	Low flow, approximately 5 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Low flow, less than 5 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, geese, ground squirrels
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

10/14/2014

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and in good condition.
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	66°F
Avg. Low temp (week of observation)	53°F
Wind Speed (day of observation)	Light wind 8 mph
Total Precipitation (week of observation)	0.85 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, no flow
Flow in Collection Piping	No flow
Outfall and Spillway	
Note Approx. Flow Volume	No flow
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, geese,
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

1/29/2014

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure.
Avg. High Temp (week of observation)	47°F
Avg. Low Temp (week of observation)	36°F
Wind Speed (day of observation)	Light wind 15 mph
Total Precipitation (week of observation)	0.70 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet (~5 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of the five buoys visible and in good condition, Buoy #4 missing
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

04/16/2014

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	63°F
Avg. Low Temp (week of observation)	44°F
Wind Speed (day of observation)	Light wind 7 mph
Total Precipitation (week of observation)	0.46 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet (~7 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of the five buoys visible and in good condition, Buoy #4 is missing
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

07/28/2014

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	90°F
Avg. Low Temp (week of observation)	62°F
Wind Speed (day of observation)	Light wind 6 mph
Total Precipitation (week of observation)	0.00 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	Ebulation observed in areas above granular oganophilic clay.
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet (~4-5 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Crayfish
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of the five buoys in place and in good condition, Buoy #4 is missing
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

10/14/2014

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	66°F
Avg. Low Temp (week of observation)	53°F
Wind Speed (day of observation)	Light wind 8 mph
Total Precipitation (week of observation)	0.85 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	Ebulation observed in areas above granular oganophilic clay.
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet. (3 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	Crayfish and Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of the five buoys in place and in good condition, Buoy #4 is missing
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

01/26/2015

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	48°F
Avg. Low temp (week of observation)	36°F
Wind Speed (day of observation)	Light wind ~ 5 mph
Total Precipitation (week of observation)	0.09 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Animal burrows near extra ACB and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, moderate flow, approximately 10 gpm
Flow in Collection Piping	Moderate flow, approximately 10 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Moderate flow, approximately 10 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, geese
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	Yes No Date:

04/30/2015

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	64°F
Avg. Low temp (week of observation)	45°F
Wind Speed (day of observation)	Light wind 7 mph
Total Precipitation (week of observation)	0.02 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Animal burrows near extra ACB and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, low flow, approximately <3 gpm
Flow in Collection Piping	low flow, approximately <3 gpm
Outfall and Spillway	
Note Approx. Flow Volume	Low flow, approximately 3 gpm
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Osprey, geese, kingfisher, hawks
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	Yes No Date:

07/17/2015

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and in good condition.
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	81°F
Avg. Low temp (week of observation)	58°F
Wind Speed (day of observation)	Light wind < 5 mph
Total Precipitation (week of observation)	0.00 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Animal burrows near extra ACB and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris and no flow.
Flow in Collection Piping	No flow.
Outfall and Spillway	
Note Approx. Flow Volume	No flow.
Sprinkler System	In place but not in use
Vegetation Conditions	Stressed due to drought.
Wildlife	Birds, geese, ground squirrels
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	Yes No Date:

A vegetation drought tolerance assessment was completed on July 21, 2015 do evaluate health of stressed vegetation observed primarily in the riparian area. On July 27, 2015, approximately 5,500 gallons of water was applied to stressed vegetation in the riparian area. A second watering event was completed on August 18, 2015, when 4,000 gallons of water was applied to the riparian area.

11/4/2015

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations	
Category	**Observation**
Gate Conditions (quarterly)	All locked and in good condition.
Perimeter Fence (quarterly)	Good
Trespassers, Entry Point	None Observed
Avg. High Temp (week of observation)	56°F
Avg. Low temp (week of observation)	42°F
Wind Speed (day of observation)	Light wind ~5mph
Total Precipitation (week of observation)	0.78 inches
Erosion	
Around Manholes	None Observed
Headway Retention Pond	None Observed
Eastern Edge of Property	None Observed
Spillway Area	None Observed
Outfall Area	Fair
Animal Burrows / Disturbance	Animal burrows near extra ACB and randomly throughout site
Manhole Conditions	Good
Debris, Flow, General Condition	No debris, low flow (~2gpm).
Flow in Collection Piping	Low flow, ~ 2 gpm.
Outfall and Spillway	
Note Approx. Flow Volume	Low flow, ~ 2 gpm.
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, geese,
Daily Activities	Site Inspection
Obsevations or Notes	
Follow Up Inspection	☐**Yes** ☒**No** **Date:**

1/26/2015

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure.
Avg. High Temp (week of observation)	48°F
Avg. Low Temp (week of observation)	36°F
Wind Speed (day of observation)	Light wind ~5 mph
Total Precipitation (week of observation)	0.09 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 30 plus feet (~12 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	None Observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Four of the five buoys visible and in good condition, Buoy #4 missing
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

04/30/2014

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	64°F
Avg. Low Temp (week of observation)	45°F
Wind Speed (day of observation)	Light wind 7 mph
Total Precipitation (week of observation)	0.02 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 30 plus feet (~8 feet NAVD88)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	None Observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Five buoys visible and in good condition.
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

07/17/2015

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	81°F
Avg. Low Temp (week of observation)	58°F
Wind Speed (day of observation)	Light wind <5 mph
Total Precipitation (week of observation)	0.00 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	Ebulation observed in areas above granular oganophilic clay.
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 30 plus feet (~8 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	None Observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Five buoys visible and in good condition.
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

11/4/2015

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (quarterly)	All locked and secure
Avg. High Temp (week of observation)	56°F
Avg. Low Temp (week of observation)	42°F
Wind Speed (day of observation)	Light wind <5 mph
Total Precipitation (week of observation)	0.78 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	Infrquent ebulation observed in areas above granular oganophilic clay.
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	20 to 40 plus feet. (3 feet NAVD)
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / Clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Five buoys visible and in good condition.
Cove Shoreline (general)	Good
FWDA Shoreline (general)	Good
Bulkhead Shoreline (general)	Good
TFA Shoreline (general)	Good
Observations or Notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Sheen Description

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 1/22/2016 Time: 09:00

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None observed
High temp (weekly)	48
Low temp (weekly)	36
Wind (daily)	Light <5mph
Precipitation (weekly)	2.67 inches (1/17/16-1/23/16)
Erosion	
Around Manholes	None observed
Headway retention pond	None observed
Eastern edge of property	None observed
Spillway area	None observed
Outfall area	None observed
Animal burrows / disturbance	Fair - some burrows observed, but none determined to compromise the cap
Manhole conditions	
Debris, flow, general condition	No debris, moderate to high flow at 20-25 gpm
Flow in collection piping	Moderate to high flow at 20-25 gpm
Outfall and Spillway	
Note approx. flow volume	Moderate to high flow at 20-25 gpm
Vegetation Conditions	Fair
Wildlife	Canada Geese and seagulls
Daily activities	Site inspection
Observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 4/20/2016 Time: 08:30

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	64 deg F
wind (weekly)	45 deg F
precipitation (weekly)	0.55 inches (4/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 7/21/2016 Time: 09:00

Site Observations Form - Soil Cap
Quarterly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None observed
High temp (weekly)	81 deg F
Low temp (weekly)	58 deg F
Wind (daily)	Light <5mph
Precipitation (weekly)	0.02 inches (7/17/16-4/23/16)
Erosion	
Around Manholes	None observed
Headway retention pond	None observed
Eastern edge of property	None observed
Spillway area	None observed
Outfall area	None observed
Animal burrows / disturbance	Fair - some burrows observed, but none determined to compromise the cap
Manhole conditions	
Debris, flow, general condition	No debris, low <1 gpm
Flow in collection piping	Low <1 gpm
Outfall and Spillway	
Note approx. flow volume	Low <1 gpm
Vegetation Conditions	Fair
Wildlife	Canada Geese
Daily activities	Site inspection
Observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 1/22/2016 Time: 09:00

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	48
wind (weekly)	36
precipitation (weekly)	2.67 inches (1/17/16-1/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 4/20/2016 Time: 08:30

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	Good
low temp (weekly)	64 deg F
wind (weekly)	45 deg F
precipitation (weekly)	0.55 inches (4/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

Date: 7/21/2016 Time: 09:00

Site Observations Form - Sediment Cap
Quarterly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure
high temp (weekly)	81 deg F
low temp (weekly)	58 deg F
wind (weekly)	<5mph
precipitation (weekly)	0.02 inches (7/17/16-4/23/16)
Sheen Observations (low tide)	None observed
Size and Location	None observed
Source (gas bubble, debris, etc.)	None observed
ACB and Riprap Armoring	Good
Changes in Location	None observed
Displaced blocks	None observed
Vandalism	None observed
River relative to top of ACB	
Organoclay Mats (extreme low water)	None observed
Edges of mats visible?	None observed
Overlying Armoring conditions	Good
Evidence of movement?	None observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	None observed
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Good
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☒ No Date:

Table I-1 - Chronology of Major Site Events
2016 Five Year Review
McCormick and Baxter Superfund Site

Event	Date
EPA performs a Site inspection which raises concerns about possible releases of hazardous substances.	1983
McCormick & Baxter Creosoting Company performs a preliminary Site investigation and notifies DEQ of possible off-site releases near the former waste disposal area.	1983
McCormick & Baxter Creosoting Company completes Site investigation concluding that soil and groundwater contamination exists at the Site.	1985
DEQ and McCormick & Baxter Creosoting Company sign a Stipulation and Final Order requiring the firm to perform specified remedial activities.	November-87
McCormick & Baxter Creosoting Company files for bankruptcy protection.	December-88
McCormick & Baxter Creosoting Company ceases operations.	October-91
DEQ conducts a Remedial Investigation and Feasibility Study under State cleanup regulations.	1990 to 1992
DEQ conducts Removal Actions, including NAPL extraction, under State of Oregon cleanup regulations.	1992 to 1996
The McCormick & Baxter Creosoting Company Site is added to the NPL.	June-94
DEQ revises Feasibility Study to comply with CERCLA.	September-95
EPA issues ROD.	March-96
NAPL extraction resumed as a Remedial Action.	March-96
DEQ and EPA entered into a Superfund State Contract.	May-96
EPA issues Amended ROD specifying off-site disposal of highly contaminated soils.	March-98
Excavation and off-site disposal of highly contaminated soils completed.	Feb to May 1999
DEQ and EPA complete first Five-Year Review.	September-01
EPA issues an ESD for groundwater contingency remedy.	August-02
The subsurface barrier wall is constructed.	Apr to Sept 2003
The sediment cap is constructed.	July 2004 to Sept 2005
The soil cap is constructed.	May to Sept 2005
Pre-final inspection of remedial actions is conducted by DEQ and EPA -Construction Completion is Achieved.	September-05
Preliminary Close Out Report is signed by EPA.	September-05
Operational and Functional (O&F) period begins.	October-05
DEQ and EPA complete second Five-Year Review.	September-06
Draft O&M Plan is approved by EPA (as a Draft Document).	March-07
DEQ and EPA complete third Five-Year Review.	September-11
O&M Plan is approved by EPA	October-13
Annual O&M Reports.	Annually 2006 - 2015

Table II-3 - Site Activities Completed Since Third FYR
2016 Five Year Review
McCormick and Baxter Superfund Site

Activities and Investigations	Dates and Descriptions
2011 (October - December)	
Soil and sediment cap inspections	Quarterly.
Routine and non-routine maintenance and vegetation management	As needed.
Groundwater elevation monitoring	Semi-annually for site-wide wells; select wells gauged continuously.
2012	
Soil and sediment cap inspections	Quarterly.
Routine and non-routine maintenance and vegetation management	As needed.
Groundwater elevation monitoring	Semi-annually for site-wide wells; select wells gauged continuously.
Shoreline repairs including soil and gravel replacement, and Turf Reinforcement Mat (TRM) repairs.	October 2012.
2013	
Soil and sediment cap inspections	Quarterly.
Routine and non-routine maintenance and vegetation management	As needed.
Groundwater elevation monitoring	Semi-annually for site-wide wells; select wells gauged continuously.
2014	
Soil and sediment cap inspections	Quarterly.
Routine and non-routine maintenance and vegetation management	As needed.
Groundwater elevation monitoring	Semi-annually for site-wide wells; select wells gauged continuously.
2015	
Soil and sediment cap inspections	Quarterly.
Routine and non-routine maintenance and vegetation management	As needed; repaired TRM in riparian area.
Groundwater elevation monitoring	Semi-annually for site-wide wells; select wells gauged continuously.
Buoy replacement	Buoy # 4 was missing during consecutive quarterly site inspections in 2014 and replaced in February 2015.
Sediment cap performance monitoring	September - October 2015.
Riparian area watering	As needed during summer months following drought conditions.
Remove irrigation system	Completed December 2015.
Shoreline repairs including soil replacement, TRM repairs, and vegetation planting.	Completed December 2015.

Table II-4 - Comparison Criteria
2016 Five Year Review
McCormick and Baxter Superfund Site

Chemical		Units	1996 AWQCs[1]		DEQ 2011 EPA-Approved AWQCs updated 2015[3]		2015 NRWQCs[2]		2011 MCLs updated 2015[4]
			Aquatic Life (chronic)	Human Health (fish consumption only)	Aquatic Life[5] (chronic)	Human Health (consumption of organism only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	Maximum Contaminant Levels (MCLs)
Total Arsenic		mg/L	0.19		0.15	2.1	0.15	0.00014	0.01
Total Chromium		mg/L	0.21		0.074		0.074		0.1
Total Copper		mg/L	0.012		0.0065		0.0049		
Total Zinc		mg/L	0.11		0.12	2600	0.12	26	
Pentachlorophenol		µg/L	13		15	0.3	15	0.04	1
Acenaphthene	L	µg/L	520			99		90	
Acenaphthylene	L	µg/L							
Anthracene	L	µg/L				4000		400	
Benz[a]anthracene	H, C	µg/L				0.0018		0.0013	
Benzo[a]pyrene	H, C	µg/L				0.0018		0.00013	0.2
Benzo[b]fluoranthene	H, C	µg/L				0.0018		0.0013	
Benzo[g,h,i]perylene	H, C	µg/L							
Benzo[k]fluoranthene	H	µg/L				0.0018		0.0013	
Chrysene	H, C	µg/L				0.0018		0.13	
Dibenzo[a,h]anthracene	H, C	µg/L				0.0018		0.00013	
Fluoranthene	H	µg/L		54		14		20	
Fluorene	L	µg/L				530		70	
Ideno[1,2,3-cd]pyrene	H, C	µg/L				0.0018		0.0013	
Naphthalene	L	µg/L	620						
Phenanthrene	L	µg/L							
Pyrene	H	µg/L				400		30	
Total LPAHs		µg/L							
Total HPAHs		µg/L							
Total cPAHs		µg/L		0.031					
Total PAHs		µg/L							

Notes:

[1] The 1996 Record of Decision (ROD) specifies the remedial action objects of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of Ambient Water Quality Criteria (AWQCs).

[2] National Recommended Water Quality Criteria (NRWQCs) published as of August 15, 2007, are included for comparison (see http://www.epa.gov/waterscience/criteria/wqcriteria.html).

[3] Oregon's revised AWQCs for human health approved by EPA on October 17, 2011

[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://www.epa.gov/safewater/contaminants/index.html).

[5] Aquatic Water Quality Criteria (AWQCs) published as of 2011, and updated effective August 4, 2015, are included for comparison (see http://www.deq.state.or.us/wq/standards/docs/tables303140.pdf)

Key:

ACLs = Alternate Concentration Limits
AWQCs = Ambient Water Quality Criteria
NRWQCs = National Recommended Water Quality Criteria
PAH = Polynuclear Aromatic Hydrocarbon
L = Low Molecular Weight PAH (LPAH)
H = High Molecular Weight PAH (HPAH)
C = Carcinogenic PAH (cPAH)
MCLs = Maximum Contaminant Levels
mg/L = milligrams per liter
µg/L = micrograms per liter

Table IV-1 - Infiltration Pond MW-59s Sampling Results
2016 Fiver Year Review
McCormick and Baxter Superfund Site

SAMPLE LOCATION			MW-59s (2nd Quarter 2006)		MW-59s (4th Quarter 2006)		MW-59s (1st Quarter 2007)		MW-59s (3rd Quarter 2007)		MW-59s (3rd Quarter 2008)		MW-59s (3rd Quarter 2009)		MW-59s (4th Quarter 2010)		MW-59s (2015)		
Sample Date		EPA Primary Drinking Water Standard Maximum Contaminant Levels (for reference only)	4/26/2006		11/3/2006		2/28/2007		10/3/2007		8/21/2008		8/31/2009		10/7/2010		10/2/2015		10/21/2015
Sample Time			18:01		14:47		12:00		9:58		9:50		17:19		14:52		8:55		16:00
Well Depth			shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow
CONTAMINANT OF CONCERN		MCL																	
Total Metals (mg/L)																			
Arsenic		0.01	**0.0080**		**0.0197**		**0.0122**		**0.0225**		**0.0301**		**0.0301**		**0.0302**		NA		**0.0453**	
Chromium		0.10	**0.0011**		**0.0015**		**0.00319**		**0.00474**		**0.0466**		**0.00073**		**0.00048**	**J**	NA		**0.000543**	**J**
Copper		1.30	**0.0005**	**J**	**0.0011**	**J**	**0.000520**	**J**	**0.00107**	**J**	**0.0584**		**0.0011**		**0.00066**		NA		**0.000646**	**J**
Iron		NA	NA		NA		NA		NA		NA		**52.6**		NA		NA		**50.5**	
Zinc		5.00	**0.0056**		**0.0075**		**0.00707**		**0.00845**		**0.140**		**0.0102**		**0.0081**		NA		**0.00567**	**J**
PAHs (µg/L)																			
Acenaphthene	L		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0476	U	0.019	U	0.0032	U	**0.0139**	**J**	**NA**	
Acenaphthylene	L		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0476	U	0.019	U	0.0030	U	0.012	U	**NA**	
Anthracene	L		0.0472	U	0.0500	U	0.0495	U	**0.0121**	**J**	**0.0397**		**0.064**		**0.039**	**J**	**0.0485**	**J**	**NA**	
Benz (a) anthracene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.033**		0.0023	U	**0.00902**	**J**	**NA**	
Benzo (a) pyrene	H, C	0.2	0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	0.078	U	0.0030	U	0.0116	U	**NA**	
Benzo (b) fluoranthene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	0.11	U	0.020	U	0.00212	U	**NA**	
Benzo (k) fluoranthene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.021**		0.0039	U	0.0136	U	**NA**	
Benzo (ghi) perylene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.035**		0.0055	U	0.00227	U	**NA**	
Chrysene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.033**		0.0032	U	0.0108	U	**NA**	
Dibenzo (a,h) anthracene	H, C		0.0943	U	0.1000	U	0.0990	U	0.0238	U	0.0238	U	0.019	U	0.0076	U	0.00396	U	**NA**	
Fluoranthene	H		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.041**		**0.031**	**J**	**0.0306**	**J**	**NA**	
Fluorene	L		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0476	U	**0.026**		0.0034	U	**0.0211**	**J**	**NA**	
Indeno (1,2,3-cd) pyrene	H, C		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	0.064	U	0.0062	U	0.0148	U	**NA**	
Naphthalene	L		0.0472	U	0.0500	U	0.0495	U	**0.257**		0.0119	U	**0.042**	**J**	0.0057	U	**0.0865**	**J**	**NA**	
Pentachlorophenol	L	1	NA		1.0000	U	0.9900	U	0.238	U	0.238	U	NA		NA		NA		**NA**	
Phenanthrene	L		0.0472	U	0.0500	U	0.0495	U	**0.0259**		**0.0357**		**0.085**		**0.048**		**0.0522**		**NA**	
Pyrene	H		0.0472	U	0.0500	U	0.0495	U	0.0119	U	0.0119	U	**0.032**		**0.020**	**J**	**0.0219**	**J**	**NA**	
Total LPAHs			0.1416	U	0.6500	U	0.6435	U	**0.2950**	**J**	**0.0754**		**0.217**	**J**	**0.087**	**J**	**0.222**	**J**	**NA**	
Total HPAHs			0.2596	U	0.2750	U	0.2723	U	0.0655	U	0.0655	U	**0.195**		**0.051**	**J**	**0.062**	**J**	**NA**	
Total Carcinogenic PAHs			0.2124	U	0.2250	U	0.2228	U	0.0536	U	0.0536	U	**0.122**		0.0259	U	**0.0090**	**J**	**NA**	
Total PAHs			0.4012	U	0.9250	U	0.9158	U	**0.2950**	**J**	**0.0754**		**0.412**	**J**	**0.138**	**J**	**0.284**	**J**	**NA**	
FIELD PARAMETERS																			
Groundwater Elevation (feet NAVD88)			**17.10**		**12.01**		**16.52**		**23.73**		**14.63**		**13.06**		**22.90**		**12.30**		**12.21**	
Temperature (°C)			**14.60**		**14.02**		**10.51**		**14.43**		**15.21**		**17.4**		**14.71**		**14.20**		**14.64**	
Oxidation-Reduction Potential (mV)			**-20.00**		**13.60**		**44.7**		**-19.50**		**-15.69**		**-33**		**11.6**		**-27.9**		**-26.6**	
pH			**5.94**		**5.77**		**5.89**		**5.90**		**6.09**		**6.23**		**6.00**		**6.08**		**5.94**	
Specific Conductance (mS/cm)			**0.54**		**0.36**		**0.264**		**0.52**		**0.559**		**0.480**		**0.441**		**0.597**		**0.601**	
Turbidity (NTU)			**40.80**		**11.60**		**3.42**		**9.15**		**78.70**		NA		NA		NA		NA	
Total Suspended Solids (mg/L)			NA		NA		NA		NA		NA		NA		**257**		**NA**		**84**	
Dissolved Oxygen (mg/L)			NA		**0.40**		**0.7**		**0.32**		**0.78**		NA		**0.39**		**0.53**		**0.54**	

Notes:

MCL = Primary Drinking Water Standard Maximum Contaminant Level
bold = Indicates the analyte was detected above MDL
bold and shaded = Indicates the analyte was detected in excess of MCL
J = Estimated Value
U = Value Below MDL (value represents MDL)
NA = Not available

MDL = method detection limit
NAVD88 = North American Vertical Datum of 1988
PAHs = polynuclear aromatic hydrocarbons
L = Low Molecular Weight PAH (LPAH)
H = High Molecular Weight PAH (HPAH)
C = Carcinogenic PAH

µg/L = micrograms per liter
mg/L = milligrams per liter
mS/cm = milliSiemens/centimeter
mV = millivolts
NTU = nephelometric turbidity unit

Table IV-2 - Bulk Organophilic Clay Sampling Results
2016 Five Year Review
McCormick and Baxter Superfund Site

Sample Location				Organophilic Clay Core 1 (C1)		Organophilic Clay Core 2 (C2)	
Client Sample ID		Sediment Cap Performance Goals		MB0C2015-01-1-3.5	MB0C2015-01-3.5-6	MB0C2015-02-0.5-3.5	MB0C2015-02-3.5-6.5
Date Collected				09/14/2015	09/14/2015	09/14/2015	09/14/2015
Contaminant of Interest			Units	Result	Result	Result	Result
Conventionals							
Total Solids		--	mg/,%	67.8	68.3	63	65.6
Total Organic Carbon (TOC)		--	mg/kg	36,700	38,000	37,300	43,400
Fractional Organic Carbon (f_{OC})		--	g C/g soil,mg/g soil	0.0466	0.0497	0.0451	0.0572
Fractional Organic Matter (f_{OM})		--	%,mg/	8.04	8.57	7.78	9.85
Polyaromatic Hydrocarbons (PAHs)							
Acenaphthene	L	--	mg/kg	**0.00427** J	**0.00259** J	**0.0241** J	**0.0285** J
Acenaphthylene	L	--	mg/kg	**0.0038** J	**0.0231**	**0.00603** J	**0.053**
Anthracene	L	--	mg/kg	**0.00228** J	**0.00239** J	**0.0134** J	**0.0114** J
Benzo(a)anthracene	H,C	--	mg/kg	0.012 U	0.012 U	0.012 U	0.012 U
Benzo(a)pyrene	H,C	--	mg/kg	0.012 U	0.012 U	0.0872 J	0.012 U
Benzo(b)fluoranthene	H,C	--	mg/kg	0.012 U	0.012 U	0.012 U	0.012 U
Benzo(g,h,i)perylene	H,C	--	mg/kg	**0.03** J	**0.0324** J	**0.0489** J	**0.0248** J
Benzo(k)fluoranthene	H,C	--	mg/kg	0.012 U	0.012 U	0.012 U	0.012 U
Chrysene	H,C	--	mg/kg	0.012 U	0.012 U	0.012 U	0.012 U
Dibenz(a,h)anthracene	H,C	--	mg/kg	0.012 U	**0.141** J	**0.323**	**0.0448** J
Fluoranthene	H	--	mg/kg	**0.00748** J	**0.00588** J	**0.0409** J	**0.0278** J
Fluorene	L	--	mg/kg	**0.00641** J	**0.00309** J	**0.0235** J	**0.0264** J
Indeno(1,2,3-cd)pyrene	H,C	--	mg/kg	0.012 U	0.012 U	0.012 U	0.012 U
Naphthalene	L	--	mg/kg	**0.0521** J	**0.0294** J	**0.0925** J	**0.0942** J
Phenanthrene	L	--	mg/kg	**0.0171** J	**0.0106** J	**0.0649**	**0.0619**
Pyrene	H	--	mg/kg	**0.0181** J	0.012 U	**0.0481** J	**0.0402** J
Total LPAHs		--	mg/kg	**0.08596**	**0.07117**	**0.22443**	**0.2754**
Total HPAHs		--	mg/kg	**0.05558**	**0.17928**	**0.5481**	**0.1376**
Total cPAHs		2	mg/kg	**0.03**	**0.1734**	**0.4591**	**0.0696**
Total PAHs		--	mg/kg	**0.14154**	**0.25045**	**0.77253**	**0.413**

Notes:
Bold Values indicate detected concentrations.
L = Low Molecular Weight PAH (LPAH); H = High Molecular Weight PAH (HPAH); C = Carcinogenic PAH (cPAH).
mg/kg = Milligrams per kilogram.
Qualifiers:
J: The identification of the analyte is acceptable; the reported value is an estimate.
U: Analyte was not detected above the associated method detection limit (MDL). Value shown is the Reporting Detection Limit (RDL).

Table IV-3 - Sediment Cap Water Sampling Results
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SAMPLE LOCATION		Screening Criteria							Location A		Location B				Location C					
SAMPLE TYPE		1996 AWQCs[1]		2015 NRWQCs[2]		DEQ 2011 EPA-Approved AWQCs updated 2015 [3]		2011 MCLs updated 2015[4]	Surface Water		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water		Inter-Armoring Water	
Sample ID		Aquatic Life (chronic)	Human Health (fish consumption only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	Maximum Contaminant Levels (MCLs)	MBSW1015-A		MBSW1015-B		MBIA1015-B		MBSW1015-C		MBIA1015-C		MBIA1015-C-Dup	
Deployment Date Time									9/15/15 16:12		9/15/15 15:33		9/15/15 15:33		9/16/15 9:15		9/16/15 9:15		9/16/15 9:15	
Sample Date Time									10/6/15 8:38		10/6/15 8:20		10/6/15 8:20		10/6/15 15:20		10/6/15 15:20		10/6/15 15:20	
CONTAMINANT OF INTEREST																				
Dissolved Metals (mg/L)																				
Arsenic		0.19		0.15	**0.00014**	0.15	0.0021	0.01	**0.0010**		*0.0015*	U	*0.0015*	U	*0.0015*	U	*0.0015*	U	*0.0015*	U
Chromium		0.21		0.074		**0.053**		0.1	--		0.002	U	--		0.002	U	0.00053		0.000079	
Copper		0.012		**0.0049**		0.0065			--		0.00011		--		0.00011		0.0051		0.0010	
Zinc		0.11		0.12	26	**0.066**	2.6		--		0.0026	B	--		0.02	B,U	0.0075	B	0.011	B
Pentachlorophenol (µg/L)		13		15	**0.04**	8.2	0.3	1	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U
Polyaromatic Hydrocarbons (µg/L)																				
Acenaphthene	L	520			**90**		99		0.025	B	0.10	B	5.6	B	0.041	B	0.0079	B	0.0076	B
Acenaphthylene	L								0.00024		0.0010		0.012		0.00046		0.0001	U	0.0001	U
Anthracene	L				**400**		4000		0.00031		0.0012		0.057		0.00061		0.000064		0.000060	
Benzo(a)anthracene	H,C				**0.0013**		0.0018		0.00017		0.00019		0.00010		0.00014		0.000013	U	0.000013	U
Benzo (a) pyrene	H,C				**0.00013**		0.0018	0.2	0.000023	U	0.000032		0.000023	U	0.000023	U	0.0000115	U	0.0000115	U
Benzo (b) fluoranthene	H,C				**0.0013**		0.0018		0.000093		0.00011		0.000066		0.000066		0.0000065	U	0.0000065	U
Benzo (g,h,i) perylene	H,C								0.000034		0.000028		0.000015		0.000022		0.0000041	U	0.0000041	U
Benzo (k) fluoranthene	H				**0.0013**		0.0018		0.000042		0.000046		0.000028		0.000030		0.000005	U	0.000005	U
Chrysene	H,C				0.13		**0.0018**		0.00021		0.00023		0.00013		0.00017		0.0000088	U	0.0000088	U
Dibenzo (a,h) anthracene	H,C				**0.00013**		0.0018		0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U
Fluoranthene	H		54		20		**14**		0.0021		0.0034		0.034		0.0023		0.00020		0.00018	
Fluorene	L				**70**		530		0.0079	B	0.040	B	1.9	B	0.015	B	0.0026	B	0.0025	B
Indeno (1,2,3-c,d) pyrene	H,C				**0.0013**		0.0018		0.000025		0.000020		0.0000033	U	0.000015		0.0000033	U	0.0000033	U
Naphthalene	L	**620**							0.00044	B,U	0.00052	B	0.0030	B	0.074	B	0.0083	B	0.0077	B
Phenanthrene	L								0.0010	B	0.0037	B	0.60	B	0.0031	B	0.00074	B	0.00061	B
Pyrene	H				**30**		400		0.0014		0.0024		0.012		0.0017		0.00014		0.00013	
Total LPAHs (µg/L)									0.034		0.15		8.17		0.13		0.020		0.018	
Total HPAHS (µg/L)									0.0041		0.0065		0.046		0.0044		0.00034		0.00031	
Total cPAHs (µg/L)			**0.031**						0.00053		0.00061		0.00031		0.00041		0.00003	U	0.00003	U
Total PAHs (µg/L)									0.039		0.15		8.22		0.14		0.020		0.019	

Refer to notes at end of this table.

Table IV-3 - Sediment Cap Water Sampling Results
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SAMPLE LOCATION		Location D				Location E						Location 13-SW		Location G				Location H			
SAMPLE TYPE		Surface Water		Inter-Armoring Water		Surface Water		Surface Water		Inter-Armoring Water		Surface Water		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water	
Sample ID		MBSW1015-D		MBIA1015-D		MBSW1015-E		MBSW1015-E-Dup		MBIA1015-E		MBSW1015-F		MBSW1015-G		MBIA1015-G		MBSW1015-H		MBIA1015-H	
Deployment Date Time		9/15/15 10:52		9/15/15 10:52		9/15/15 10:24		9/15/15 10:24		9/15/15 10:24		9/15/15 14:45		9/15/15 12:23		9/15/15 12:23		9/15/15 11:25		9/15/15 11:25	
Sample Date Time		10/6/15 13:54		10/6/15 13:54		10/6/15 13:42		10/6/15 13:42		10/6/15 13:42		10/6/15 10:03		10/6/15 13:02		10/6/15 13:02		10/6/15 13:25		10/6/15 13:25	
CONTAMINANT OF INTEREST																					
Dissolved Metals (mg/L)																					
Arsenic		*0.0015*	U	--		*0.0015*	U	*0.0015*	U	--		*0.0015*	U	*0.0015*	U	--		*0.0015*	U	*0.0015*	U
Chromium		0.002	U	--		0.002	U	0.002	U	--		0.002	U	0.002	U	--		0.002	U	--	
Copper		0.00019		--		0.00016		0.00016		--		0.00016		0.00015		--		0.00015		--	
Zinc		0.00016	B	--		0.00043	B	0.00038	B	--		0.0020	B	0.00045	B	--		0.02	B,U	--	
Pentachlorophenol (µg/L)		0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U
Polyaromatic Hydrocarbons (µg/L)																					
Acenaphthene	L	0.0036	B	0.0031	B	0.0026	B	0.0027	B	0.3700	B	0.0094	B	0.00096	B	0.00029	B	0.0022	B	0.00029	B
Acenaphthylene	L	0.0001	U	0.00005	U	0.0001	U	0.0001	U	0.0001	U	0.00024		0.0001	U	0.00005	U	0.0001	U	0.00005	U
Anthracene	L	0.00023		0.000087		0.00018		0.00013		0.00013		0.00024		0.00018		0.000032	U	0.00017		0.000032	U
Benzo(a)anthracene	H,C	0.00019		0.000013	U	0.00012		0.00013		0.000013	U	0.000060		0.00020		0.000013	U	0.00016		0.000013	U
Benzo (a) pyrene	H,C	0.000038		0.0000115	U	0.000023	U	0.000023	U	0.0000115	U	0.000012		0.000023	U	0.0000115	U	0.000023	U	0.0000115	U
Benzo (b) fluoranthene	H,C	0.000077		0.000013		0.000051		0.000052		0.0000065	U	0.000030		0.000076		0.0000065	U	0.000061		0.0000065	U
Benzo (g,h,i) perylene	H,C	0.000030		0.0000041	U	0.000022		0.000026		0.0000041	U	0.0000083		0.000037		0.0000041	U	0.000027		0.0000041	U
Benzo (k) fluoranthene	H	0.000036		0.00001	U	0.000026		0.000027		0.00001	U	0.000013		0.000040		0.00001	U	0.000031		0.00001	U
Chrysene	H,C	0.00022		0.000017		0.00014		0.00015		0.0000088	U	0.000076		0.00022		0.0000088	U	0.00018		0.0000088	U
Dibenzo (a,h) anthracene	H,C	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U
Fluoranthene	H	0.0024		0.00036		0.0018		0.0017		0.0034		0.0014		0.0017		0.00032		0.0016		0.00056	
Fluorene	L	0.0012	B	0.00044	B	0.00082	B	0.00077	B	0.00510	B	0.0033	B	0.00048	B	0.00025	B	0.00079	B	0.00026	B
Indeno (1,2,3-c,d) pyrene	H,C	0.000021		0.0000033	U	0.000017		0.000020		0.0000033	U	0.0000063		0.000028		0.0000033	U	0.000019		0.0000033	U
Naphthalene	L	0.00019	B	0.00044	B,U	0.00044	B,U	0.00041	B	0.00022	B,U	0.00088	B	0.00051	B	0.00044	B,U	0.00061	B	0.00044	B,U
Phenanthrene	L	0.00086	B	0.00063	B	0.00060	B	0.00042	B	0.00065	B	0.00082	B	0.00048	B	0.00032	B	0.00047	B	0.00034	B
Pyrene	H	0.0020		0.00028		0.0014		0.0013		0.0014		0.0011		0.0013		0.00024		0.0013		0.00042	
Total LPAHs (µg/L)		0.0061		0.0043		0.0042		0.0044		0.38		0.0149		0.0026		0.00086		0.0042		0.00089	
Total HPAHS (µg/L)		0.0050		0.00067		0.0036		0.0034		0.0048		0.0027		0.0036		0.00056		0.0034		0.0010	
Total cPAHs (µg/L)		0.00058		0.00003		0.00035		0.00038		0.00003	U	0.00019		0.00056		0.00003	U	0.00045		0.00003	U
Total PAHs (µg/L)		0.011		0.0049		0.0078		0.0078		0.38		0.018		0.0062		0.0014		0.0076		0.0019	

Refer to notes at end of this table.

Table IV-3 - Sediment Cap Water Sampling Results
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SAMPLE LOCATION		Location I				Location J				Location K				Location L				Location 5						Location 12-SW	
SAMPLE TYPE		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water		Surface Water		Inter-Armoring Water		Sub-Armoring Water		Surface Water	
Sample ID		MBSW1015-I		MBIA1015-I		MBSW1015-J		MBIA1015-J		MBSW1015-K		MBIA1015-K		MBSW1015-L		MBIA1015-L		MBSW1015-5		MBIA1015-5		MBSA1015-5		MBSW1015-12	
Deployment Date Time		9/15/15 13:22		9/15/15 13:22		9/15/15 13:51		9/15/15 13:51		9/15/15 14:22		9/15/15 14:22		9/16/15 9:45		9/16/15 9:45		9/15/15 16:12		9/15/15 16:12		9/15/15 16:12		9/15/15 14:15	
Sample Date Time		10/6/15 12:15		10/6/15 12:15		10/6/15 11:10		10/6/15 11:10		10/6/15 11:40		10/6/15 11:40		10/6/15 15:20		10/6/15 15:20		10/6/15 9:00		10/6/15 9:00		10/6/15 9:00		10/6/15 9:38	
CONTAMINANT OF INTEREST																									
Dissolved Metals (mg/L)																									
Arsenic		*0.025*	U	**0.00096**		*0.0015*	U	*0.0015*	U	*0.0015*	U	NR		*0.0015*	U	--		--		--		--		--	
Chromium		0.002	U	--		0.002	U	0.002	U	0.002	U	0.00059		0.002	U	--		--		--		--		--	
Copper		0.00014		--		0.00013		0.00031		0.00014		0.00021		0.00012		--		--		--		--		--	
Zinc		0.0038	B	--		0.00010	B	0.00036	B	0.0025	B	0.0024	B	0.000049	B	--		--		--		--		--	
Pentachlorophenol (µg/L)		0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U
Polyaromatic Hydrocarbons (µg/L)																									
Acenaphthene	L	0.00088	B	0.0033	B	0.0011	B	0.000023	B,U	0.0012	B	0.0018	B	0.0072	B	0.000120	B	0.044	B	0.0031	B	0.45	B	0.16	B
Acenaphthylene	L	0.0001	U	0.00005	U	0.0001	U	0.00005	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00035		0.0001	U	0.00062		0.0021	
Anthracene	L	0.00018		0.00022		0.00022		0.000032	U	0.00020		0.000085		0.00030		0.00028		0.00071		0.00013		0.00024		0.00046	
Benzo(a)anthracene	H,C	0.00013		0.000055		0.00032		0.0000065	U	0.00025		0.000013	U	0.00026		0.000054		0.00023		0.000013	U	0.000062		0.00018	
Benzo (a) pyrene	H,C	0.000023	U	0.000023	U	0.000049		0.0000115	U	0.000023	U	0.0000115	U	0.000046		0.000023	U	0.000023	U	0.0000115	U	0.000023	U	0.000039	
Benzo (b) fluoranthene	H,C	0.000059		0.000033		0.00011		0.0000065	U	0.000091		0.0000065	U	0.00012		0.000039		0.00012		0.000020		0.000053		0.000090	
Benzo (g,h,i) perylene	H,C	0.000028		0.000024		0.000044		0.0000041	U	0.000036		0.0000041	U	0.000039		0.0000081	U	0.000046		0.0000081	U	0.0000081	U	0.000032	
Benzo (k) fluoranthene	H	0.000029		0.00001	U	0.000054		0.0000050	U	0.000043		0.00001	U	0.000051		0.00001	U	0.000055		0.00001	U	0.00001	U	0.000040	
Chrysene	H,C	0.00015		0.000066		0.00034		0.0000088	U	0.00028		0.0000088	U	0.00031		0.000041		0.00028		0.000030		0.000071		0.00024	
Dibenzo (a,h) anthracene	H,C	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U
Fluoranthene	H	0.0014		0.0010		0.0024		0.00029		0.0022		0.00031		0.0024		0.00075		0.0030		0.00055		0.00067		0.0022	
Fluorene	L	0.00041	B	0.00110	B	0.00065	B	0.000098	B	0.00056	B	0.00031	B	0.0027	B	0.00036	B	0.017	B	0.00130	B	0.027	B	0.040	B
Indeno (1,2,3-c,d) pyrene	H,C	0.000020		0.000019		0.000029		0.0000033	U	0.000024		0.0000033	U	0.000027		0.0000033	U	0.000030		0.0000033	U	0.0000033	U	0.000021	
Naphthalene	L	0.00044	B,U	0.00044	B,U	0.00013	B	0.00044	B,U	0.00044	B,U	0.00044	B,U	0.0043	B	0.00044	B,U	0.0260	B	0.0006	B	0.0008	B	0.0006	B
Phenanthrene	L	0.00043	B	0.00094	B	0.00066	B	0.000082	B	0.00066	B	0.00024	B	0.0014	B	0.00043	B	0.0041	B	0.00035	B	0.00084	B	0.00048	B
Pyrene	H	0.0011		0.00074		0.0018		0.00019		0.0016		0.00024		0.0016		0.0021		0.0020		0.00037		0.00056		0.0026	
Total LPAHs (µg/L)		0.0019		0.0056		0.0028		0.00018		0.0026		0.00244		0.016		0.0012		0.092		0.0055		0.48		0.20	
Total HPAHS (µg/L)		0.0029		0.0019		0.0051		0.00048		0.0045		0.00055		0.0048		0.0030		0.006		0.0010		0.0014		0.0054	
Total cPAHs (µg/L)		0.00039		0.00020		0.00089		0.00003	U	0.00068		0.00003	U	0.00080		0.00013		0.00071		0.000050		0.00019		0.00060	
Total PAHs (µg/L)		0.0048		0.0075		0.0079		0.00066		0.0071		0.0034		0.021		0.0042		0.098		0.0065		0.48		0.21	

Refer to notes at end of this table.

Table IV-3 - Sediment Cap Water Sampling Results
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SAMPLE LOCATION		Location 12				Location 13				Location 16						Location 1		Location 27	
SAMPLE TYPE		Inter-Armoring Water		Sub-Armoring Water		Inter-Armoring Water		Sub-Armoring Water		Surface Water		Inter-Armoring Water		Sub-Armoring Water		Surface Water		Surface Water	
Sample ID		MBIA1015-12		MBSA1015-12		MBIA1015-13		MBSA1015-13		MBSW1015-16		MBIA1015-16		MBSA1015-16		MBSW1015-1		MBSW1015-27	
Deployment Date Time		9/15/15 14:15		9/15/15 14:15		9/15/15 13:30		9/15/15 13:30		9/16/15 10:14		9/16/15 10:14		9/16/15 10:14		9/15/15 15:23		9/16/15 10:40	
Sample Date Time		10/6/15 9:38		10/6/15 9:38		10/6/15 10:06		10/6/15 10:06		10/6/15 10:52		10/6/15 10:52		10/6/15 10:52		10/6/15 9:45		10/6/15 10:00	
CONTAMINANT OF INTEREST																			
Dissolved Metals (mg/L)																			
Arsenic		--		--		--		--		--		--		--		**0.00074**		**0.00077**	
Chromium		--		--		--		--		--		--		--		--		0.002	U
Copper		--		--		--		--		--		--		--		--		0.00016	
Zinc		--		--		--		--		--		--		--		--		0.010	B
Pentachlorophenol (µg/L)		0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U	0.0004325	U
Polyaromatic Hydrocarbons (µg/L)																			
Acenaphthene	L	6.0	B	2.7	B	0.0082	B	0.0031	B	0.0016	B	0.019	B	0.40	B	0.00080	B	0.00094	B
Acenaphthylene	L	0.016		0.0060		0.00005	U	0.00005	U	0.0001	U	0.0001	U	0.00097		0.0001	U	0.0001	U
Anthracene	L	0.0059		0.0017		0.00120		0.00068		0.00019		0.000032	U	0.00052		0.00017		0.00022	
Benzo(a)anthracene	H,C	0.00012		0.00013		0.000013	U	0.000013	U	0.00012		0.000013	U	0.000013	U	0.000087		0.00015	
Benzo (a) pyrene	H,C	0.000023	U	0.000031		0.0000115	U	0.0000115	U	0.000021		0.0000115	U	0.000023	U	0.000023	U	0.000023	U
Benzo (b) fluoranthene	H,C	0.000041		0.000065		0.0000065	U	0.0000065	U	0.000047		0.0000065	U	0.000011		0.000038		0.000066	
Benzo (g,h,i) perylene	H,C	0.0000092		0.000014		0.0000041	U	0.0000041	U	0.000017		0.0000041	U	0.0000083		0.000018		0.000026	
Benzo (k) fluoranthene	H	0.000018		0.000027		0.0000050	U	0.0000050	U	0.000021		0.0000050	U	0.00001	U	0.000020		0.000034	
Chrysene	H,C	0.00016		0.00016		0.000016		0.000012		0.00014		0.0000088	U	0.000013		0.00010		0.00018	
Dibenzo (a,h) anthracene	H,C	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U
Fluoranthene	H	0.0042		0.0015		0.00051		0.00063		0.0016		0.00021		0.00017		0.0014		0.0017	
Fluorene	L	0.63	B	0.120	B	0.0040	B	0.00110	B	0.00052	B	0.0032	B	0.067	B	0.00036	B	0.00038	B
Indeno (1,2,3-c,d) pyrene	H,C	0.0000033	U	0.000012		0.0000033	U	0.0000033	U	0.000010		0.0000033	U	0.0000033	U	0.000016		0.000021	
Naphthalene	L	0.020	B	0.026	B	0.00044	B,U	0.00044	B,U	0.00044	B,U	0.00044	B,U	0.00044	B,U	0.00044	B,U	0.00044	B,U
Phenanthrene	L	0.0130	B	0.0077	B	0.0120	B	0.0048	B	0.00050	B	0.00014	B	0.00048	B	0.00042	B	0.00044	B
Pyrene	H	0.0048		0.0024		0.00045		0.00052		0.0013		0.00014		0.00017		0.0011		0.0014	
Total LPAHs (µg/L)		6.68		2.86		0.0254		0.0097		0.0028		0.022		0.47		0.0018		0.0020	
Total HPAHS (µg/L)		0.0093		0.0043		0.00098		0.0012		0.0033		0.00035		0.00037		0.0028		0.0036	
Total cPAHs (µg/L)		0.00033		0.00041		0.000016		0.000012		0.00036		0.00003	U	0.000032		0.00026		0.00044	
Total PAHs (µg/L)		6.69		2.87		0.026		0.01		0.0061		0.023		0.47		0.0045		0.0056	

Refer to notes at end of this table.

Table IV-3 - Sediment Cap Water Sampling Results
2016 Five Year Review
McCormick & Baxter Superfund Site

Notes:
The number of significant figures presented in the table does not reflect true accuracy presented by the laboratory results. Data should only retain 2 significant figures. Due to statistical evaluation using Microsoft Excel, additional significant figures may be shown.

[1]The 1996 Record of Decision (ROD) specifies the remedial action objectives of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of Ambient Water Quality Criteria (AWQCs).
[2] National Recommended Water Quality Criteria (NRWQCs) published as of 2007 and updated 2015, are included for comparison (see https://www.epa.gov/wqc/national-recommended-water-quality-criteria)
[3] Aquatic Water Quality Criteria (AWQCs) published as of 2011, and updated effective August 4, 2015, are included for comparison (see http://www.deq.state.or.us/wq/standards/docs/tables303140.pdf)
[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://water.epa.gov/drink/contaminants/index.cfm).

Key:
Gamma = gamma distribution
J = estimated value
L = low molecular weight PAH (LPAH)
H = high molecular weight PAH (HPAH)
C = carcinogenic PAH (cPAH)
µg/L = micrograms per liter
mg/L = milligrams per liter
MDL = method detection limit
NA = not applicable
Normal = normal distribution
-- = not analyzed
ND = not detected
NP = non-parametric distribution
U = value below MDL (value represents MDL)

Table IV-4 - Sediment Cap Water Summary Statistics
2016 Five Year Review
McCormick and Baxter Superfund Site

SAMPLE TYPE		Screening Criteria							Surface Water Statistics						
		1996 AWQCs[1]		2015 NRWQCs[2]		DEQ 2011 EPA-Approved AWQCs updated 2015 [3]		2011 MCLs updated 2015[4]							
CONTAMINANT OF INTEREST		Aquatic Life (chronic)	Human Health (fish consumption only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	Maximum Contaminant Levels (MCLs)	Number of Samples	Detection Frequency (%)	Max Detection	Max Location	Mean Conc.	Data Distribution	95% UCL Value
Dissolved Metals (mg/L)															
Arsenic		0.19		0.15	**0.00014**	0.15	0.0021	0.01	12	8	**0.0010**	MBSW1015-A	**0.0018**	NA	NA
Chromium		0.21		0.074		**0.053**		0.1	11	0	ND	NA	NA	NA	NA
Copper		0.012		**0.0049**		0.0065			11	100	0.00019	MBSW1015-D	0.00014	Normal	0.00016
Zinc		0.11		0.12	26	**0.066**	2.6		11	82	0.0038	MBSW1015-I	0.0029	Gamma	0.0072
Pentachlorophenol (µg/L)		13		15	**0.04**	8.2	0.3	1	15	0	NA	NA	NA	NA	NA
Polyaromatic Hydrocarbons (µg/L)															
Acenaphthene	L	520			**90**		99		15	100	0.16	MBSW1015-12	0.027	Gamma	0.067
Acenaphthylene	L								15	50	0.0021	MBSW1015-12	0.00032	NP	0.00095
Anthracene	L				**400**		4000		15	100	0.0012	MBSW1015-B	0.00036	NP	0.00068
Benzo(a)anthracene	H,C				**0.0013**		0.0018		15	100	0.00032	MBSW1015-J	0.00018	NP	0.00021
Benzo (a) pyrene	H,C				**0.00013**		0.0018	0.2	15	47	0.000049	MBSW1015-J	0.000022	NP	0.0000383
Benzo (b) fluoranthene	H,C				**0.0013**		0.0018		15	100	0.00012	MBSW1015-5	0.000080	Normal	0.000097
Benzo (g,h,i) perylene	H,C								15	100	0.000046	MBSW1015-5	0.000030	Normal	0.000035
Benzo (k) fluoranthene	H				**0.0013**		0.0018		15	100	0.000055	MBSW1015-5	0.000037	Normal	0.00004
Chrysene	H,C				0.13		**0.0018**		15	100	0.00034	MBSW1015-J	0.00021	Normal	0.00025
Dibenzo (a,h) anthracene	H,C				**0.00013**		0.0018		15	0	ND	NA	NA	NA	NA
Fluoranthene	H		54		20		**14**		15	100	0.0034	MBSW1015-B	0.0021	Normal	0.0024
Fluorene	L				**70**		530		15	100	0.040	MBSW1015-12	0.0088	NP	0.024
Indeno (1,2,3-c,d) pyrene	H,C				**0.0013**		0.0018		15	100	0.000030	MBSW1015-5	0.000021	Normal	0.000024
Naphthalene	L	**620**							15	67	0.074	MBSW1015-C	0.0073	NP	0.0293
Phenanthrene	L								15	100	0.0041	MBSW1015-5	0.0013	NP	0.027
Pyrene	H				**30**		400		15	100	0.0026	MBSW1015-12	0.0016	Normal	0.0018
Total LPAHs (µg/L)									15	100	0.20	MBSW1015-12	0.045	NP	0.118
Total HPAHS (µg/L)									15	100	0.0065	MBSW1015-5	0.0043	Normal	0.0049
Total cPAHs (µg/L)			**0.031**						15	100	0.00089	MBSW1015-J	0.00054	Normal	0.00063
Total PAHs (µg/L)									15	100	0.21	MBSW1015-12	0.049	NP	0.12

Refer to notes at end of this table.

Table IV-4 - Sediment Cap Water Summary Statistics
2016 Five Year Review
McCormick and Baxter Superfund Site

SAMPLE TYPE		Inter-Armoring Water Statistics							Sub-Armoring Water Statistics						
CONTAMINANT OF INTEREST		Number of Samples	Detection Frequency (%)	Max Detection	Max Location	Mean Conc.	Data Distribution	95% UCL Value	Number of Samples	Detection Frequency	Max Detection	Max Location	Mean Conc.	Data Distribution	95% UCL Value
Dissolved Metals (mg/L)															
Arsenic		5	20	**0.0010**	MBIA1015-I	**0.00044**	NA	NA	0	NA	NA	NA	NA	NA	NA
Chromium		3	67	0.00059	MBIA1015-K	0.00071	NA	NA	0	NA	NA	NA	NA	NA	NA
Copper		3	67	0.0051	MBIA1015-C	0.0019	NA	NA	0	NA	NA	NA	NA	NA	NA
Zinc		3	67	0.0075	MBIA1015-C	0.0034	NA	NA	0	NA	NA	NA	NA	NA	NA
Pentachlorophenol (µg/L)		14	0	NA	NA	NA	NA	NA	4	0	NA	NA	NA	NA	NA
Polyaromatic Hydrocarbons (µg/L)															
Acenaphthene	L	14	93	6.0	MBIA1015-12	0.92	NP	24	4	100	2.7	MBSA1015-12	0.89	NA	NA
Acenaphthylene	L	14	14	0.016	MBIA1015-12	0.0022	NA	NA	4	100	0.0060	MBSA1015-12	0.0019	NA	NA
Anthracene	L	14	71	0.057	MBIA1015-B	0.0050	NP	0.021	4	100	0.0017	MBSA1015-12	0.00079	NA	NA
Benzo(a)anthracene	H,C	14	29	0.00012	MBIA1015-12	0.000030	NP	0.000069	4	50	0.00013	MBSA1015-12	0.000051	NA	NA
Benzo (a) pyrene	H,C	14	0	NA	NA	NA	NA	NA	4	25	0.000031	MBSA1015-12	0.000015	NA	NA
Benzo (b) fluoranthene	H,C	14	43	0.000066	MBIA1015-B	0.000018	NP	0.000038	4	75	0.000065	MBSA1015-12	0.000033	NA	NA
Benzo (g,h,i) perylene	H,C	14	21	0.000024	MBIA1015-I	0.0000056	NP	0.000012	4	50	0.000014	MBSA1015-12	0.0000071	NA	NA
Benzo (k) fluoranthene	H	14	14	0.000028	MBIA1015-B	0.0000070	NA	NA	4	25	0.000027	MBSA1015-12	0.000010	NA	NA
Chrysene	H,C	14	50	0.00016	MBIA1015-12	0.000037	NP	0.000088	4	100	0.00016	MBSA1015-12	0.000064	NA	NA
Dibenzo (a,h) anthracene	H,C	14	0	NA	NA	NA	NA	NA	4	0	NA	NA	NA	NA	NA
Fluoranthene	H	14	100	0.034	MBIA1015-B	0.0035	NP	0.013	4	100	0.0015	MBSA1015-12	0.00074	NA	NA
Fluorene	L	14	100	1.9	MBIA1015-B	0.20	NP	0.74	4	100	0.12	MBSA1015-12	0.054	NA	NA
Indeno (1,2,3-c,d) pyrene	H,C	14	0	NA	NA	NA	NA	NA	4	25	0.000012	MBSA1015-12	0.0000042	NA	NA
Naphthalene	L	14	29	0.020	MBIA1015-12	0.0026	NP	0.0090	4	50	0.026	MBSA1015-12	0.0068	NA	NA
Phenanthrene	L	14	100	0.60	MBIA1015-B	0.048	NP	0.22	4	100	0.0077	MBSA1015-12	0.0035	NA	NA
Pyrene	H	14	100	0.012	MBIA1015-B	0.0018	NP	0.0051	4	100	0.0024	MBSA1015-12	0.00091	NA	NA
Total LPAHs (µg/L)		14	100	8.2	MBIA1015-B	1.18	NP	3.97	4	100	2.9	MBSA1015-12	0.95	NA	NA
Total HPAHS (µg/L)		14	100	0.046	MBIA1015-B	0.0054	NP	0.018	4	100	0.0043	MBSA1015-12	0.0018	NA	NA
Total cPAHs (µg/L)		14	57	0.00033	MBIA1015-D	0.00012	NP	0.00026	4	100	0.00041	MBSA1015-12	0.00016	NA	NA
Total PAHs (µg/L)		14	100	8.2	MBIA1015-B	1.2	NP	3.98	4	100	2.9	MBSA1015-12	0.96	NA	NA

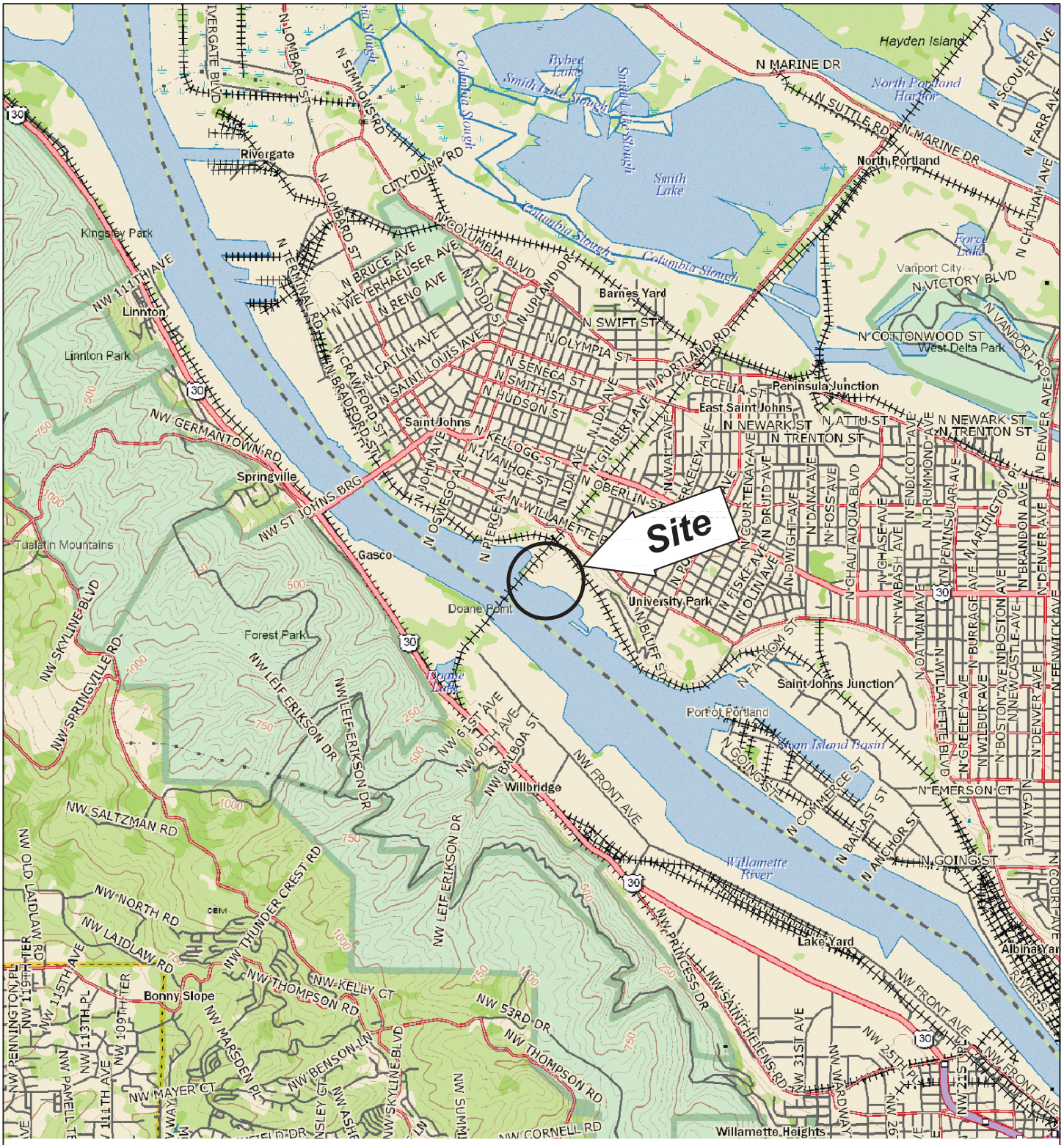
Refer to notes at end of this table.

Table IV-4 - Sediment Cap Water Summary Statistics
2016 Five Year Review
McCormick and Baxter Superfund Site

Notes:
The number of significant figures presented in the table does not reflect true accuracy presented by the laboratory results. Data should only retain 2 significant figures. Due to statistical evaluation using Microsoft Excel, additional significant figures may be shown.

[1]The 1996 Record of Decision (ROD) specifies the remedial action objectives of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of Ambient Water Quality Criteria (AWQCs).
[2] National Recommended Water Quality Criteria (NRWQCs) published as of 2007 and updated 2015, are included for comparison (see https://www.epa.gov/wqc/national-recommended-water-quality-criteria)
[3] Aquatic Water Quality Criteria (AWQCs) published as of 2011, and updated effective August 4, 2015, are included for comparison (see http://www.deq.state.or.us/wq/standards/docs/tables303140.pdf)
[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://water.epa.gov/drink/contaminants/index.cfm).

Key:
Gamma = gamma distribution
L = low molecular weight PAH (LPAH)
H = high molecular weight PAH (HPAH)
C = carcinogenic PAH (cPAH)
µg/L = micrograms per liter
mg/L = milligrams per liter
MDL = method detection limit
NA = not applicable
Normal = normal distribution
-- = not analyzed
ND = not detected
NP = non-parametric distribution
J = estimated value
U = value below MDL (value represents MDL)



McCormick and Baxter Superfund Site
6900 N Edgewater Street, Portland, Oregon

Site Location Map

6/16

Figure
I-1

HARTCROWSER
GSI Water Solutions, Inc.

Source: DeLorme Topo USA.

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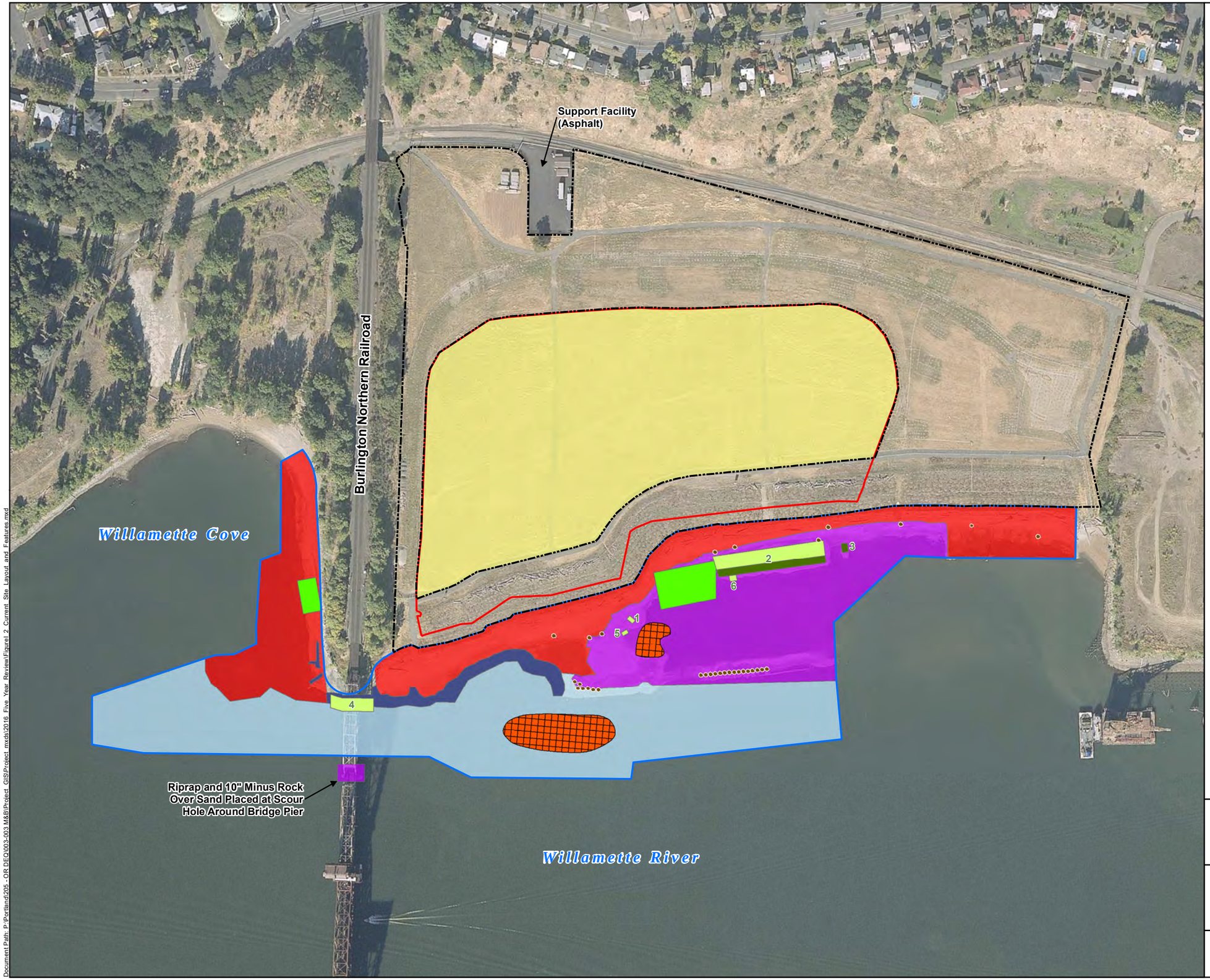

LEGEND

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Riprap Armor
- Articulated Concrete Block
- 6-inch Minus Rock Armor
- 10-inch Minus Rock Armor
- Impermeable Cap
- Earthen Soil Cap Boundary

NOTE: Aerial photo taken on September 22, 2006

0 250 500

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Current Site Layout and Features

6/16

HARTCROWSER GSI Water Solutions, Inc.

Figure
I-2

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NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.
7. Additional rock was placed at the 6" minus rock placement areas on 6/26/07. These areas have not been surveyed and the contours of this figure do not reflect the additional rock placement.

Burlington Northern Inc.
(Spokane, Portland, and Seattle Railway Co.)

Property Line

Fence (Typ.)

Union Pacific Railroad

Building

Asphalt Surface

Gravel Road

EARTHEN CAP

Perforated Collection Piping

Subsuface Barrier Wall

SDMH-A

SDMH-B

SDMH-C

SDMH-D

SDMH-E

High Point

DRAINAGE SYSTEM

Retention Pond

12" Minus Rock

IMPERMEABLE CAP

8" Corrugated HDPE (High Density Polythene)

Spillway

Rock Pile

12" PVC Outfall

Sand Pile

Willamette Cove

SEDIMENT CAP

Sediment Cap Boundary

Willamette River

DSL Easement (#31530-EA)

0 200 400

Scale in Feet

N

-40 Elevation Contour, 1' Interval (Ft. NAVD 88)

Boulder Clusters/Rock Mound

Riprap Armor

Organoclay™ Reactive Core Mats (Double Layer)

Organoclay™ Reactive Core Mats (Single Layer)

Granular Organophilic Clay

Hot Spot Treatment (Thickened Sand Layer)

Articulated Concrete Block

6-Inch Minus Rock Armor

10-Inch Minus Rock Armor

Turf Reinforcement Mat Placed Over Earthen Cap

A2 A2' Cross Section Line

McCormick & Baxter Superfund Site
Portland, Oregon

Current Site Layout with Surface Elevations

6/16

HARTCROWSER GSI Water Solutions, Inc.

Figure
I-3

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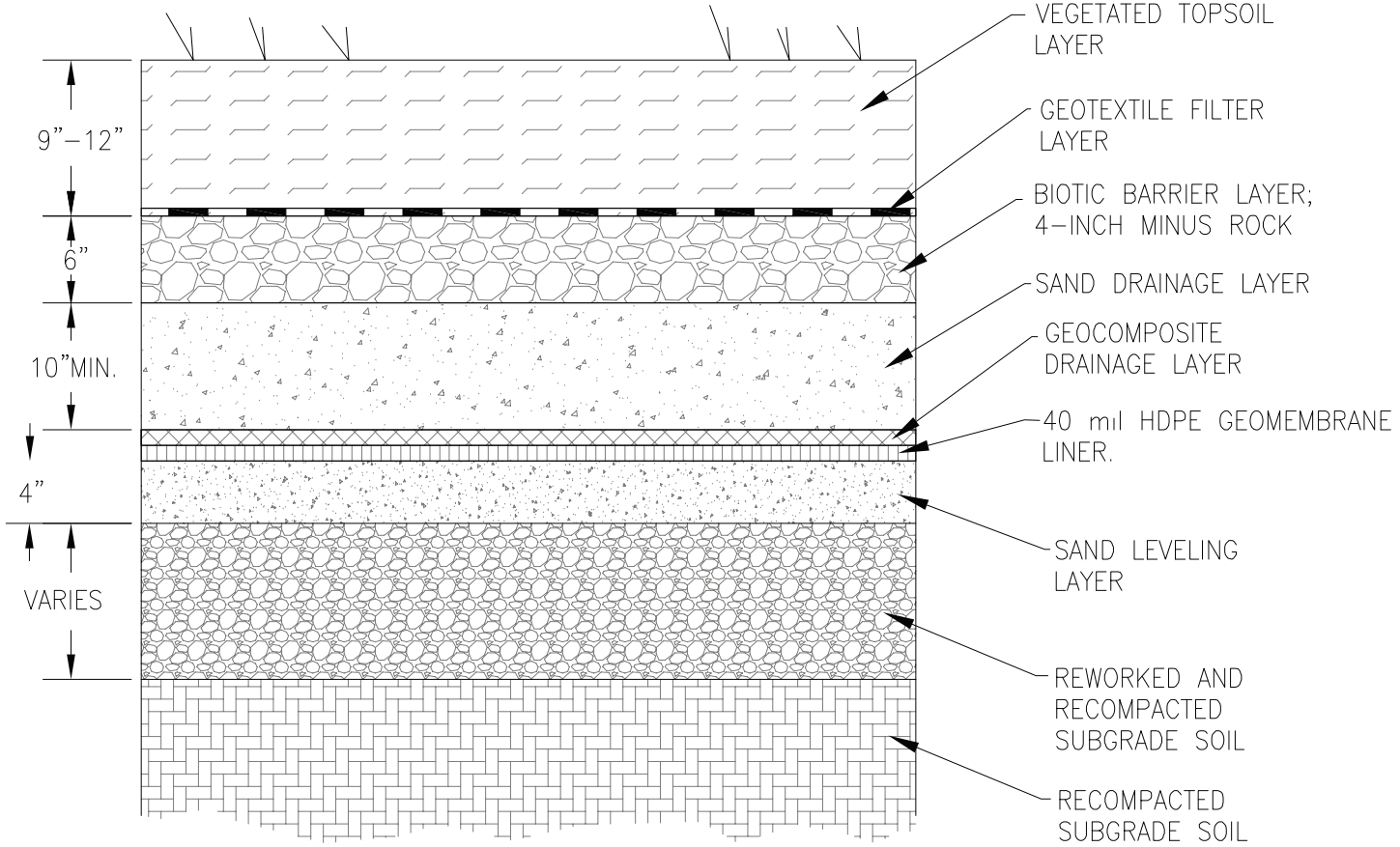
FIGURE II-1

Typical Impermeable Cap Section

McCormick & Baxter Superfund Site
Portland, Oregon



NOTE

Original drawing in Appendix J of the 2006 Annual Report (E&E, 2007).

Not to Scale

GSI Water Solutions, Inc.

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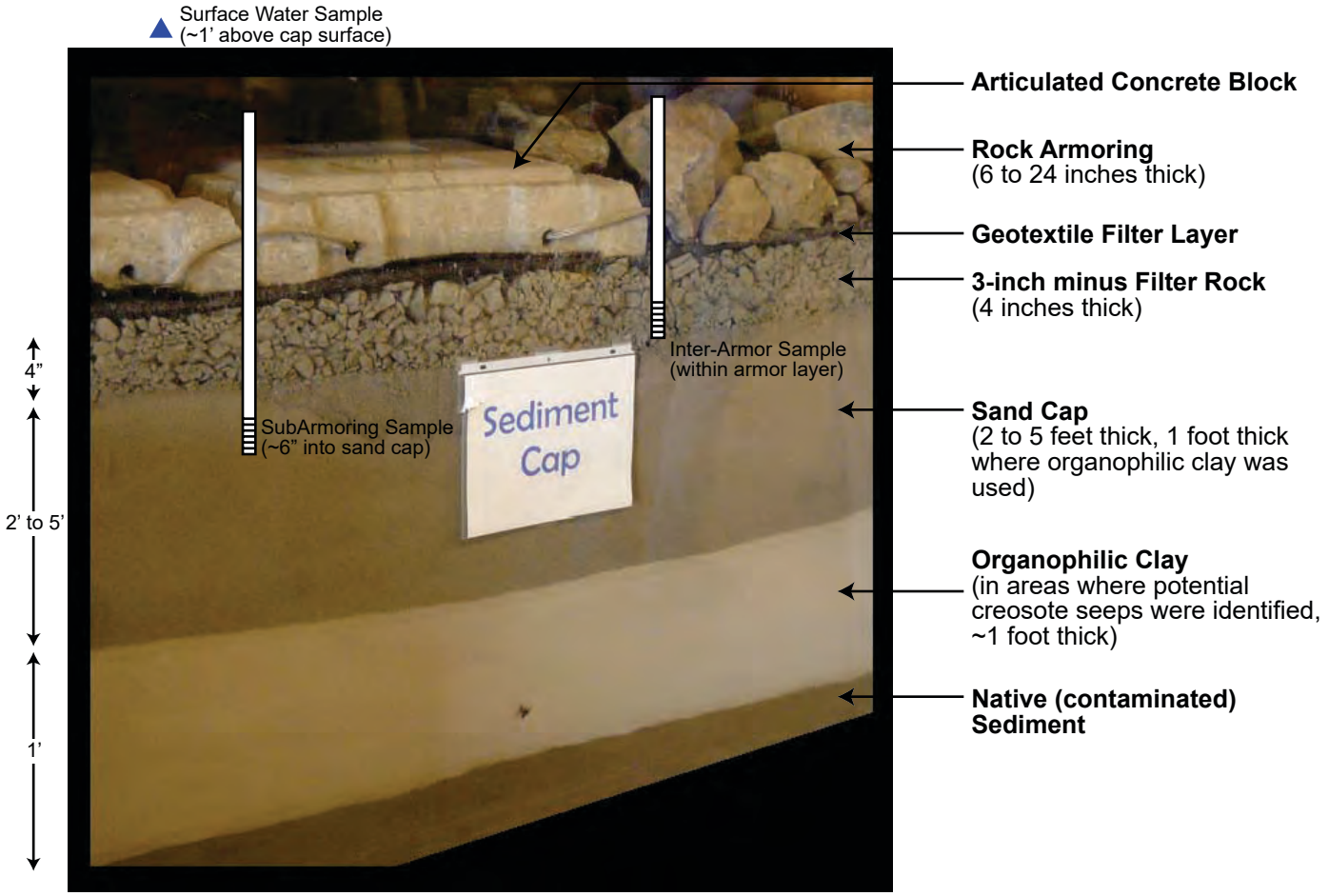

FIGURE II-2

Typical Sediment Cap Section

McCormick & Baxter Superfund Site
Portland, Oregon

LEGEND

- Surface Water Sample
- Push Point Pore Water Sampler
- Screen Interval

NOTE

Detailed sediment cap drawings in Appendix J of the 2006 Annual Report (E&E, 2007).

Not to Scale

GSI Water Solutions, Inc.

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Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project GIS\Project mxds\2016 Five Year Review\FigureIV-1 Monitoring Well Location Map.mxd

LEGEND

- Groundwater Monitoring Wells
- Groundwater Monitoring Wells with Transducers
- Subsurface Barrier Wall

NOTE:
Aerial photo taken on September 22, 2006.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Monitoring Well Location Map

6/16

HARTCROWSER GSI Water Solutions, Inc.

Figure
IV-1

LEGEND

- Groundwater Monitoring Wells
- Infiltration Pond
- Subsurface Barrier Wall
- Drainage Swale Flow Direction Arrow

NOTE: Aerial photo taken on September 22, 2006

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Monitoring Well MW-59s and Infiltration Pond Location Map

6/16

HARTCROWSER GSI Water Solutions, Inc.

Figure
IV-2

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project GIS\Project mxds\2016 Five Year Review\Figure\V-2 GW Monitoring Well MW-59s Location Map.mxd

LEGEND

- Actual O&M Sampling Locations

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Organoclay Granular
- Organoclay Mats (Double)
- Organoclay Mats (Single)
- Hot Spot Treatment (thickened sand layer)
- MW-37; DGPS Reference Location
- Boulder Clusters
- Lowest Willamette River Level During Sampling Event[3]

NOTES:

1) Aerial photo taken on September 22, 2006.
2) The surface water sample at the early warning station will serve as the compliance monitoring point for monitoring area F while the inter-armoring and sub-armoring samples will serve as early warning samples.
3) The passive sampler deployment period was from September 15, 2015 to October 6, 2015. The lowest river stage during deployment was 5.32 ft NAVD 88, recorded on September 22, 2015 at 9:30 am.

0 250 500

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Inter-Armoring and Sub-Armoring Water Sampling Locations

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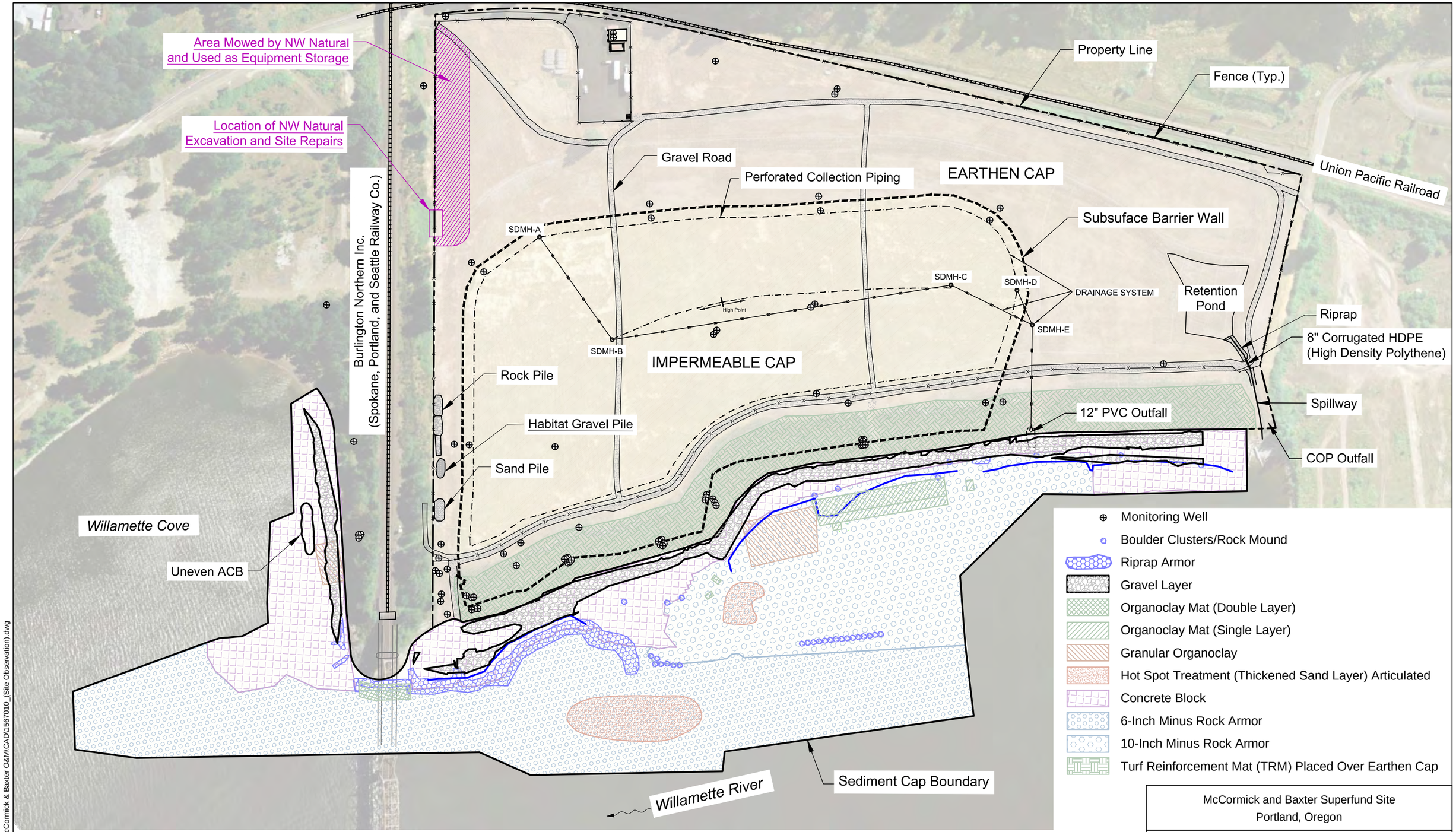
Figure
IV-3

Document Path: P:\Portland\205 - OR DEQ\003-003 M&B\Project GIS\Project mxds\2016 Five Year Review\Figure\IV-3 Armoring Water Sample Locs.mxd



McCormick and Baxter Superfund Site
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Gas Line Excavation Location Map

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Figure
IV-4

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