STUDY AREA INVESTIGATION AND ALTERNATIVES ANALYSIS WORK PLAN

ABERDEEN SAWMILL SITE, FACILITY SITE ID 1126,
CLEANUP SITE ID 4987
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC LANDS

EXHIBIT C
AGREED ORDER NO. DE 11225

Prepared for
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NOTE

This Study Area Investigation and Alternatives Analysis Work Plan was originally submitted under the title Remedial Investigation and Feasibility Study Work Plan (November 25, 2014). For purposes of this Order, the Study Area refers to the state-owned aquatic lands in the Chehalis River, offshore of the upland property owned by GHHSA, as detailed in Figure 2.

Ecology requested that the title be changed to indicate the work plan does not encompass the full site. Therefore the language within the text that refers to an RI/FS actually refers to the Study Area Investigation and Alternatives Analysis Work Plan.

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CONTENTS

TABLES AND ILLUSTRATIONS

FOLLOWING WORK PLAN:

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

AET	apparent effects thresholds
bml	below mudline
BTEX	benzene, toluene, ethylbenzene, and xylenes
CSL	cleanup screening level
CSM	conceptual site model
dioxins	polychlorinated dibenzo-p-dioxins and -furans
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
Former Mill Area	Overwater sawmill (demolished)
the GHHSA	Grays Harbor Historical Seaport Authority
HPA	Hydraulic Permit Approval
IPG	Integrated Planning Grant
JARPA	Joint Aquatic Resource Permit Application
the leased property	leased tideland and in-water property
MFA	Maul Foster & Alongi, Inc.
mg/kg	milligrams per kilogram
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PARIS	Ecology Water Quality Permitting and Reporting Information System
PCB	polychlorinated biphenyl
PES	PES Environmental
pg/g	picograms per gram
Property	The upland property formerly owned by Weyerhaeuser and currently owned Grays Harbor Historical Seaport Authority the aquatic property owned by DNR
RAO	remedial action objective
RCW	Revised Code of Washington
RI/FS	remedial investigation and feasibility study
SAIC	Science Applications International Corporation
SAP	sampling and analysis plan
the site	the upland property and the leased property
SMS	Sediment Management Standards
SVOC	semivolatile organic compound
TEQ	toxicity equivalence quotient
TPH	total petroleum hydrocarbons
ug/kg	micrograms per kilogram
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA) has prepared this Study Area Investigation and Alternatives Analysis Work Plan (herein referred to as Remedial Investigation and Feasibility Study [RI/FS] Work Plan) for the Grays Harbor Historical Seaport Authority (GHHSA) to characterize nature and extent of environmental impacts at the former leased tideland and in-water property (the leased property) located at 500 North Custer Street in Aberdeen, Washington (see Figure 1). The leased property, on the Chehalis River in Grays Harbor County, was being leased from the Washington State Department of Natural Resources (DNR) by Weyerhaeuser under Lease No. 22-A02150. The leased property is part of the Aberdeen Sawmill Site (the site), which includes upland areas and the leased in-water property. See Figure 2 for location of the leased property. In 2013, GHHSA entered into a sublease agreement with Weyerhaeuser for the state-owned aquatic lands and is currently negotiating a direct lease for the area with DNR. The leased property historically was used by Weyerhaeuser and other wood products companies. The leased property is proposed for future use as the homeport for the *Lady Washington* and *Hawaiian Chieftain* tall ships as part of a new maritime heritage facility called Seaport Landing.

Environmental sampling in the area of the former sawmill and lumber processing operations indicates that hazardous substances have impacted sediments on the leased property. Previous investigations indicated that polychlorinated dibenzo-p-dioxins and -furans (dioxins), semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), metals including mercury, and woodwaste are present in sediment on the leased property.

This RI/FS work plan proposes a scope of work to characterize contamination in sediment and evaluate remedial options, as appropriate on the leased property. This work plan also represents a single, stand-alone document summarizing historical operations and historical data from past investigations. Before beginning the RI, DNR required that it review and approve this work plan (DNR, 2014).

1.1 Purpose and Objectives

This work plan is designed consistent with the Sediment Management Standards (SMS) stipulated in Washington Administrative Code (WAC) 173-204-550 as required pursuant to Section 4b of the DNR consent to sublease agreement. The purpose of the RI is to generate sufficient data to adequately characterize the nature and extent of contaminants in the leased property sediment, characterize risk to human health and the environment, and perform an FS that will evaluate options for remediation, if necessary. Only the aquatic portion of the DNR-owned property that is subleased by the GHHSA is included in this evaluation. The work described does not encompass the entire Site since upland areas and facility operations are not addressed in this RI/FS work plan, aside from limited source evaluation.

The RI/FS work plan includes the following per WAC 173-204-550(4):

- A summary of available information regarding the leased property and data gaps that the RI will address.
- A conceptual site model (CSM) including current and potential human and ecological receptors and exposure pathways.
- Cleanup action alternatives that are likely to be considered in the FS.
- A sampling plan and recordkeeping in compliance with WAC 173-204-600 through 173-204-610.
- A site safety plan to meet the requirements of the Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.) and the Washington Industrial Safety and Health Act (Chapter 49.17 Revised Code of Washington [RCW]).
- A proposed schedule for completion of the RI/FS.

1.2 Regulatory Framework

Weyerhaeuser assumed the aquatic land lease at the time of the site acquisition in 1955. The most recent aquatic land lease (Aquatic Land Lease No. 22-A02150) was signed by DNR on September 13, 2001. Subsequently, GHHSA entered into a sub-lease agreement with Weyerhaeuser for the in-water portion of the site (the leased property). In addition to the sub-lease agreement, DNR, Weyerhaeuser, and GHHSA jointly entered into a consent to sub-lease agreement that identifies a number of requirements to be completed before the termination of the master tideland lease on March 9, 2015. These include a requirement to submit a RI/FS work plan for the leased property that is DNR-owned property.

The site is listed on Ecology's database as Facility Site ID 1126/Cleanup Site ID 4987. The RI/FS work plan is not intended to be a complete RI/FS for the site, as defined by Ecology under the Model Toxics Control Act (MTCA), but is instead focused on the aquatic land lease-portion of the site.

DNR requests "bookend" sediment sampling at the initiation and termination of an aquatic lease in order to differentiate baseline sediment conditions from impacts that may have occurred during the lease period, as well as to evaluate long-term trends in sediment conditions. On February 2, 2011, in correspondence with Weyerhaeuser, DNR requested sediment sampling and proposed a sampling approach for the leased property. Floyd|Snider, consultant to Weyerhaeuser, proposed a reduction to the DNR-requested sampling in a proposal letter prepared for Weyerhaeuser on March 15, 2012 (Floyd|Snider, 2012). On March 26, 2012, DNR modified the Floyd|Snider proposed sediment sampling plan (DNR, 2012) by expanding the analyte list for the three proposed surface sediment samples from the Chehalis River and requesting three sediment core samples in the Former Mill Area, a portion of the leased property.

In October 2013, MFA assisted the GHHSA in preparing an Integrated Planning Grant (IPG) application. On April 10, 2014, the GHHSA received an IPG from Ecology (G1400582) to develop a community-based plan to transform this historical sawmill facility into a revitalized asset for the community while managing the risk of legacy environmental impacts.

MFA prepared a sampling and analysis plan (SAP) (MFA, 2013a) as follows:

- On March 26, 2012 MFA submitted the Draft SAP incorporating DNR modifications to the Floyd|Snider proposed SAP and submitted it to DNR on June 27, 2013.
- Comments regarding analyte hold times, permitting, and right-of-entry were received from DNR via e-mail on July 16, 2013 (DNR, 2013a).
- MFA replied to DNR comments in a July 23, 2013, letter (MFA, 2013b) acknowledging DNR concerns over hold times and permitting.
- MFAs response to DNR comments were accepted by DNR in a July 31, 2013, e-mail (DNR, 2013b).
- Additional DNR conditions of approval including wood waste evaluation methods, analyte additions, conventionals sampling, and porewater sample methods were received on August 22, 2013 (DNR, 2013c). These comments were addressed in the final SAP that was submitted by MFA on September 12, 2013 (MFA, 2013c) and approved by DNR.

MFA conducted sediment sampling on November 7-8, 2013, and submitted a sediment sampling report on February 5, 2014 (MFA, 2014). On April 4, 2014, DNR requested an RI/FS for the aquatic leased portion of the site (DNR, 2014). During a July 2, 2014 meeting between DNR, Ecology, the GHHSA, and MFA, an RI/FS work plan due date of October 2, 2014, was set. Comments on the sediment sampling report were received from the Washington State Department of Ecology (Ecology) by e-mail on July 9, 2014 (Ecology, 2014a), and are addressed in this work plan.

1.3 Work Plan Organization

This document is organized as follows:

- *Section 2* discusses background information and physical setting of the leased property.
- *Section 3* summarizes previous investigations and interprets results of historical data.
- *Section 4* presents the preliminary CSM for sources, transport pathways, and exposure scenarios for impacted media on the DNR aquatic leased land.
- *Section 5* sets expectations for the FS. Preliminary remedial action objectives (RAOs) are identified in the section and possible cleanup action alternatives for a portion of the DNR aquatic leased land are discussed.

- *Section 6* presents the proposed data collection activities in support of the RI/FS.
- *Section 7* discusses permitting that may be required to carry out the proposed data collection activities.
- *Section 8* describes the project management plan and schedule.

The following appendices are attached:

- Appendix A—a SAP. The SAP consists of a field sampling plan.
- Appendix B—a site-specific health and safety plan.

The field SAP identifies the proposed number, location, and depth of sediment, soil, and groundwater samples. It also addresses practices related to the proper handling and disposal of investigation-derived waste. The SAP defines laboratory and field analytical quality procedures and quality assurance and quality control requirements for analytical sampling and analysis.

The SAP outlines standard field operating procedures for collecting sediment, soil, and groundwater samples, surface and subsurface sediment sampling, drilling and sampling reconnaissance groundwater, analyzing samples, cleaning equipment, and managing waste. If procedures for a later stage of work deviate from the SAP, the deviations will be described in progress reports or the final report.

2 BACKGROUND AND PHYSICAL SETTING

The background and physical setting summarized below for the leased property have been obtained from site visits, interviews with the GHHSA, and review of past environmental reports.

2.1 Location

The Property (the upland property and the leased property) is located along the shoreline of the tidally influenced Chehalis River waterfront in Aberdeen, Washington. The leased property is located in the alluvial meander plain of the Chehalis River in the northwestern margins of the Willapa Hills physiographic region of southwest Washington. Located at 500 North Custer Street in Aberdeen, the site is approximately 2 miles upriver from Grays Harbor. The City of Aberdeen is situated in southwestern Washington, approximately 15 miles from the Pacific Ocean and approximately 70 air miles west-southwest of Tacoma, Washington. US Highway 101 and US Highway 105 are located less than 0.25 mile south of the site. The site is situated in sections 9 and 10 of township 17 north, range 9 west, Willamette Base Meridian, and occupies approximately 80 acres.

Figure 2 shows the Property Vicinity. The Property is located along the south shoreline of the Chehalis River, which enters Grays Harbor approximately two miles west of the Property. The

Property is bordered on the west by a former boat dock and marine service center; to the east by a log storage yard; to the north by the Chehalis River; and to the south by residential, commercial, and retail sites.

There was a waterfront sawmill (Former Mill Area) built over the leased property that was demolished between 2006 and 2008; the remaining upland Property structures are located in the center of the Property. Some structures, including a large overwater wharf, still exist in the leased property (see Figure 3).

The property leased from DNR by Weyerhaeuser and subleased by the GHHSA encompasses approximately 16.9 acres (see Figure 2). This leased property is the focus of this investigation. Weyerhaeuser maintained ownership of a contiguous portion of the former facility and continues to have adjoining tidelands and in-water property leased from DNR to the east of the Property (see Figure 2).

In the Former Mill Area, there is an approximately 100-by-200-foot pocket beach that is exposed at low tide and inundated to an existing bulkhead wall at high tide. Immediately upstream of the Former Mill Area is the Filled Tidelands area, and immediately downstream is the Dock Area, containing buildings and a dock structure.

2.2 Topography

According to the U.S. Geological Survey Aberdeen, Washington, 7.5-minute series topographic map, the Property is located at elevations near sea level along the shoreline up to approximately 20 feet above mean sea level. The topography northeast of Aberdeen gradually slopes upward toward the foothills and peaks of the Olympic Mountains. The topography to the east, southeast, and south consists of rolling hills.

Surface water bodies in the vicinity of the Property include the Chehalis River; the Wishkah River; one small, unnamed drainage channel that enters the Chehalis River beyond the east end of the Property; and Shannon Slough, which enters the Chehalis River at an embayment located in the middle of the leased property. The Chehalis River is tidally influenced and some areas of the leased property are periodically submerged at high tide. All surface water drainages in the area ultimately discharge to the Chehalis River.

2.3 Property Geology and Hydrogeology

This section presents a summary of the geology and hydrogeology for the leased property and surrounding area. The Property is located in the alluvial meander plain of the Chehalis River on the northwestern margins of the Willapa Hills physiographic region of southwestern Washington. The topography of the Willapa Hills is generally characterized by gentle rolling hills with straight, moderate slopes descending to wide valley floors.

The Chehalis River valley is filled with variable thicknesses of recent alluvium consisting of river-deposited gravels, sands, and silts. Near the ocean, the thicknesses of these alluvial deposits can be significant (greater than 100 feet) because of valley filling as rising sea levels decrease the ability of the river to transport sediments downstream. Well logs from resource protection wells in the vicinity of the Property indicate that alluvium in the area of the Property is at least 60 feet thick and consists of sands, silts, and clayey silts. Logs from borings located along State Highway 12 to the north indicate that the bedrock encountered below the alluvium is silt/sandstone.

Geologic logs from on-Property environmental borings indicate that silts are present at depths of 3 to 10 feet below ground surface in upland areas. In places, the native silt is overlain by fill comprised of wood debris, cobble- to boulder-sized rock, gravel, and sand. The depth to groundwater below the upland Property is approximately 5 feet below ground surface. Groundwater flow in the area is generally to the northwest; however, flow direction and gradient may be tidally affected. Cross sections from a 1951 map of the Property provided by Weyerhaeuser indicate that much of the area of the main mill facilities was tideland prior to, and during, the early development of the Property in the late 1800s and early 1900s. Most of the early Property structures were constructed on wood piling support platforms.

One water well within a 1-mile search radius of the Property was identified in the regulatory agency database search conducted by Environmental Data Resources, Inc. as part of the Level I environmental site assessment report (PES Environmental [PES], 2010). This well was a public water supply well operated by the City of Aberdeen. The well is located northwest of the Property, across the Chehalis River. There are no potable water wells or groundwater monitoring wells currently on the Property; however, groundwater monitoring wells were installed in the past. According to Weyerhaeuser, all of the monitoring wells previously installed at the Property have been decommissioned.

3 PREVIOUS INVESTIGATIONS AND DATA EVALUATION

The information summarized below has been obtained from interviews with the GHHSA and from review of environmental reports completed by Weyerhaeuser.

3.1 Property History

Sawmills operated on the upland property (directly south of the leased property) and the leased property since before 1900. The South Aberdeen waterfront has been developed for commercial and industrial use since the early 1890s. The piling (commonly referred to as a pile field) at the mouth of Shannon Slough marks the location of an early Aberdeen salmon cannery. In the late 1890s, the Aberdeen Lumber sawmill was constructed on the upland property with logs rafted along the shoreline to feed the mill. Aberdeen Lumber was later sold, becoming Schafer Brothers Lumber and Door Co. Mill #4. The business expanded, and so did its footprint. Schafer Brothers later sold the property to Simpson Timber Company. Weyerhaeuser acquired the Property in 1955 and operated several sawmills and associated support facilities through January 2009, when the mill known as the small log sawmill was permanently closed.

Currently, there are no active wood-products-manufacturing operations at the Property. Until the mid-1960s raw logs were brought to the Property in log rafts on the Chehalis River and tied up to pilings in the river in front of the Big Mill. After the mid-1960s, raw logs were brought to the Property by truck and staged on log decks at various locations in and adjacent to the Property. The Big Mill was originally configured to manufacture shingles and slats for housing construction. During World War II, the Big Mill was converted for manufacturing ship keels for the war effort. The precursor to the small log mill was added in 1972; small log mill operations were performed in the upland portion of the site outside of the leased property. The last upgrade to the small log mill took place in 2003. In 2006, the Big Mill and attached finger pier were closed; the associated structures were removed from the Property between 2006 and 2008. This area is now known as the Former Mill Area. The Property continued to operate the small log mill into early 2009. The operational history of the Property is detailed in the Level I assessment (PES, 2010). The GHHSA acquired the upland property on March 29, 2013.

3.2 Leased Property Activities

Former facility operations in the leased property, with demonstrated or potential environmental impacts, are discussed below. These former operational areas of interest will be carried forward for further evaluation. Upland facility operations are not included in this discussion but are detailed in the Level I environmental site assessment (PES, 2010). The areas of interest identified below are identified on Figure 3.

3.2.1 Former Mill Area and Pocket Beach

The mill was originally constructed on pilings over the Chehalis River and the pocket beach area. Mill facilities and equipment were installed over plank flooring. Before 1970, there was no spill protection to prevent spills on the flooring from falling into the river below. In the mid-1970s, Weyerhaeuser reportedly reworked the flooring to prevent releases through the planking. Beginning in approximately 1980, containment pans were installed beneath all mill hydraulic components.

The original mill at the Property was closed in 2006 and was removed between 2006 and 2008, exposing the River and pocket beach. Over 1,000 creosoted wood pilings were also removed from this area during mill demolition. Creosote-treated piles can be harmful and toxic to aquatic species. Therefore, the removal of the creosote-treated pilings has been a major focus of DNR's Restoration Program and has also been used in the regulatory process to generate mitigation credits. Since removal of the mill and pilings, debris in the Chehalis River, the pocket beach area has been colonized by vegetation characteristic of wetland environments, such as cattail (Typha sp.) and rushes (Juncus sp.). This location in the river has also been observed to be a depositional area with debris including loose pilings and household appliances floating downstream and becoming lodged against the wharf.

Several environmental investigations have focused on the pocket beach area; sediment analytical data are presented later in this report.

3.2.2 Lumber Shed

The lumber shed located in the northwest corner of the property was used to store finished products. Historically, an iron fuel-oil tank was used to supply the fuel-oil-fired internal combustion engine powered cranes that were located at the west end of the wharf. According to the GHHSA staff, a fire destroyed much of this area in 1965.

3.2.3 Former Boiler

Wood-fired boilers were located adjacent to the powerhouse at the east end of the wharf. The boilers contained asbestos that reportedly was removed during demolition of the mill. One transformer is currently present at the powerhouse, and is not known to contain PCBs. The powerhouse has been cleaned and a vault below the powerhouse has been cleaned and filled with pea gravel. An oil house was also located next to the powerhouse.

3.2.4 Shannon Slough

Shannon Sough meanders from south to north across the property, through an oil/water separator, and discharges into the Chehalis River next to the former chip area. Shannon Slough receives stormwater runoff from the property, residential areas, and the highway. The upland Property National Pollutant Discharge Elimination System (NPDES) sampling location is at the outfall along the west bank of the slough. Past releases of paint waste to Shannon Slough in 1989 resulted in a Clean Water Act conviction and subsequent remediation activities (see PES, 2010). Shannon Slough discharges to the Chehalis River in the leased property, forming a small deltaic feature. Multiple pilings are present in the mudflats along the northeastern portion of the slough.

3.2.5 Tidelands and Beach Area

Along the Chehalis River, the area between the Former Mill Area (pocket beach) and the mouth of Shannon Slough consists of former tidal flats that historically were filled with unknown types and quantities of debris, including construction debris and woodwaste.

3.3 Property Investigations

Sediment data from the vicinity of the leased property, dating back to 1999, were made available to MFA and are summarized below. Historical sample locations are shown on Figure 3.

3.3.1 Chehalis River Sampling

In 1999, Ecology conducted a sediment quality investigation on the Chehalis River (Ecology, 1999). Two of the samples collected during this investigation were taken from the leased property (see

Figure 3 for historical sample locations [samples 7S and 14S]). Samples were analyzed for all SMS compounds and for the presence of wood debris. There were no exceedances of the SMS, and no woodwaste accumulations were observed.

3.3.2 Level I Environmental Site Assessment

In August 2010, PES prepared an extensive Level I environmental site assessment. The document summarized past releases of contaminants to the leased property, including the following:

- In 1989, red-end paint wastes (containing 1,1,1-trichloroethane and naphthalene) were released to Shannon Slough, resulting in a U.S. Environmental Protection Agency (USEPA) fine and cleanup action. PAHs; pentachlorophenol; and benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected in sediments, but PCBs were not.
- In 1992, storm system sediments (in catch basins and oil/water separators) were evaluated. Aroclor 1260 was detected at 959 parts per billion at CB-1, located southwest of the planer. PAHs and BTEX were commonly detected in sediments, with dibenzofuran, phenol, and 2- and 4-methylphenol detected at the catch basin at the main shipping shed (located upland). Stormwater outfalls locations will be evaluated during the field investigation.
- Between 2006 and 2008, the Big Mill (which sat over the pocket beach area) was demolished. Over 1,000 piles were removed during the demolition.
- The facility stormwater pollution prevention plan significant spills report lists three spills: a June 2001 release of 17.5 gallons of hydraulic oil (with 1 gallon spilling into the Chehalis River); an August 2002 release of 4 gallons of hydraulic oil to the Chehalis River; and a March 2005 release of 50 gallons of diesel fuel to land near the stacker (in the upland area).
- The Big Mill, originally constructed in 1924, contained hydraulic equipment installed over plank flooring. Drip pans were installed under the hydraulic equipment in approximately 1980.

Numerous Recognized Environmental Conditions were also identified in the Level I environmental site assessment on the upland portion of the Property (PES, 2010).

3.3.3 Phase II Environmental Site Assessment

In April 2011, Science Applications International Corporation (SAIC) conducted a soil and sediment investigation at the leased property (SAIC, 2011) on behalf of DNR. Three composited sediment samples were collected in the Dock Area immediately downstream of the 1999 Ecology sample locations (see Figure 3). The surface sediment samples were analyzed for all SMS constituents and for the presence of wood debris and dioxins. Butyl-benzyl phthalate was detected at a concentration slightly above the sediment quality standard screening level. No accumulation of wood debris was encountered in the Dock Area. Surface sediment dioxins with a toxicity equivalence quotient (TEQ) of 6.1 picograms per gram (pg/g) were detected in the Dock Area.

SAIC also collected surface and subsurface sediments in the Former Mill Area (see Figure 3). Fine wood debris was encountered in surface sediment at two of the three locations, with woodwaste observed in all subsurface sediment throughout the length of the cores (i.e., 5 feet below mudline [bml]). Surface and core sediment samples from all three locations were tested for SMS chemicals. A composite of the three surface samples was analyzed for dioxins. The reported TEQ was 68 pg/g. Two of the sample locations had initial surface mercury detections in excess of the SMS cleanup screening level (CSL). Subsequent averaging with split samples collected by Weyerhaeuser found that the surface mercury concentrations exceeded the sediment quality standard, but were below the CSL. One of the sample locations had surface exceedances of the SMS CSL for bis(2-ethylhexyl) phthalate and 1,4-dichlorobenzene. There were also concentrations of several chemicals in subsurface sediment above SMS CSLs. Note, however, that surface sediments are the point of compliance for SMS (Ecology, 2008).

SAIC further collected six soil borings from the filled tidelands area to depths of 5 feet bgs (see Figure 3 for locations SB1 through SB6). Generally, the soil cores were observed to have dark brown, sandy sawdust at a depth of approximately 4 to 5 feet bgs, overlain by light brown sawdust and wood chips. Soil samples were analyzed for MTCA Method A constituents (up to three sample depth horizons per location) and two composite soil samples from each of the filled tideland areas were analyzed for dioxins. No chemicals were detected above MTCA Method A criteria, with the exception of motor oil at 1.5-3 feet bgs and 3-5 feet bgs at sample location SB-6. The dioxin TEQs for the composite soil samples collected in the filled tidelands were 13.5 pg/g and 2.37 pg/g for the composite samples from locations SB1-SB3 and SB4-SB6, respectively.

3.3.4 Water Investigation Report

In January 2010, Floyd|Snider evaluated water quality at the upper pocket beach area under the former mill. After evaluating the seeps and river water, the study concluded that the water coming from the seeps does not have the same general chemical parameters as the river water, suggesting that the seeps are not bank storage of river water captured during high tide, but are more likely related to groundwater discharge. Analytical data showed low-level detections of metals and TPH at the stormwater outfall and seep locations, and samples were non-detect for volatile organic compounds. Also, the study indicated that an intermittent sheen previously observed at one of the seeps in 2009 was not observed during the Property visit in January 2010.

3.3.5 NPDES Data Review

When the facility was active, stormwater was managed under an NPDES industrial stormwater permit administered by Ecology (Permit Nos. SO3001015 and WAR001015). Data from the facility NPDES stormwater program obtained from the Ecology Water Quality Permitting and Reporting Information System (PARIS) were retrieved. Between 2003 and 2007, the facility had benchmark exceedances for pH, turbidity, biological oxygen demand, and zinc. The PARIS database was searched for NPDES data on August 1, 2014; not all facility NPDES data were available in the database.

3.3.6 Leased property Sediment Sampling

In November 2013, MFA collected sediment samples from six locations. As a condition of aquatic lands lease renewal, DNR required this additional sediment sampling in the Former Mill Area (pocket beach) and in the Chehalis River at the leased property. Data that were originally presented in the sediment sampling report (MFA, 2014) are presented below and address Ecology's e-mailed comments on the sediment sampling report (Ecology, 2014a).

Table 1 presents all data collected during the MFA sampling event as reported by the analytical laboratory (i.e., dry weight values only). Table 2 summarizes data collected from locations in the Chehalis River, where the data are compared with SMS marine dry-weight (for metals and polar organics) or organic carbon corrected (for nonpolar organics) criteria, as appropriate. Table 3 summarizes data from the Former Mill Area; however, because the organic carbon content was very high, it is not appropriate to organic carbon-normalize the data (i.e., it is not recommended that these data be normalized with an organic carbon content outside the range of 0.5 to 3.5 percent) (Ecology, 2013b). These data are instead compared to dry-weight SMS marine criteria or, when dry-weight SMS criteria are not available, the Ecology Marine Sediment apparent effects thresholds (AETs).

3.3.6.1 Chehalis River Samples

Surface sediment samples were analyzed for SMS constituents with marine criteria, dioxins, and TOC. No impacts, including woodwaste, were observed in surface sediments collected in the Chehalis River portion of the leased property. Therefore, analysis was not conducted for conventional parameters used to evaluate toxicity in sediment impacted with woodwaste. Only one chemical (4-methylphenol at CR-02) was detected marginally above the SMS screening criterion.

Bioaccumulative compounds PCBs, PAHs, and dioxins were detected in Chehalis River sediment. PCBs were detected at a laboratory-estimated dry weight concentration of 12 micrograms per kilogram (ug/kg) dry weight (374 ug/kg organic carbon normalized) in CR-02, the same location where 4-methylphenol exceeded screening criteria (see above). PCBs were also detected in storm system solids during the 1990s (PES, 2010). Note that PCBs are ubiquitous and are frequently present in the aquatic environment; however, because nearby Chehalis River sediment samples in the Ecology EIM database generally had elevated reporting limits for PCBs, a comparison of the PCB concentration at CR-02 with existing Chehalis River PCB analytical data was not possible.

Dioxins were detected at all locations in the Chehalis River, with TEQs ranging from 12.4 pg/g to 15.8 pg/g dry weight. These TEQs are within an order of magnitude of the average dioxin TEQ (2.38 pg/g dry weight) in nearby Chehalis River samples found in the EIM database.

PAHs were detected at low concentrations near method reporting limits.

3.3.6.2 Former Mill Area Samples

DNR and Ecology requested sampling in the Former Mill Area to further delineate historical elevated concentrations of butyl benzyl phthalate, pentachlorophenol, mercury and dioxins (DNR, 2012). Sediment cores were analyzed using a tiered approach and the list of analytes included mercury, dioxins, PCBs, SVOCs, and petroleum hydrocarbons. Analysis for conventional parameters (TOC, total volatile solids, total solids, ammonia, total sulfides, and percent fines) was conducted on surface sediment samples and some subsurface sediment containing more than 25 percent woodwaste by volume.

Accumulations of woodwaste (greater than 25 percent) were observed in all locations in the Former Mill Area. In addition, sheen, petroleum-hydrocarbon-like odor, and dark-colored water or water-non-aqueous phase liquid (NAPL) mixtures were observed below approximately 1 foot bml at all three locations.

Because organic carbon contents were high (between 13 percent and 36 percent in surface sediment), organic carbon normalization was not performed on data from these locations (i.e., CR-04, CR-05, and CR-06). Instead, the dry weight results were compared with the Ecology Marine Sediment AETs (dry weight).

Exceedances of screening criteria in surface sediment include the following:

- Mercury exceeded the AET SCO in surface samples CR-04 and CR-06, and exceeded the CSL at CR-04.
- Total PCBs exceeded the AET Sediment Cleanup Objective in surface sediment at CR-04 and CR-05 (PCBs were not analyzed in surface sediment at CR-06).
- Benzoic acid exceeded the SMS CSL in surface sediment at CR-04 and CR-05 (Benzoic acid was not analyzed in surface sediment at CR-06).
- Phenol exceeded the SMS Sediment Cleanup Objective at CR-05.
- Several SVOCs exceeded the AET screening levels in surface sediment.

Concentrations generally increased in the subsurface samples collected between 1 and 2.5 feet bml. Bioaccumulative chemicals PCBs, dioxins, and PAHs were detected in surface sediment. In subsurface sediment (1 to 2.5 feet bml), concentrations of dioxins, PCBs, SVOCs, PAHs, and TPH generally increased relative to surface sediment concentrations.

Concentrations of dioxin TEQs in surface sediment in the Former Mill Area ranged from 27.2 pg/g dry weight to 68.9 pg/g dry weight, somewhat elevated relative to nearby Chehalis River dioxins found in the EIM database, with average dioxin TEQ of 2.38 pg/g dry weight. Subsurface concentrations ranged from 44.4 pg/g dry weight to 370 pg/g dry weight and appear to be substantially elevated relative to other Chehalis River samples.

PCB concentrations in surface sediment were 180 ug/kg dry weight and 200 ug/kg dry weight, while subsurface concentrations increased to between 690 ug/kg dry weight and 1,170 ug/kg dry weight. Elevated PCB method reporting limits prevent an appropriate quantitative evaluation of samples historically collected nearby in the Chehalis River. However, relative to CR-02, the Chehalis River sample collected during this sampling event, the PCB concentrations in the Former Mill Area appear to be substantially elevated.

Similarly, PAH concentrations in surface sediment (total PAHs ranging from 2,580 ug/kg dry weight to 4,680 ug/kg dry weight) are elevated relative to Chehalis River samples collected during this sampling event (CR-01, CR-02, and CR-03, ranging from 101micrograms per kilogram [ug/kg] dry weight to 705 ug/kg dry weight), and concentrations increase in the subsurface in the Former Mill Area.

TPH was detected in the diesel and motor-oil range in all samples collected in the Former Mill Area. Concentrations were higher in subsurface sediment, and all locations except surface sediment at CR-05 were above the Model Toxics Control Act residual saturation screening level (i.e., 2,000 mg/kg), suggesting the presence of NAPL. All locations had concentrations above the diesel-range SMS freshwater sediment CSL (i.e., 510 mg/kg).

All samples collected in the Former Mill Area contained more than 25 percent woodwaste by volume. Scoring of the woodwaste according to the DNR guidance (Integral, 2011) resulted in scores ranging from "Medium Concern" to "High Concern" (MFA, 2014), indicating potential for adverse ecological impacts.

3.3.6.2.1 Station Cluster Analysis

A station cluster is defined as any number of sample locations (stations) that are determined to be spatially and chemically similar (WAC 173-204-510). Sediments in the pocket beach portion of the Former Mill Area fall into this category, and are well suited for station cluster analysis. A brief station cluster analysis was presented in the Phase II data interpretation memo prepared by Floyd|Snider (2011), and found that mercury concentrations possibly identify this area as a cluster of *potential concern*. A station cluster analysis is presented below, using the more recent 2013 sediment data collected by MFA in the pocket beach portion of the Former Mill Area (i.e., stations CR-04, CR-05, and CR-06) (see Figure 3).

As described in WAC 173-204-510(2), station cluster analysis identifies three stations in the station cluster with the highest concentration of each chemical. An average concentration for the chemical is calculated from the three stations, and if this average concentration exceeds the applicable CSL in WAC 173-204-562 (marine sediment), then the station is defined as a station cluster of potential concern.

Additionally, a station cluster can be defined as a station cluster of potential concern for other deleterious substances such as woodwaste and dioxins. While numerical criteria do not exist for woodwaste or dioxins, WAC 173-204-562 states that "[deleterious substances] shall be at or below levels which cause minor adverse effects in marine biological resources."

Consistent with previous findings and based on numerical criteria and the presence of deleterious substances that are elevated relative to natural conditions, the following suggests that the pocket beach is a station cluster of potential concern:

- Mercury concentrations (average surface sediment concentration of 2.3 mg/kg compared to the SMS CSL of 0.59 mg/kg)
- Benzoic acid concentrations (average surface sediment concentration of 1,325 ug/kg compared to the SMS CSL of 650 ug/kg)
- Elevated concentrations of bioaccumulatives, e.g., dioxins and PCBs
- Woodwaste (average of 55 percent by volume in surface sediment) and associated toxicity scores of medium and high concern

Station clusters of potential concern shall be further evaluated using the hazard assessment standards of WAC 173-204-520.

4 CONCEPTUAL SITE MODEL

The CSM describes the physical and chemical conditions, potential chemical sources, release mechanisms, environmental transport processes, and potential exposure pathways and receptors (WAC 173-34-200) at the leased property. The primary purpose of the CSM is to identify contaminant sources and migration, to describe pathways by which human and ecological receptors may be exposed to Property-related chemicals in the environment, and to facilitate planning of effective cleanup and elimination of sources of potential recontamination. According to the USEPA, a complete exposure pathway consists of four necessary elements: (1) a source and mechanism of chemical release to the environment; (2) an environmental transport medium for a released chemical; (3) a point of potential contact with the impacted medium (referred to as the exposure point); and (4) an exposure route (e.g., incidental sediment ingestion) at the exposure point (USEPA, (1989).

Potential source areas and chemical release and transport mechanisms that can allow chemicals to migrate to potential receptors are summarized for the leased property. In addition, a discussion of significant exposure points, pathways, and potential receptors for the leased property is presented separately in individual sections. The human health and ecological CSM depicting exposure pathways and potential receptors is shown in Figure 4.

4.1 Sources

Suspected historical sources of sediment impacts at the leased property include releases from the overwater mill and upland operations related to wood-processing. Potential historical sources include:

- Spills from the overwater sawmill hydraulic equipment previously located in the leased property.
- Releases to sediment from overwater structures currently and formerly located in the leased property.
- Releases from upland Property operations that migrated to the leased aquatic land via stormwater or groundwater transport. Petroleum products, antifreeze, various oils and lubricants, boiler treatment chemicals, anti-sapstain mixtures (that contained PCP until approximately 1986), inks, red end paint (until the early 1990s), and paints and solvents were used and/or stored during Property operations.
- Wood-fired boilers and two wood refuse burners identified at the site. Operation of this equipment is associated with dioxin formation; the historical disposition of boiler ash at the site is unknown (PES, 2010).
- PCB-containing equipment supporting site operations was historically present. Note all PCB-containing transformers and light ballasts were removed from the site between 1990 and 2001 and USEPA identified no other PCB-containing equipment at the site in 2006 (PES, 2010).
- Background sources (see Section 4.1.1 below), including stormwater discharge to Shannon Slough.

Accumulations of woodwaste can be a source of substances that are deleterious to the aquatic environment. Impacts from woodwaste include the physical presence of the woodwaste, decreased dissolved oxygen concentrations in sediment, and increased concentrations of woodwaste decomposition products, such as sulfides, ammonia, and phenols, that can cause or contribute to toxicity (Ecology, 2013a).

4.1.1 Background Sources

In addition to former mill-related sources, upstream or ubiquitous sources of chemicals and deleterious substances have the potential to impact the aquatic leased land. The Chehalis River has a long history of industrial activity that could result in the release of contaminants and wood debris similar to what has been observed at the leased property. Shannon Slough, which discharges to the Chehalis River, receives considerable stormwater input from roads and neighborhoods upgradient of the Property. Further, persistent organic pollutants such as dioxins and PCBs are known to be widespread in the environment.

Dioxins are widespread in the environment and can result from both natural and anthropogenic sources (USEPA, 2006). The area around the leased property is an urban environment where industrial activity has been conducted and a city has been established for over 100 years. In urban areas, dioxins can result from vehicle emissions, back-yard trash burning, structure fires, stormwater runoff, and other common events and activities. Therefore, low levels of dioxins are commonly present in sediment because of natural and/or non-point anthropogenic activities.

PCBs are a class of persistent, bioaccumulative, and toxic compounds that historically had a wide range of uses, including electrical transformers, hydraulic systems, lubricants, surface coatings, adhesives, plasticizers, inks, insulating materials, pesticides, and consumer products (Ecology, 2014b). In the Puget Sound, surface runoff is the largest pathway to aquatic environments, followed by wastewater treatment plants and air deposition. PCBs are ubiquitous throughout the natural environment, including sediment, and are found in animal tissue throughout the food chain.

Metals, including mercury, are naturally occurring elements in the environment, and can be concentrated by human activities. The distribution of naturally occurring metals is controlled by geologic processes that occur across different physiographic regions. Metals are commonly transferred to the marine environment from sewage treatment facilities, atmospheric deposition, and continental weathering.

To evaluate nearby concentrations of these compounds, existing Chehalis River sediment data collected within 1 mile of the Property were queried from Ecology's EIM database; 46 sample locations were identified (MFA, 2014). Minimum, maximum, and average concentrations are summarized below. Note that data from the nearby Chehalis River sediment are used for comparison purposes only and are not considered background concentrations. A refined background evaluation will be conducted to identify natural and/or regional background consistent with the SMS, as appropriate, as part of the RI:

- Twelve of the 46 nearby samples were analyzed for dioxins. Dioxin TEQs were calculated for the EIM data, resulting in a minimum TEQ of 0.36 pg/g, a maximum TEQ of 7.82 pg/g, and an average TEQ of 2.38 pg/g.
- Twenty-five of the samples were analyzed for PCBs. PCBs were not detected in any of the samples evaluated; however, many reporting limits were elevated compared to those currently achievable and attained for Property samples. Reporting limits ranged from 0.64 ug/kg to 69 ug/kg, with an average reporting limit of 21.5 ug/kg.
- Thirty-four of the samples were analyzed for mercury. Mercury concentrations ranged from not detected at a reporting limit of 0.008 mg/kg to a maximum concentration of 0.14 mg/kg. The average mercury concentration was 0.05 mg/kg.

4.2 Contaminant Transport

Potential upland contaminant transport mechanisms to the aquatic environment have not been investigated in some areas of the Property, e.g., the Former Mill Area. Groundwater and stormwater flow to surface water and sediment are potentially complete transport pathways to the leased property, necessitating further evaluation.

Stormwater discharges to leased property sediments have the potential to transfer contaminants to areas adjacent to stormwater outfalls at the pocket beach and Shannon Slough, as well as through overland flow. Existing stormwater analytical data described in Section 3.3.4 above suggest an incomplete pathway because of minimal contaminant transport via these mechanisms. To evaluate potential contaminant transport via stormwater, additional stormwater sampling and analysis will be conducted in the Former Mill Area as part of the RI.

Groundwater in the leased property has not been evaluated, but likely discharges to leased property sediment and the Chehalis River. A previous study in the pocket beach area determined that water originating from seeps in the pocket beach area had a different chemical signature than Chehalis River water, suggesting that the seeps do not represent bank storage of river water inundated during high tide (Floyd|Snider, 2010). It is likely that the seeps are fed by upland groundwater, and reconnaissance borings during the RI fieldwork are proposed to evaluate groundwater characteristics in this area. However, an opportunistic seep sample may be collected during low tide to confirm seepage is groundwater (see Section 6.2.3). If a representative seep sample is collected, groundwater sampling will not be conducted. At this time, groundwater is considered a potentially complete transport pathway.

Transport mechanisms operating at the leased property include deposition to sediment from former facility operations, outfall discharge to sediments, stormwater runoff to sediments, atmospheric deposition to sediments, sediment erosion caused by waves, erosion of sediment caused by propeller wash, water current sediment erosion, and food chain transfer originating from impacted media.

In sediments, physical transport of contaminants can be upward (advection/diffusion, ebullition), downward (advection/diffusion, burial), or lateral (resuspension/deposition); bioturbation caused by benthic organisms can further displace or mix contaminants. In water, contaminants can move by the same advective and diffusive forces operating in the sediment, by sorption to/from sediments resuspended by currents or scour events, or via bioturbation (e.g., releases from sediment to the water column).

The relative importance of the above processes will vary, depending on the chemical and physical properties of a released contaminant. The properties of sediment and the dynamics of groundwater flow also shape contaminant fate and transport. The most significant site-specific transport mechanisms are discussed further below.

A number of processes, including water flow, wave erosion, and propeller wash, have the potential to impact sediment transport in the Chehalis River. Since this reach of the Chehalis River is tidally influenced, some sediment resuspension likely occurs during the ebb and flood of the tides. Wind waves are not anticipated to be a significant mechanism for erosion in the Chehalis River. Wakes from passing vessels will be larger and are a potential factor for sediment movement. Wakes from vessels common to this reach of the river can range from 1 foot to 2.5 feet. Portions of the leased property in the Chehalis River are potentially vulnerable to erosion from propeller wash where vessels are anticipated to operate. Wakes from passing vessels have the potential to resuspend fine materials in water depths of less than 8 feet.

High-percentages fine-grained sediment (silt and very fine sand) indicate that the Chehalis River is a low-energy depositional environment in the pocket beach area, and observations of sand-sized clasts suggest that the river is a medium-energy environment in other portions of the leased property. Sediment resuspension and redistribution due to river and wave energy inputs is not expected to be a significant transport mechanism in the pocket beach area (where concentrations are elevated), as evidenced by significantly reduced or non-detected chemical concentrations both upstream and downstream of the pocket beach area. Evidence of significant sediment accumulation in the Chehalis River near the leased property also indicates potential for long-term improvement of chemical concentrations in surface sediment via natural recovery (i.e., deposition) processes.

4.3 Exposure Scenarios

Public use and access to the leased property are currently limited. The GHHSA staff occupies the office building and use other structures remaining on Property. The upland portion of the Property is proposed for future use as the homeport for the *Lady Washington* and *Hawaiian Chieftain* tall ships as part of a new maritime heritage facility called Seaport Landing. Visitors to the Property will include staff who work at the facility, as well as visitors from among the public, including children.

The Property is currently zoned by the City of Aberdeen for industrial use. According to DNR, the leased property's only permitted uses are a process mill, chip storage, log storage, and a shipping pier.

The Chehalis River offshore of the leased property is a relatively shallow, slow-velocity river that is frequented by industrial marine users, recreationists and is habitat to aquatic animals, including threatened bull trout, waterbirds such as the great blue heron, and aquatic mammals such as the river otter.

Potentially complete exposure pathways for human health and ecological receptors are described below and are presented in Figure 4.

4.3.1 Human Health CSM

The principal human receptors that have the potential to contact sediment in and offshore of the leased property in the Chehalis River are described below.

- Property users. Current and future users of the upland areas, occupational workers and public visitors, may come into contact with the aquatic leased lands portion of the Property. Occupational workers may come into contact with the Chehalis River while maintaining the area. Future visitors may come into contact with the aquatic leased lands portion of the Property while touring and exploring the Property. While these Property users may come into direct contact with leased property sediment and surface water, the exposure is anticipated to be occasional and incidental. However, because development plans for the Property will evolve over time and the exposure of Property users to nearshore sediment and surface water may change over time, the exposure scenarios are considered potentially complete.
- Recreationists. The water recreation scenario includes activities related to operation of personal watercraft and assorted beach and water activities. Individuals may come into contact with sediment and surface water while operating vessels; however, exposure is

expected to be generally limited to contact with sediment and surface water while entering and exiting the water. Swimming is not a common activity in the area, given boat traffic and dangerous currents; any limited swimming that does occur is likely significantly limited in duration and frequency given Aberdeen weather conditions. Current and reasonably likely future recreational use is not expected to change significantly in the foreseeable future. Because recreational activities do not result in significant exposure to sediment and surface water near the site, exposure of recreationists to Property-related impacts is considered insignificant.

- Fishers. Fishers generally angle near the leased property by boat or from nearby shorelines, using hook and line. The shoreline is not conducive to shore fishing. Fishers may include adults and children. Fish may be caught for personal consumption by sport fisherman and tribes during permitted times of the year. There are no commercial fishing operations on the Chehalis River. Because of the strongly hydrophobic nature of the chemicals of interest, exposure to fishers via surface water is not expected to be a significant pathway. The primary exposure media for potential fishers are aquatic biota; direct contact with surface water and sediment is considered an insignificant pathway.

4.3.2 Ecological Receptor CSM

Water-dependent ecological receptors, including plants, benthic invertebrates, fish (piscivorous, omnivorous, and benthivorous), piscivorous mammals, and piscivorous raptors are the ecological receptors most likely to become exposed to Property-related impacts.

Relevant exposure media for ecological receptors include sediment and also fish tissue (for receptors at higher trophic levels). Plants, benthic invertebrates, fish, birds, and mammals may all be exposed to chemicals present in sediment. Specifically, plants and benthic invertebrates may be exposed to chemicals through direct contact with and uptake from sediment; fish may be exposed to chemicals through direct contact with sediment and ingestion of food that has accumulated contaminants. Birds and mammals may be exposed to chemicals through incidental ingestion of sediment and consumption of food that has accumulated the contaminant. Although birds and mammals may have some dermal exposure to chemicals in sediment, this exposure route is considered insignificant because of external protection such as fur and feathers.

4.3.3 Exposure Scenario Summary

The following exposure pathways and receptors are considered complete or potentially complete and are selected for further evaluation:

- Occupational worker and Property visitor direct contact with sediment and incidental sediment ingestion
- Fisher secondary ingestion (consumption of chemicals in tissue of aquatic biota)
- Benthic invertebrate and fish uptake of chemicals in sediment, pore water, and surface water

- Bird or mammal secondary ingestion (consumption of chemicals in aquatic prey)

5 FEASIBILITY STUDY

The purpose of the FS is to develop and evaluate alternative cleanup actions to enable selection of the most feasible and protective of these for the leased property (WAC 173-340-350). The FS will include cleanup action alternatives that protect human health and the environment by eliminating, reducing, or otherwise controlling risks consistent with WAC 173-204-570 for sediment cleanups, as necessary.

Unacceptable risks to human health and the environment have not been established and additional data collection is proposed in this work plan (see Section 6). However, based on review of historical results presented in Section 3, DNR, in consultation with Ecology, determined that an RI/FS is appropriate for sediments at the leased property. At present, the only area of the leased property that is classified as a cluster of potential concern (see Section 3.3.6.2.1) is the Former Mill Area. Therefore, this feasibility study work plan is limited to evaluation of this area. The study area of the RI/FS may be expanded upon receipt of RI results and final definition of the Site as defined under MTCA.

Potential remedial action objectives (RAOs) for the Former Mill Area have been identified and a preliminary range of remedial actions and associated technologies identified for sediment is discussed in the following text. The purpose of identifying potential remedial actions is to: (1) inform the sampling and analysis proposed in this work plan, and (2) to provide a general classification of potential remedial actions based on the exposure scenarios that have the potential to result in unacceptable risk to human health or ecological receptors.

5.1 Preliminary Remedial Action Objectives

During the FS, potential response actions are selected and evaluated relative to their ability to achieve site-specific RAOs. The RAOs are proposed goals for protecting human health and the environment and provide the framework for evaluating remedial action alternatives. Preliminary RAOs for the Former Mill Area related to the protection of human health and the environment, as required by Ecology, are as follows:

- Prevent, mitigate, or reduce potential human health and ecological exposure to Site-related impacts.
- Prevent or minimize transport of Site impacts in sediment to other parts of the Chehalis River.
- Protect ecological habitat and beneficial uses of surface water.

Further, DNR may identify additional RAOs for the Former Mill Area. DNR is charged with management of state-owned aquatic lands and must provide a balance of public benefits for all citizens of the state (RCW 79.105.030). Public benefits include: (1) encouraging direct public use and access, (2) fostering water-dependent uses, (3) ensuring environmental protection, and (4) utilizing renewable resources. The present lease (Commencement Date of March 11, 2000 and fully executed on September 13, 2001) describes obligations to be demonstrated upon termination. The lease requires that the property be in the "same or better condition" as it was on the Commencement Date. In a March 30, 2012 letter from Weyerhaeuser to DNR, Weyerhaeuser stated that it ". . .is not aware of any Hazardous Substances that have been released or deposited on the Property during the Term".

RAOs may be expanded or refined based on results of the RI.

5.2 Feasibility Study

The FS will identify and review cleanup action alternatives that are applicable to the conditions in the Former Mill Area. The current understanding of the Former Mill Area is that there is at least four feet of wood waste (sawdust, bark chips, occasional dimensional lumber), pockets of NAPL, and elevated concentrations of chemicals. The most significant impacts are in the subsurface, below approximately 1 foot bml. The vertical and lateral extent of impacts is unknown. Further, it is not known whether there are any ongoing sources of impacts to the Former Mill Area (e.g., via groundwater or storm water). Delineation of extent and evaluation of sources of contamination are objectives of the RI given that upland source control is a key component of any in-water remedy.

Sediment cleanup actions will meet the following minimum requirements, (WAC 173-204-570):

- Protect human health and the environment.
- Comply with all applicable laws.
- Comply with sediment cleanup standards established in the RI.
- Use permanent solutions to the maximum extent practicable.
- Provide for a reasonable restoration time frame; preference will be given to alternatives with a shorter restoration time frame.
- Where source control measures are necessary as part of a cleanup action, preference shall be given to alternatives that include source control measures that are more effective in minimizing the accumulation of contaminants in sediment caused by discharges.
- Not rely exclusively on monitored natural recovery or institutional control where it is technically possible to implement a more permanent cleanup action.
- Where institutional controls are used they must comply with WAC 173-340-440 and will consider aquatic state land use classification under WAC 332-30.

- Provide an opportunity for review and comment by affected landowners and the general public.
- Provide adequate monitoring to ensure the effectiveness of the cleanup action. Preference will be given to alternatives with a greater ability to monitor the effectiveness of the cleanup action.
- Provide for periodic review to determine the effectiveness and protectiveness of cleanup actions.

5.2.1 Cleanup Action Considerations

During the FS, additional data may be necessary or required in order to evaluate potential remedial actions. The following are key considerations in selecting the most appropriate actions in the Former Mill area:

- Nature and extent of contamination – Upon delineation of the extent of impacts, the area and volume of impacted material will be estimated, and that estimate will be used in the evaluation of cleanup alternatives. The vertical delineation will be corrected for compression resulting from sample collection methods (e.g., vibracorer or direct-push technologies).
- Material classification – the classification of the impacted material has significant impact on the options and costs associated with removal, handling, and disposal. A preliminary classification of the material indicates that there is a possibility that, if excavated, the waste will be classified as hazardous due to lead and mercury concentrations. Sampling conducted during the RI will further inform the designation of the material.
- Regulatory preference – Based on communications with Ecology and DNR, and Ecology guidance documents, these agencies have a preference for removing wood waste from the marine environment (Ecology, 2013). Regulatory preference should be addressed upfront in order to streamline the FS if Ecology and DNR will require removal as a presumptive remedy.
- Recontamination potential – the Former Mill Area is a depositional area of the Chehalis River and receives stormwater, and possibly groundwater, discharge. Potential sources of impacts to the Former Mill Area will be characterized during the RI such that cleanup alternatives are evaluated within the context of the greater Chehalis River, potential contributions from the Upland property, and more discrete stormwater and groundwater inputs.

5.2.2 Potential Cleanup Actions

The cleanup actions proposed for evaluation include the following, either as stand-alone actions or as a component of the cleanup alternative:

- Administrative controls (e.g., deed notifications)
- Engineering and institutional controls (e.g., fences and signage, chemical or biological treatment, isolation cap or barrier, enhanced natural recovery)
- Source control measures (e.g., stormwater or groundwater management, if appropriate)
- Removal actions (e.g., excavation with onsite or offsite disposal)

Preliminarily, the following specific actions have been considered as potentially appropriate for the Former Lumber Mill area, based upon understood requirements of both Ecology and DNR.

1. Monitored natural recovery and administrative controls: Natural recovery appears to be occurring. Wood waste and NAPL are not evident in surface sediment and chemical concentrations are lower in the surface than the subsurface sediment. Additional deposition would further improve surface conditions to achieve consistence with regional background conditions. Administrative controls would be considered to limit visitor access, exposure, and sediment disturbance. This cleanup alternative is particularly applicable if RI characterization indicates that there are no ongoing sources to the Former Mill Area, there is limited migration of impacts, and toxicity to benthos associated with the presence of wood waste is expected to be limited.

2. Enhanced natural recovery and administrative controls: Enhanced natural recovery is similar to the monitored natural recovery option identified above except that placement of a clean substrate would result in an immediate decrease in surface concentrations facilitating the re-establishment of benthic organisms, minimizing short-term disruption of the benthic community, and accelerating the process of physical isolation continued over time by natural sediment deposition, resulting in a shorter restoration timeframe.

3. Containment and administrative controls: An engineered isolation cap is expected to limit or eliminate exposure to deleterious substances to human and ecological receptors. This alternative may be appropriate if there is substantial toxicity to benthos stemming from wood waste, considerable migration of impacts, or unacceptable risk to human health or ecological receptors via consumption of chemicals that accumulate in tissue. This alternative may be particularly appropriate if RI characterization indicates that the volume of wood waste and the waste designation of the material make removal a less viable option.

   If the cap is designed such that the Former Mill Area remains a pocket beach that provides aquatic habitat, the cap would be engineered such that chemicals, NAPL, and deleterious substances associated with wood waste breakdown, such as ammonia and sulfides, would not be expected to express through the cap at levels that would result in unacceptable risk to human health and the environment. Cap configuration such as thickness, composition, and armoring would be determined using site-specific feasibility and/or land use determinations in conjunction with the RAOs. Potential configurations for isolation caps include: sand placed to a required thickness with armoring and scour protection; thin (or "low-profile") caps that employ organoclay, activated carbon, and/or apatite to limit migration of chemicals and deleterious substances; or a combination to meet RAOs and Property constrictions.

If the cap is designed such that the elevation no longer accommodates aquatic habitat, i.e., the area is filled to the grade of adjacent uplands, it is anticipated that a nearby mitigation project would offset the loss of aquatic habitat at this location. This option may be appropriate if it is determined that restoration work at a different location would better serve the Chehalis River ecological system.

Administrative controls would be required to prohibit disturbance of any of the engineered caps described above and ongoing monitoring would be performed to evaluate the effectiveness of the cap.

4. Removal and fill. Excavation of wood waste and contaminated media will be evaluated. Wood waste appears to be a minimum of 4 to feet thick in the Former Mill Area; therefore, it is likely that bank stabilization and/or fill would be required upon completion of excavation. Further, some enhanced natural recovery may be appropriate to manage any residual impacts. Administrative controls may not be necessary for this cleanup alternative.

5.3 Feasibility Study Report

The FS will summarize applicable results of the RI and will include the results of the RAO identification and cleanup action alternatives evaluation. The results of the FS will provide the basis for remedy selection by DNR and Ecology and will document the development and detailed analysis of remedial alternatives. The FS will apply remedy selection evaluation criteria as follows (WAC 173-340-360):

- Protectiveness – the degree to which existing risks are reduced, time required to reduce risk and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.
- Permanence – degree to which the alternative permanently reduces toxicity, mobility, or volume of hazardous substances.
- Cost – cost of implementing the alternative.
- Long-term effectiveness – the degree of certainty that the alternative will be successful, the reliability of the alternative, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.
- Management of short-term risks – risk to human health and the environment associated with the alternative during construction and implementation.
- Technical and administrative implementability- ability to implement including consideration of whether the alternative is technically possible.

- Consideration of public concerns – evaluation of any public concerns and the extent to which the alternative addresses those concerns.

For each alternative described in the FS, the report will include an assessment relative to each of the remedy selection evaluation criteria.

6 SCOPE OF WORK

This section describes the objectives and scope of work for the RI/FS. The field investigations will be completed consistent with the methods and protocol described in the SAP (see Appendix A).

6.1 RI Objectives

Consistent with the SMS, and as stipulated in WAC 173-204-550, the purpose of an RI/FS is to collect, develop, and evaluate sufficient information regarding a site or sediment cleanup unit for DNR and Ecology to establish sediment cleanup standards and select a cleanup action.

RI objectives as they relate to hazardous substances include the following:

- Information gathering with respect to physical site features that have the potential to contribute to or transport contamination, e.g., storm drain system.
- Identification and characterization of significant hazardous substance source areas in the leased property of the site. Source areas shall be characterized through a review of historical information; investigation results; and the collection of environmental samples for physical observation, field screening, and chemical analyses.
- Evaluation of contaminant migration pathways at the site. Key elements relevant to contaminant migration include, but are not limited to, the rate and direction of groundwater flow, preferential migration pathways, and sediment-river interactions.
- Determination of the nature, extent, and distribution of hazardous substances in leased property sediments, focusing on the vertical and lateral extent of contamination.
- Identification of all current and reasonably likely future human and ecological receptors at the site. Receptors shall include human and ecological receptors that may be exposed to hazardous substances at the site. This analysis should consider all relevant contaminant migration pathways and the nature, extent, and distribution of hazardous substances in affected media.
- Evaluation of the risk to human health and the environment from releases of hazardous substances at or from the leased property.

- Generation or use of data of sufficient quality for site characterization and risk assessment at the facility.
- Development of the information required for evaluating and designing source control measures or remedial actions to address contaminant releases at the site, if deemed necessary.

The proposed RI scope of work is designed to meet each of these objectives as they relate to the hazardous compounds identified at the leased property.

6.2 Characterization

Many areas of the leased property were characterized during previous investigations, as summarized above. Results of previous characterization efforts, along with a review of past facility operations in the leased property, indicate a need for additional characterization efforts in some locations. Investigation locations proposed in this RI/FS work plan are those near potential source of impacts and features of interest, and in areas where contaminant impacts are quantified but not delineated. The potential sources of impacts and features of interest in the leased property are:

- Former Mill Area and pocket beach
- Lumber storage shed area
- Former boiler area
- Stormwater outfall to pocket beach
- Beach area
- Mouth of Shannon Slough

Physical site features will be evaluated with respect to the potential for contribution to or transport of contamination. The proposed investigation locations, in conjunction with the previous investigations, provide coverage across the leased property. A combination of surface sediment samples and subsurface sediment cores is proposed for the RI, using manual and mechanically assisted (e.g., GeoProbe™) sampling techniques (see Figures 5 and 6).

6.2.1 Surface Sediment Samples

MFA proposes collecting a number of surface sediment samples from each area of interest within the leased property boundary. Surface sediment (0 to 10 centimeters bml) subsamples from each area of concern will be field composited and submitted to the analytical laboratory in order to maximize limited resources. Composite samples will be analyzed for chemicals of specific concern to each area, as summarized in Table 4. Sampling, compositing, and analysis methods are described in the SAP (see Appendix A). Proposed sample areas and the individual subsample locations are presented in Figure 5 and 6.

6.2.2 Subsurface Sediment Samples

Subsurface sediment samples will be collected to assess the vertical extent of impacts observed previously in the Former Mill Area. Borings will be advanced using mechanical methods (e.g., vibracorer and/or GeoProbe) at the locations proposed in Figures 5 and 6. In the subtidal portion of the Former Mill Area, sediment cores will be advanced and sediment observed for visual impacts (sheen, NAPL, woodwaste). If impacts are observed, additional cores will be advanced offshore, east, and west to delineate the extent of visual impacts. Cores will be stepped out until subsurface impacts are no longer observed. Surface and subsurface sediment (below visual impacts) will be collected from all cores and archived at the laboratory. Surface and subsurface sediment from the three outermost core locations to the north and the outermost core locations to the west and east (i.e., locations where impacts are not observed) will be submitted for analysis to confirm that the extent of contamination has been delineated. Additional surface and subsurface samples may be analyzed upon receipt of results of the initial analysis. Locations of cores, shown on Figure 6, are estimated and may be adjusted based on field observations during the sampling event.

Four cores will be advanced in the pocket beach portion of the Former Mill Area. Sediment cores will be advanced to clean sediment underlying the visual impacts, or to refusal; if refusal is met, locations may be field-adjusted. Samples will be collected from visually impacted areas, composited, and submitted for analysis to characterize the material for possible disposal. Subsurface sediment where impacts are not observed (i.e., visual or olfactory) will be submitted to the analytical laboratory for analysis (see Figure 6 and Table 4) to confirm the vertical extent of contamination.

Two cores will be advanced in the near the former boiler. Sediment cores will be advanced to clean sediment underlying the visual impacts (if present), or to refusal; if refusal is met, locations may be field-adjusted. Subsurface sediment where impacts are not observed (i.e., visual or olfactory) will be submitted to the analytical laboratory for analysis (see Figure 6 and Table 4) to confirm the vertical extent of contamination. Samples will be collected from sediment beneath visual impacts at a sublocation to be determined field in the field. If no visual impacts are observed, a sample will be collected from 0.5 to 1 foot bml.

Three borings will be advanced using a GeoProbe direct-push drill rig in the area immediately upgradient of the pocket beach retaining wall (see Figure 6) in the leased property. Soil from these three borings will be evaluated in the field for visual impacts, and soil samples will be collected if visual impacts are present.

6.2.3 Water Samples

An opportunistic seep sample may be collected in the pocket beach area during low tide, provided seep(s) are identified. The seep sample would be tested for compounds and water quality parameters identified for groundwater (see Table 4) to evaluate whether seepage is characteristic of groundwater.

Reconnaissance groundwater samples will be collected from all three borings in the area immediately upgradient of the pocket beach retaining wall (see Figure 6) to evaluate potential upgradient contaminant sources to the pocket beach. However, if a representative seep sample is collected, groundwater sampling will not be conducted. Groundwater sampling will be conducted using the methods and protocol described in the SAP included as Appendix A. Groundwater samples will be analyzed for compounds as summarized in Table 4.

A stormwater sample will be collected from the stormwater outfall located in the pocket beach area during a storm event (see Figure 5). The sample will be analyzed for compounds as summarized in Table 5. Water quality parameters including pH, conductivity, temperature, turbidity, dissolved oxygen, and oxidation/reduction potential will also be collected. The stormwater outfall will also be observed for dry-weather flow (e.g., due to groundwater infiltration) during appropriate conditions. Stormwater sampling will be conducted using the methods and protocol described in the SAP included as Appendix A.

7 PERMITTING REQUIREMENTS

Multiple regulatory agencies necessitate permits in order to collect in-water sediment samples. The following agencies should be contacted before sediment sampling begins.

7.1 Washington State Department of Natural Resources

Typically, a right of entry permit is required for any sampling conducted on DNR-owned property. However, because the work described in this document is being directed by the DNR, a right of entry permit likely is not required.

7.2 Washington State Department of Fish and Wildlife

For certain construction projects and activities such as sampling in or near state waters, an environmental permit commonly known as a Hydraulic Permit Approval (HPA) is required. The Washington State Department of Fish and Wildlife (WDFW) administer the HPA program under the state Hydraulic Code, which was specifically designed to protect fish.

The WDFW also specifies periods of time during which in-water work is less likely to disturb aquatic wildlife, i.e., in-water work windows. According to the WDFW, the work window for the project area is June 15 through February 28 (WDFW, 2014).

7.3 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers regulates in-water work through authorities under the Rivers and Harbors Act of 1899 and the Clean Water Act. Permits under these laws are coordinated through a Joint Aquatic Resource Permit Application (JARPA). These permits are occasionally required for sediment sampling activities. However, given that limited sediment disturbance is anticipated and the work likely will be conducted during the recommended in-water work window, further limiting any possible deleterious impacts to sensitive species, it is anticipated that these federal permits will not be required for this project.

8 PROJECT MANAGEMENT PLAN

The following describes the role of key personnel on the project.

Capt. Les Bolton will be the project director for the GHHSA. Capt. Bolton will be kept informed of the status of the project and of project activities. Capt. Bolton will review all data, reports, and other project-related documents prepared by MFA before their submittal to DNR. He will be responsible for communicating with DNR and the GHHSA board of directors, and will coordinate on-site activities with MFA.

Jim Darling will be the project director for MFA. Mr. Darling will coordinate with project task leaders and will communicate regularly with Capt. Bolton. He will be responsible for allocating the resources necessary to ensure that the objectives of the RI/FS are met.

Madi Novak will be the project manager and she will be responsible for managing the overall completion of the RI/FS and for regular communication of project status to the project director and the Ecology and DNR project managers. Mrs. Novak will provide technical assistance to the assigned staff geologist, data manager, and health and safety officer, as appropriate; assist with resolution of technical or logistical challenges that may be encountered during the investigation; assist with field activities and write and review reports; and participate in discussions with DNR and Ecology at the request of the GHHSA.

Michael Murray will be responsible for assisting in the completion of the RI/FS and for communications of project status with the project manager and the project director. Mr. Murray will assist with field activities, write and review reports, and participate in discussions with Ecology at the request of the GHHSA.

8.1 Schedule

The RI schedule as stipulated by the DNR (2014) is as follows:

Task	Start Date or Event	Time Frame
Submit draft RI/FS work plan	July 2, 2014	3 months (Due October 2, 2014)
Submit Final RI work plan incorporating state comments	Receipt of Ecology and DNR comments on draft RI work plan	30 days

Task	Start Date or Event	Time Frame
RI fieldwork	Approval of final RI work plan	30 days and receipt of appropriate permits and grant funding
Draft RI/FS report	Receipt of analytical data	90 days
Final RI/FS report	Receipt of Ecology comments on draft RI/FS report	30 days

The time frames for the work to be performed may change, based on changes to the scope of work, site access, permitting requirements, and subcontractor availability, and subject to Ecology and DNR approval.

LIMITATIONS

The services undertaken in completing this work plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This work plan is solely for the use and information of our client unless otherwise noted. Any reliance on this work plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this work plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this work plan.

The purpose of an environmental assessment is to reasonably evaluate the potential for or actual impact of past practices on a given site area. In performing an environmental assessment, it is understood that a balance must be struck between a reasonable inquiry into the environmental issues and an exhaustive analysis of each conceivable issue of potential concern. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation is thorough enough to exclude the presence of hazardous materials at a given site. If hazardous conditions have not been identified during the assessment, such a finding should not, therefore, be construed as a guarantee of the absence of such materials on the site.

Environmental conditions that cannot be identified by visual observation may exist at the site. Where subsurface work was performed, our professional opinions are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations.

Except where there is express concern of our client, or where specific environmental contaminants have been previously reported by others, naturally occurring toxic substances, potential environmental contaminants inside buildings, or contaminant concentrations that are not of current environmental concern may not be reflected in this document.

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MFA. 2013b. Letter (re: the GHHSA draft sediment sampling and analysis plan, response to DNR comments) to E. Shaffer, Washington State Department of Natural Resources, from M. Novak, Maul Foster & Alongi, Inc. July 23.

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TABLES

Location:	CR-01	CR-02	CR-03	CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:	CR01-10cm	CR02-10cm	CR03-10cm	CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):	0-0.33	0-0.33	0-0.33	0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
Dioxins/Furans (pg/g)										
1,2,3,4,6,7,8-HpCDD	211	201	66.1	817	4070	--	1820	12200	1080	1090
1,2,3,4,6,7,8-HpCDF	31.9	113	24.7	165	919	--	437	1170	258	276
1,2,3,4,7,8,9-HpCDF	1.59	4.94	0.894 J	7.55 U	42.8	--	19.8	81.3	13.2	15.5
1,2,3,4,7,8-HxCDD	1.76	1.96	1.42	4.26	32.5	--	11.2	24.5	12.7	8.21
1,2,3,4,7,8-HxCDF	2.77	4.6	1.02	7.26	35.9	--	15.3	115	18.1	21.7
1,2,3,6,7,8-HxCDD	9.98	10.4	4.81	54.5	350	--	136	1020	63.8	72.8
1,2,3,6,7,8-HxCDF	1.19	3.22	0.862 J	3.38	18.9	--	10.9	51.7	8.9	8.35
1,2,3,7,8,9-HxCDD	11.1	12.4	12.9	10.2	48.1	--	29.9	98.1	16.5	15.4
1,2,3,7,8,9-HxCDF	0.778 U	0.886 J	0.268 J	2.45	14.6	--	6.11	62.9	4.79	4.66
1,2,3,7,8-PeCDD	3.93	4.53	5.08	4.34	18.8	--	13.9	34.1	9.35	8.27
1,2,3,7,8-PeCDF	0.683 J	0.804 J	0.508 J	2.06	12.4	--	4.73	41.4	3.28	3.24
2,3,4,6,7,8-HxCDF	1.8	5.58	0.785 J	5.09	22.2	--	11.1	69.3	16.9	16.3
2,3,4,7,8-PeCDF	0.814 J	1.13	0.594 J	3.43	15.7	--	5.82	43.5	5.96	5.87
2,3,7,8-TCDD	2.62	2.89	3.56	1.14 U	3.97	--	3	5.26	2.09	2.11
2,3,7,8-TCDF	1.96	2.18	1.34	3.53	16	--	6.3	54.3	4.87	4.95
OCDD	1690	1550	489	5340 J	23500 J	--	10300 J	68300 J	7830 J	6810 J
OCDF	51	211	36.4	476	1900	--	863	3100	680	652
Total HpCDDs	485	433	167	1530	7520	--	3750	21300	2480	2050
Total HpCDFs	87.1 U	310	55.9	678 U	3910	--	1560	5060 U	950	1120 U
Total HxCDDs	97	114	80.8 U	350 U	1540 U	--	1010 U	4840	742 U	783 U
Total HxCDFs	52.5 U	125	24.4 U	301 U	2130	--	853	6030 U	463 U	518 U
Total PeCDDs	25.8	34.9	30.6	68.7 U	133 U	--	334 U	862 U	88.7	67 U
Total PeCDFs	18 U	47.6 U	13.2 U	101 U	658 U	--	281 U	2660 U	203 U	147 U
Total TCDDs	17.4 U	28.1 U	24.7 U	17.5 U	32.6 U	--	73.6 U	180	42.6 U	28.7
Total TCDFs	12.4 U	33 U	16.7 U	27.9 U	119 U	--	78.1 U	558 U	82.8 U	62.3 U
Dioxin TEQ	13.1	15.8	12.4	27.2	143	--	68.9	370	44.9	44.4
Total Metals (mg/kg)										
Arsenic	10 U	9 U	10 U	--	--	--	--	--	--	20 U
Cadmium	0.5	0.4	0.5 U	--	--	--	--	--	--	1 U
Chromium	40 J	38.5 J	48 J	--	--	--	--	--	--	26 J
Copper	58 J	56.3 J	65.4 J	--	--	--	--	--	--	96 J
Lead	7	9	8	--	--	--	--	--	--	110
Mercury	0.05	0.1	0.09	6.2	0.5 J	--	0.16	0.5 J	0.55	0.53
Silver	0.7 U	0.6 U	0.8 U	--	--	--	--	--	--	1 U
Zinc	87	79	91	--	--	--	--	--	--	237

Table 1
Summary of Analytical Results
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location:	CR-01	CR-02	CR-03	CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:	CR01-10cm	CR02-10cm	CR03-10cm	CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):	0-0.33	0-0.33	0-0.33	0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
PCBs (ug/kg)										
Aroclor 1016	18 U	19 U	19 U	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1221	18 U	19 U	19 U	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1232	23 U	38 U	46 U	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1242	18 U	19 U	19 U	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1248	18 U	19 U	19 U	29 UJ	48 UJ	--	29 UJ	97 UJ	--	99 U
Aroclor 1254	18 U	**12** J	19 U	97 UJ	**440** J	--	98 UJ	**490** J	--	200 U
Aroclor 1260	18 U	19 U	19 U	**200** J	**730** J	--	**180** J	**670** J	--	**690**
Total PCBs [a]	ND	**12** J	ND	**200** J	**1170** J	--	**180** J	**1160** J	--	**690**
SVOCs (ug/kg)										
1,2,4-Trichlorobenzene	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	**43** J	**74** J	--	70 U
1,2-Dichlorobenzene	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
1,3-Dichlorobenzene	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	**620** J	**280** J	--	70 U
1,4-Dichlorobenzene	4.8 U	**19** J	4.8 U	100 UJ	81 UJ	--	**1000** J	**540** J	--	70 U
2,4-Dimethylphenol	24 U	24 U	24 U	530 UJ	400 UJ	--	290 UJ	440 UJ	--	350 U
2-Methylphenol	4.8 U	4.9 U	**3.3** J	100 UJ	81 UJ	--	**44** J	88 UJ	--	**45** J
4-Methylphenol	**30**	**730**	**60**	420 UJ	320 UJ	--	**310** J	**280** J	--	**420**
Benzoic acid	190 U	**240**	**180** J	**1700** J	3200 UJ	--	**950** J	3500 UJ	--	**860** J
Benzyl alcohol	**15** J	**43** J	**43** J	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Bis(2-ethylhexyl)phthalate	**29** J	49 U	48 U	1000 UJ	**870** J	--	**960** J	**9400** J	--	**1900**
Butylbenzylphthalate	4.8 U	4.9 U	4.8 U	58 UJ	81 UJ	--	58 UJ	88 UJ	310 UJ	70 U
Dibenzofuran	**12** J	**20**	19 U	420 UJ	**210** J	--	**310** J	**230** J	--	**490**
Diethylphthalate	**56**	**20**	**36**	420 UJ	320 UJ	--	230 UJ	350 UJ	--	**270** J
Dimethyl phthalate	4.8 U	**3.1** J	**2.5** J	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Di-n-butyl phthalate	19 U	20 U	19 U	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Di-n-octyl phthalate	19 U	20 U	19 U	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Hexachlorobenzene	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Hexachlorobutadiene	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
N-Nitrosodiphenylamine	4.8 U	4.9 U	4.8 U	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Pentachlorophenol	19 U	20 U	19 U	**270** J	**400** J	--	230 UJ	350 UJ	1500 UJ	**240** J
Phenol	**24**	**94**	**43**	**290** J	**390** J	**980** J	**570** J	**530** J	**370** J	**240** J
PAHs (ug/kg)										
2-Methylnaphthalene	19 U	**28**	19 U	420 UJ	320 UJ	--	**310**	350 UJ	--	**780**
Acenaphthene	**14** J	**20**	19 U	420 UJ	**180** J	--	**210**	**390** J	--	**490**
Acenaphthylene	19 U	**68**	19 U	420 UJ	320 UJ	--	**170**	350 UJ	--	**520**
Anthracene	**14** J	**16** J	19 U	420 UJ	**290** J	--	**230**	**320** J	--	**750**
Benzo(a)anthracene	**28**	**11** J	19 U	**250** J	**640** J	--	**390**	**680** J	--	**1300**
Benzo(a)pyrene	**21**	20 U	19 U	**300** J	**680** J	--	**340** J	**530** J	--	**1200**
Benzo(ghi)perylene	**14** J	**15** J	19 U	**230** J	**660** J	--	**260** J	**300** J	--	**590**

Table 1
Summary of Analytical Results
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location:	CR-01	CR-02	CR-03	CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:	CR01-10cm	CR02-10cm	CR03-10cm	CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):	0-0.33	0-0.33	0-0.33	0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
Chrysene	**35**	**17** J	19 U	**530** J	**940** J	--	**420** J	**460** J	--	**1600**
Dibenzo(a,h)anthracene	**3** J	4.9 U	4.8 U	**120** J	**360** J	--	**94** J	**190** J	--	**150**
Fluoranthene	**100**	**63**	**25**	**590** J	**2200** J	--	**1300** J	**3900** J	--	**3200**
Fluorene	**14** J	**15** J	19 U	420 UJ	**180** J	--	**260** J	**230** J	--	**650**
Indeno(1,2,3-cd)pyrene	19 U	20 U	19 U	420 UJ	**480** J	--	**200** J	**190** J	--	**490**
Naphthalene	**25**	**280**	**23**	**420** J	**340** J	--	**720** J	**440** J	--	**1800**
Phenanthrene	**47**	**89**	**19**	**320** J	**370** J	--	**700** J	**470** J	--	**3600**
Pyrene	**110**	**61**	**21**	**700** J	**1800** J	--	**1300** J	**3100** J	--	**3600**
Total Benzofluoranthenes	**52**	**22** J	**13** J	**550** J	**1700** J	--	**660**	**810** J	--	**2000**
Total PAHs[a]	**477**	**705**	**101**	**2580** J	**6410** J	--	**4680** J	**8720** J	--	**22720**
Total HPAHs	**363**	**189**	**59**	**1840** J	**5700** J	--	**3260** J	**7810** J	--	**13640**
Total LPAHs	**114**	**488**	**42**	**740** J	**710** J	--	**1420** J	**910** J	--	**7290**
NWTPH-Dx (mg/kg)										
Diesel	--	--	--	**2400** J	**3200** J	--	**1200** J	**3200** J	--	**20000**
Motor-Oil Range	--	--	--	**7400** J	**10000** J	--	**4800** J	**13000** J	--	**60000**
NWTPH-Gx (mg/kg)										
Gasoline	--	--	--	--	--	--	--	--	--	54 UJ
Conventionals										
Ammonia (as N) (mg N/kg)	--	--	--	0.47 U	--	**15.2**	**7.21**	--	**1.37**	**14.0**
Sulfide (mg/kg)	--	--	--	**6.46**	--	**179**	**320**	--	**906**	**2910**
Total Organic Carbon (%)	**2.06** J	**3.21** J	**2.91** J	**31.4** J	--	**16.5** J	**13.6** J	--	**35.6** J	**49.5** J
Total Volatile Solids (%)	--	--	--	**59.91**	--	**38.2**	**36.49**	--	**60.05**	**69.23**
Total solids (%)	**44.09**	**51.8**	**36.4**	**20.62**	--	**19.98**	**30.32**	--	**21.4**	**21.59**
Grain Size (%)										
Gravel	--	--	--	**22.8**	--	**23.6**	**20.2**	--	**22.7**	--
Very coarse sand	--	--	--	**13.8**	--	**13**	**11.4**	--	**13**	--
Coarse sand	--	--	--	**14.2**	--	**10.7**	**13.2**	--	**15.7**	--
Medium sand	--	--	--	**8.5**	--	**6.1**	**10.5**	--	**11.9**	--
Fine sand	--	--	--	**3.7**	--	**3.2**	**6**	--	**5.1**	--
Very fine sand	--	--	--	**1.4**	--	**1.4**	**3.5**	--	**2**	--
Coarse silt	--	--	--	**7.2**	--	**1.3**	**8.1**	--	**4.1**	--
Medium silt	--	--	--	**5.9**	--	**10.6**	**7.7**	--	**5.1**	--
Fine silt	--	--	--	**6.2**	--	**8.9**	**5.1**	--	**4.5**	--
Very fine silt	--	--	--	**4.8**	--	**6.1**	**4.5**	--	**3.7**	--
Coarse clay	--	--	--	**2.9**	--	**4.3**	**2.1**	--	**2.7**	--
Medium clay	--	--	--	**2.6**	--	**3.7**	**2.4**	--	**2.1**	--
Fine clay	--	--	--	**6.1**	--	**7.2**	**5.4**	--	**7.4**	--
Total fines	--	--	--	**35.6**	--	**42.1**	**35.3**	--	**29.7**	--
Pore Water Analysis										
Conductivity (umhos/cm)	**18700**	**12200**	**17500**	--	--	--	--	--	--	--
Salinity (ppt)	**11**	**6.9**	**10.2**	--	--	--	--	--	--	--

NOTES:
Bioaccumulative chemicals defined in WAC 173-333-310 are italicized.
Detections are in **bold** font.
-- = not analyzed.
cPAH TEQ = carcinogenic PAH toxicity equivalence quotient.
dioxin TEQ = dioxin toxicity equivalence quotient.
ft bgs = feet below ground surface.
HPAH = high-molecular-weight PAH.
J = Result is an estimated value.
LPAH = low-molecular-weight PAH.
mg N/kg = milligrams of nitrogen per kilogram.
mg/kg = milligrams per kilogram.
ND = not detected.
PAH = polycyclic aromatic hydrocarbon.
PCB = polychlorinated biphenyl.
pg/g = picograms per gram (parts per trillion).
ppt = parts per thousand.
SIM = selective ion monitoring.
SVOC = semivolatile organic compound. When samples were analyzed by both 8270D and 8270D SIM methods, or when samples were reanalyzed, the higher detected value or lower non-detect value was used.
Total PCBs = sum of PCB Aroclors.
U = Result is non-detect at method reporting limit.
ug/kg = micrograms per kilogram.
UJ = Result is non-detect at or above method reporting limit. Reported value is estimated.
umhos/cm = micromhos per centimeter = microSiemen.
WAC = Washington Administrative Code.
[a]Calculated value. Only detected values are summed.

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location: Sample Name: Collection Date: Collection Depth (ft bgs):	SMS Marine Cleanup Screening Levels				CR-01 CR01-10cm 11/08/2013 0-0.33	CR-02 CR02-10cm 11/08/2013 0-0.33	CR-03 CR03-10cm 11/08/2013 0-0.33
	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon			
Dry weight corrected results							
Dioxins/Furans—dry weight (pg/g)							
1,2,3,4,6,7,8-HpCDD	NV	NV	NA	NA	**211**	**201**	**66.1**
1,2,3,4,6,7,8-HpCDF	NV	NV	NA	NA	**31.9**	**113**	**24.7**
1,2,3,4,7,8,9-HpCDF	NV	NV	NA	NA	**1.59**	**4.94**	**0.894** J
1,2,3,4,7,8-HxCDD	NV	NV	NA	NA	**1.76**	**1.96**	**1.42**
1,2,3,4,7,8-HxCDF	NV	NV	NA	NA	**2.77**	**4.6**	**1.02**
1,2,3,6,7,8-HxCDD	NV	NV	NA	NA	**9.98**	**10.4**	**4.81**
1,2,3,6,7,8-HxCDF	NV	NV	NA	NA	**1.19**	**3.22**	**0.862** J
1,2,3,7,8,9-HxCDD	NV	NV	NA	NA	**11.1**	**12.4**	**12.9**
1,2,3,7,8,9-HxCDF	NV	NV	NA	NA	0.778 U	**0.886** J	**0.268** J
1,2,3,7,8-PeCDD	NV	NV	NA	NA	**3.93**	**4.53**	**5.08**
1,2,3,7,8-PeCDF	NV	NV	NA	NA	**0.683** J	**0.804** J	**0.508** J
2,3,4,6,7,8-HxCDF	NV	NV	NA	NA	**1.8**	**5.58**	**0.785** J
2,3,4,7,8-PeCDF	NV	NV	NA	NA	**0.814** J	**1.13**	**0.594** J
2,3,7,8-TCDD	NV	NV	NA	NA	**2.62**	**2.89**	**3.56**
2,3,7,8-TCDF	NV	NV	NA	NA	**1.96**	**2.18**	**1.34**
OCDD	NV	NV	NA	NA	**1690**	**1550**	**489**
OCDF	NV	NV	NA	NA	**51**	**211**	**36.4**
Total HpCDDs	NV	NV	NA	NA	**485**	**433**	**167**
Total HpCDFs	NV	NV	NA	NA	87.1 U	**310**	**55.9**
Total HxCDDs	NV	NV	NA	NA	**97**	**114**	80.8 U
Total HxCDFs	NV	NV	NA	NA	52.5 U	**125**	24.4 U
Total PeCDDs	NV	NV	NA	NA	**25.8**	**34.9**	**30.6**
Total PeCDFs	NV	NV	NA	NA	18 U	47.6 U	13.2 U

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location: / **Sample Name:** / **Collection Date:** / **Collection Depth (ft bgs):**	SMS Marine Cleanup Screening Levels				CR-01 / CR01-10cm / 11/08/2013 / 0-0.33	CR-02 / CR02-10cm / 11/08/2013 / 0-0.33	CR-03 / CR03-10cm / 11/08/2013 / 0-0.33
	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon			
Total TCDDs	NV	NV	NA	NA	17.4 U	28.1 U	24.7 U
Total TCDFs	NV	NV	NA	NA	12.4 U	33 U	16.7 U
Dioxin TEQ	NV	NV	NA	NA	**13.1**	**15.8**	**12.4**
Total Metals—dry weight (mg/kg)							
Arsenic	57	93	NA	NA	10 U	9 U	10 U
Cadmium	5.1	6.7	NA	NA	**0.5**	**0.4**	0.5 U
Chromium	260	270	NA	NA	**40** J	**38.5** J	**48** J
Copper	390	390	NA	NA	**58** J	**56.3** J	**65.4** J
Lead	450	530	NA	NA	**7**	**9**	**8**
Mercury	0.41	0.59	NA	NA	**0.05**	**0.1**	**0.09**
Silver	6.1	6.1	NA	NA	0.7 U	0.6 U	0.8 U
Zinc	410	960	NA	NA	**87**	**79**	**91**
PCBs—dry weight (ug/kg)							
Aroclor 1016	NV	NV	NA	NA	18 U	19 U	19 U
Aroclor 1221	NV	NV	NA	NA	18 U	19 U	19 U
Aroclor 1232	NV	NV	NA	NA	23 U	38 U	46 U
Aroclor 1242	NV	NV	NA	NA	18 U	19 U	19 U
Aroclor 1248	NV	NV	NA	NA	18 U	19 U	19 U
Aroclor 1254	NV	NV	NA	NA	18 U	**12** J	19 U
Aroclor 1260	NV	NV	NA	NA	18 U	19 U	19 U
Total PCBs [a]	NV	NV	NA	NA	ND	**12** J	ND
PCBs (ug/kg-OC)							
Aroclor 1016	NA	NA	NV	NV	874 U	592 U	653 U
Aroclor 1221	NA	NA	NV	NV	874 U	592 U	653 U
Aroclor 1232	NA	NA	NV	NV	1117 U	1184 U	1581 U
Aroclor 1242	NA	NA	NV	NV	874 U	592 U	653 U

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location: / Sample Name: / Collection Date: / Collection Depth (ft bgs):	SMS Marine Cleanup Screening Levels				CR-01 / CR01-10cm / 11/08/2013 / 0-0.33	CR-02 / CR02-10cm / 11/08/2013 / 0-0.33	CR-03 / CR03-10cm / 11/08/2013 / 0-0.33
	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon			
Aroclor 1248	NA	NA	NV	NV	874 U	592 U	653 U
Aroclor 1254	NA	NA	NV	NV	874 U	**374** J	653 U
Aroclor 1260	NA	NA	NV	NV	874 U	592 U	653 U
Total PCBs [a]	NA	NA	12000	65000	ND	**374** J	ND
SVOCs—dry weight (ug/kg)							
1,2,4-Trichlorobenzene	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
1,2-Dichlorobenzene	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
1,3-Dichlorobenzene	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
1,4-Dichlorobenzene	NV	NV	NA	NA	4.8 U	**19** J	4.8 U
2,4-Dimethylphenol	29	29	NA	NA	24 U	24 U	24 U
2-Methylphenol	63	63	NA	NA	4.8 U	4.9 U	**3.3** J
4-Methylphenol	670	670	NA	NA	**30**	**730**	**60**
Benzoic acid	650	650	NA	NA	190 U	**240**	**180** J
Benzyl alcohol	57	73	NA	NA	**15** J	**43** J	**43** J
Bis(2-ethylhexyl)phthalate	NV	NV	NA	NA	**29** J	49 U	48 U
Butylbenzylphthalate	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
Dibenzofuran	NV	NV	NA	NA	**12** J	**20**	19 U
Diethylphthalate	NV	NV	NA	NA	**56**	**20**	**36**
Dimethyl phthalate	NV	NV	NA	NA	4.8 U	**3.1** J	**2.5** J
Di-n-butyl phthalate	NV	NV	NA	NA	19 U	20 U	19 U
Di-n-octyl phthalate	NV	NV	NA	NA	19 U	20 U	19 U
Hexachlorobenzene	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
Hexachlorobutadiene	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U
N-Nitrosodiphenylamine	NV	NV	NA	NA	4.8 U	4.9 U	4.8 U

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location: Sample Name: Collection Date: Collection Depth (ft bgs):	SMS Marine Cleanup Screening Levels				CR-01 CR01-10cm 11/08/2013 0-0.33	CR-02 CR02-10cm 11/08/2013 0-0.33	CR-03 CR03-10cm 11/08/2013 0-0.33
	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon			
Pentachlorophenol	360	690	NA	NA	19 U	20 U	19 U
Phenol	420	1200	NA	NA	**24**	**94**	**43**
SVOCs (ug/kg-OC)							
1,2,4-Trichlorobenzene	NA	NA	810	1800	233 U	153 U	165 U
1,2-Dichlorobenzene	NA	NA	2300	2300	233 U	153 U	165 U
1,3-Dichlorobenzene	NA	NA	NV	NV	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	3100	9000	233 U	**592** J	165 U
2,4-Dimethylphenol	NA	NA	NV	NV	NA	NA	NA
2-Methylphenol	NA	NA	NV	NV	NA	NA	NA
4-Methylphenol	NA	NA	NV	NV	NA	NA	NA
Benzoic acid	NA	NA	NV	NV	NA	NA	NA
Benzyl alcohol	NA	NA	NV	NV	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	47000	78000	**1408** J	1526 U	1649 U
Butylbenzylphthalate	NA	NA	4900	64000	233 U	153 U	165 U
Dibenzofuran	NA	NA	15000	58000	**583** J	**623**	653 U
Diethylphthalate	NA	NA	61000	110000	**2718**	**623**	**1237**
Dimethyl phthalate	NA	NA	53000	53000	233 U	**97** J	**86** J
Di-n-butyl phthalate	NA	NA	220000	1700000	922 U	623 U	653 U
Di-n-octyl phthalate	NA	NA	58000	4500000	922 U	623 U	653 U
Hexachlorobenzene	NA	NA	380	2300	233 U	153 U	165 U
Hexachlorobutadiene	NA	NA	3900	6200	233 U	153 U	165 U
N-Nitrosodiphenylamine	NA	NA	11000	11000	233 U	153 U	165 U
Pentachlorophenol	NA	NA	NV	NV	NA	NA	NA
Phenol	NA	NA	NV	NV	NA	NA	NA
PAHs—dry weight (ug/kg)							
2-Methylnaphthalene	38000	64000	NA	NA	19 U	**28**	19 U
Acenaphthene	16000	57000	NA	NA	**14** J	**20**	19 U

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location: / Sample Name: / Collection Date: / Collection Depth (ft bgs):	SMS Marine Cleanup Screening Levels				CR-01	CR-02	CR-03
	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon	CR01-10cm / 11/08/2013 / 0-0.33	CR02-10cm / 11/08/2013 / 0-0.33	CR03-10cm / 11/08/2013 / 0-0.33
Acenaphthylene	66000	66000	NA	NA	19 U	**68**	19 U
Anthracene	220000	1200000	NA	NA	**14** J	**16** J	19 U
Benzo(a)anthracene	110000	270000	NA	NA	**28**	**11** J	19 U
Benzo(a)pyrene	99000	210000	NA	NA	**21**	20 U	19 U
Benzo(ghi)perylene	31000	78000	NA	NA	**14** J	**15** J	19 U
Chrysene	110000	460000	NA	NA	**35**	**17** J	19 U
Dibenzo(a,h)anthracene	12000	33000	NA	NA	**3** J	4.9 U	4.8 U
Fluoranthene	160000	1200000	NA	NA	**100**	**63**	**25**
Fluorene	23000	79000	NA	NA	**14** J	**15** J	19 U
Indeno(1,2,3-cd)pyrene	34000	88000	NA	NA	19 U	20 U	19 U
Naphthalene	99000	170000	NA	NA	**25**	**280**	**23**
Phenanthrene	100000	480000	NA	NA	**47**	**89**	**19**
Pyrene	1000000	1400000	NA	NA	**110**	**61**	**21**
Total Benzofluoranthenes	230000	450000	NA	NA	**52**	**22** J	**13** J
Total PAHs[a]	NV	NV	NA	NA	**477**	**705**	**101**
Total HPAHs	960000	5300000	NA	NA	**363**	**189**	**59**
Total LPAHs	370000	780000	NA	NA	**114**	**488**	**42**
cPAH TEQ	NV	NV	NA	NA	**30.6**	**14.7**	**13.0**
PAHs (ug/kg-OC)							
2-Methylnaphthalene	NA	NA	38000	64000	922 U	**872**	653 U
Acenaphthene	NA	NA	16000	57000	**680** J	**623**	653 U
Acenaphthylene	NA	NA	66000	66000	922 U	**2118**	653 U
Anthracene	NA	NA	220000	1200000	**680** J	498 J	653 U
Benzo(a)anthracene	NA	NA	110000	270000	**1359**	343 J	653 U
Benzo(a)pyrene	NA	NA	99000	210000	**1019**	623 U	653 U
Benzo(ghi)perylene	NA	NA	31000	78000	**680** J	467 J	653 U

Table 2
Chehalis River Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location:	SMS Marine Cleanup Screening Levels				CR-01	CR-02	CR-03
Sample Name:					CR01-10cm	CR02-10cm	CR03-10cm
Collection Date:	SQS—Dry Weight	CSL—Dry Weight	SQS—Organic Carbon	CSL—Organic Carbon	11/08/2013	11/08/2013	11/08/2013
Collection Depth (ft bgs):					0-0.33	0-0.33	0-0.33
Chrysene	NA	NA	110000	460000	**1699**	530 J	653 U
Dibenzo(a,h)anthracene	NA	NA	12000	33000	**146** J	153 U	165 U
Fluoranthene	NA	NA	160000	1200000	**4854**	**1963**	**859**
Fluorene	NA	NA	23000	79000	**680** J	467 J	653 U
Indeno(1,2,3-cd)pyrene	NA	NA	34000	88000	922 U	623 U	653 U
Naphthalene	NA	NA	99000	170000	**1214**	**8723**	**790**
Phenanthrene	NA	NA	100000	480000	**2282**	**2773**	**653**
Pyrene	NA	NA	1000000	1400000	**5340**	**1900**	**722**
Total Benzofluoranthenes	NA	NA	230000	450000	**2524**	685 J	**447** J
Total PAHs[a]	NA	NA	NV	NV	**23155**	**21963**	**3471**
Total HPAHs	NA	NA	960000	5300000	**17621**	**5888**	**2027**
Total LPAHs	NA	NA	370000	780000	**5534**	**15202**	**1443**
Conventionals							
Total Organic Carbon (%)	NV	NV	NA	NA	**2.06** J	**3.21** J	**2.91** J
Total solids (%)	NV	NV	NA	NA	**44.09**	**51.8**	**36.4**
Pore Water Analysis							
Conductivity (umhos/cm)	NV	NV	NA	NA	**18700**	**12200**	**17500**
Salinity (ppt)	NV	NV	NA	NA	**11**	**6.9**	**10.2**

NOTES:

Bioaccumulative chemicals defined in WAC 173-333-310 are italicized.

Detections are in **bold** font.

Detections that exceed the CSL are shaded gray. Non-detect results are not screened against SLVs.

cPAH TEQ = carcinogenic PAH toxicity equivalence quotient.

CSL = cleanup screening level.

ft bgs = feet below ground surface.

HPAH = high-molecular-weight PAH.

J = Result is an estimated value.

LPAH = low-molecular-weight PAH.

mg/kg = milligrams per kilogram.

NA = not applicable.

ND = not detected.

NV = no value.

OC =organic carbon.

PAH = polycyclic aromatic hydrocarbon.

PCB = polychlorinated biphenyl.

pg/g = picograms per gram (parts per trillion).

ppt = parts per thousand.

SIM = selective ion monitoring.

SMS = Sediment Management Standards.

SQS = Sediment Quality Standards (WAC 173-294-320).

SVOC = semivolatile organic compound. When samples were analyzed by both 8270D and 8270D SIM methods, or when samples were reanalyzed, the higher detected value or lower non-detect value was used.

Total PCBs = sum of PCB Aroclors.

U = Result is non-detect at method reporting limit.

ug/kg = micrograms per kilogram.

umhos/cm = micromhos per centimeter = microSiemen.

WAC = Washington Administrative Code.

[a]Calculated value. Only detected values are summed.

Table 3
Former Mill Area Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location:	Marine Sediment AETs		SMS Marine Cleanup Screening Levels		CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:					CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	SCO	CSL	SCO	CSL	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):					0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
Dioxins/Furans (pg/g)											
1,2,3,4,6,7,8-HpCDD	NV	NV	NV	NV	**817**	**4070**	--	**1820**	**12200**	**1080**	**1090**
1,2,3,4,6,7,8-HpCDF	NV	NV	NV	NV	**165**	**919**	--	**437**	**1170**	**258**	**276**
1,2,3,4,7,8,9-HpCDF	NV	NV	NV	NV	7.55 U	**42.8**	--	**19.8**	**81.3**	**13.2**	**15.5**
1,2,3,4,7,8-HxCDD	NV	NV	NV	NV	**4.26**	**32.5**	--	**11.2**	**24.5**	**12.7**	**8.21**
1,2,3,4,7,8-HxCDF	NV	NV	NV	NV	**7.26**	**35.9**	--	**15.3**	**115**	**18.1**	**21.7**
1,2,3,6,7,8-HxCDD	NV	NV	NV	NV	**54.5**	**350**	--	**136**	**1020**	**63.8**	**72.8**
1,2,3,6,7,8-HxCDF	NV	NV	NV	NV	**3.38**	**18.9**	--	**10.9**	**51.7**	**8.9**	**8.35**
1,2,3,7,8,9-HxCDD	NV	NV	NV	NV	**10.2**	**48.1**	--	**29.9**	**98.1**	**16.5**	**15.4**
1,2,3,7,8,9-HxCDF	NV	NV	NV	NV	**2.45**	**14.6**	--	**6.11**	**62.9**	**4.79**	**4.66**
1,2,3,7,8-PeCDD	NV	NV	NV	NV	**4.34**	**18.8**	--	**13.9**	**34.1**	**9.35**	**8.27**
1,2,3,7,8-PeCDF	NV	NV	NV	NV	**2.06**	**12.4**	--	**4.73**	**41.4**	**3.28**	**3.24**
2,3,4,6,7,8-HxCDF	NV	NV	NV	NV	**5.09**	**22.2**	--	**11.1**	**69.3**	**16.9**	**16.3**
2,3,4,7,8-PeCDF	NV	NV	NV	NV	**3.43**	**15.7**	--	**5.82**	**43.5**	**5.96**	**5.87**
2,3,7,8-TCDD	NV	NV	NV	NV	1.14 U	**3.97**	--	**3**	**5.26**	**2.09**	**2.11**
2,3,7,8-TCDF	NV	NV	NV	NV	**3.53**	**16**	--	**6.3**	**54.3**	**4.87**	**4.95**
OCDD	NV	NV	NV	NV	**5340** J	**23500** J	--	**10300** J	**68300** J	**7830** J	**6810** J
OCDF	NV	NV	NV	NV	**476**	**1900**	--	**863**	**3100**	**680**	**652**
Total HpCDDs	NV	NV	NV	NV	**1530**	**7520**	--	**3750**	**21300**	**2480**	**2050**
Total HpCDFs	NV	NV	NV	NV	678 U	**3910**	--	**1560**	5060 U	**950**	1120 U
Total HxCDDs	NV	NV	NV	NV	350 U	1540 U	--	1010 U	**4840**	742 U	783 U
Total HxCDFs	NV	NV	NV	NV	301 U	**2130**	--	**853**	6030 U	463 U	518 U
Total PeCDDs	NV	NV	NV	NV	68.7 U	133 U	--	334 U	862 U	**88.7**	67 U
Total PeCDFs	NV	NV	NV	NV	101 U	658 U	--	281 U	2660 U	203 U	147 U
Total TCDDs	NV	NV	NV	NV	17.5 U	32.6 U	--	73.6 U	**180**	42.6 U	**28.7**
Total TCDFs	NV	NV	NV	NV	27.9 U	119 U	--	78.1 U	558 U	82.8 U	62.3 U
Dioxin TEQ	NV	NV	NV	NV	**27.2**	**143**	--	**68.9**	**370**	**44.9**	**44.4**
Total Metals (mg/kg)											
Arsenic	57	93	57	93	--	--	--	--	--	--	20 U
Cadmium	5.1	6.7	5.1	6.7	--	--	--	--	--	--	1 U
Chromium	260	270	260	270	--	--	--	--	--	--	**26** J
Copper	390	390	390	390	--	--	--	--	--	--	**96** J
Lead	450	530	450	530	--	--	--	--	--	--	**110**
Mercury	0.41	0.59	0.41	0.59	**6.2**	**0.5** J	--	**0.16**	**0.5** J	**0.55**	**0.53**
Silver	6.1	6.1	6.1	6.1	--	--	--	--	--	--	1 U
Zinc	410	960	410	960	--	--	--	--	--	--	**237**

Location:	Marine Sediment AETs		SMS Marine Cleanup Screening Levels		CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:					CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	SCO	CSL	SCO	CSL	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):					0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
PCBs (ug/kg)											
Aroclor 1016	NV	NV	NV	NV	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1221	NV	NV	NV	NV	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1232	NV	NV	NV	NV	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1242	NV	NV	NV	NV	20 UJ	19 UJ	--	20 UJ	19 UJ	--	20 U
Aroclor 1248	NV	NV	NV	NV	29 UJ	48 UJ	--	29 UJ	97 UJ	--	99 U
Aroclor 1254	NV	NV	NV	NV	97 UJ	**440** J	--	98 UJ	**490** J	--	200 U
Aroclor 1260	NV	NV	NV	NV	**200** J	**730** J	--	**180** J	**670** J	--	**690**
Total PCBs [a]	130	1000	NA	NA	**200** J	**1170** J	--	**180** J	**1160** J	--	**690**
SVOCs (ug/kg)											
1,2,4-Trichlorobenzene	31	51	NA	NA	100 UJ	81 UJ	--	**43** J	**74** J	--	70 U
1,2-Dichlorobenzene	35	50	NA	NA	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
1,3-Dichlorobenzene	NV	NV	NV	NV	100 UJ	81 UJ	--	**620** J	**280** J	--	70 U
1,4-Dichlorobenzene	110	110	NA	NA	100 UJ	81 UJ	--	**1000** J	**540** J	--	70 U
2,4-Dimethylphenol	29	29	29	29	530 UJ	400 UJ	--	290 UJ	440 UJ	--	350 U
2-Methylphenol	63	63	63	63	100 UJ	81 UJ	--	**44** J	88 UJ	--	**45** J
4-Methylphenol	670	670	670	670	420 UJ	320 UJ	--	**310** J	**280** J	--	**420**
Benzoic acid	650	650	650	650	**1700** J	3200 UJ	--	**950** J	3500 UJ	--	**860** J
Benzyl alcohol	57	73	57	73	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Bis(2-ethylhexyl)phthalate	1300	3100	NA	NA	1000 UJ	**870** J	--	**960** J	**9400** J	--	**1900**
Butylbenzylphthalate	63	900	NA	NA	58 UJ	81 UJ	--	58 UJ	88 UJ	310 UJ	70 U
Dibenzofuran	540	540	NA	NA	420 UJ	**210** J	--	**310** J	**230** J	--	**490**
Diethylphthalate	200	>200	NA	NA	420 UJ	320 UJ	--	230 UJ	350 UJ	--	**270** J
Dimethyl phthalate	71	160	NA	NA	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Di-n-butyl phthalate	1400	5100	NA	NA	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Di-n-octyl phthalate	6200	6200	NA	NA	420 UJ	320 UJ	--	230 UJ	350 UJ	--	280 U
Hexachlorobenzene	22	70	NA	NA	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Hexachlorobutadiene	11	120	NA	NA	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
N-Nitrosodiphenylamine	28	40	NA	NA	100 UJ	81 UJ	--	58 UJ	88 UJ	--	70 U
Pentachlorophenol	360	690	360	690	**270** J	**400** J	--	230 UJ	350 UJ	1500 UJ	**240** J
Phenol	420	1200	420	1200	**290** J	**390** J	**980** J	**570** J	**530** J	**370** J	**240** J
PAHs (ug/kg)											
2-Methylnaphthalene	670	670	NA	NA	420 UJ	320 UJ	--	**310**	350 UJ	--	**780**
Acenaphthene	500	500	NA	NA	420 UJ	**180** J	--	**210**	**390** J	--	**490**
Acenaphthylene	1300	1300	NA	NA	420 UJ	320 UJ	--	**170**	350 UJ	--	**520**
Anthracene	960	960	NA	NA	420 UJ	**290** J	--	**230**	**320** J	--	**750**
Benzo(a)anthracene	1300	1600	NA	NA	**250** J	**640** J	--	**390**	**680** J	--	**1300**
Benzo(a)pyrene	1600	1600	NA	NA	**300** J	**680** J	--	**340** J	**530** J	--	**1200**
Benzo(ghi)perylene	670	720	NV	NV	**230** J	**660** J	--	**260** J	**300** J	--	**590**

Table 3
Former Mill Area Sediment Screening
Grays Harbor Historical Seaport Authority Site
Aberdeen, Washington

Location:	Marine Sediment AETs		SMS Marine Cleanup Screening Levels		CR-04	CR-04	CR-04	CR-05	CR-05	CR-06	CR-06
Sample Name:					CR04-10cm	CR04-2.5	CR04-5	CR05-10cm	CR05-2.5	CR06-10cm	CR06-2.5
Collection Date:	SCO	CSL	SCO	CSL	11/07/2013	11/08/2013	11/08/2013	11/08/2013	11/08/2013	11/07/2013	11/07/2013
Collection Depth (ft bgs):					0-0.33	1-2.5	2.5-5	0-0.33	0.33-2.5	0-0.33	1-2.5
Chrysene	1400	2800	NA	NA	**530** J	**940** J	--	**420** J	**460** J	--	**1600**
Dibenzo(a,h)anthracene	230	230	NV	NV	**120** J	**360** J	--	**94** J	**190** J	--	**150**
Fluoranthene	1700	2500	NA	NA	**590** J	**2200** J	--	**1300** J	**3900** J	--	**3200**
Fluorene	540	540	NA	NA	420 UJ	**180** J	--	**260** J	**230** J	--	**650**
Indeno(1,2,3-cd)pyrene	600	690	NA	NA	420 UJ	**480** J	--	**200** J	**190** J	--	**490**
Naphthalene	2100	2100	NA	NA	**420** J	**340** J	--	**720** J	**440** J	--	**1800**
Phenanthrene	1500	1500	NA	NA	**320** J	**370** J	--	**700** J	**470** J	--	**3600**
Pyrene	2600	3300	NA	NA	**700** J	**1800** J	--	**1300** J	**3100** J	--	**3600**
Total Benzofluoranthenes	3200	3600	NA	NA	**550** J	**1700** J	--	**660**	**810** J	--	**2000**
Total PAHs[a]	NV	NV	NV	NV	**2580** J	**6410** J	--	**4680** J	**8720** J	--	**22720**
Total HPAHs	12000	17000	NA	NA	**1840** J	**5700** J	--	**3260** J	**7810** J	--	**13640**
Total LPAHs	5200	5200	NA	NA	**740** J	**710** J	--	**1420** J	**910** J	--	**7290**
NWTPH-Dx (mg/kg)											
Diesel	NV	NV	NV	NV	**2400** J	**3200** J	--	**1200** J	**3200** J	--	**20000**
Motor-Oil Range	NV	NV	NV	NV	**7400** J	**10000** J	--	**4800** J	**13000** J	--	**60000**
NWTPH-Gx (mg/kg)											
Gasoline	NV	NV	NV	NV	--	--	--	--	--	--	54 UJ
Conventionals											
Ammonia (as N) (mg N/kg)	NV	NV	NV	NV	0.47 U	--	**15.2**	**7.21**	--	**1.37**	**14.0**
Sulfide (mg/kg)	NV	NV	NV	NV	**6.46**	--	**179**	**320**	--	**906**	**2910**
Total Organic Carbon (%)	NV	NV	NV	NV	**31.4** J	--	**16.5** J	**13.6** J	--	**35.6** J	**49.5** J
Total Volatile Solids (%)	NV	NV	NV	NV	**59.91**	--	**38.2**	**36.49**	--	**60.05**	**69.23**
Total solids (%)	NV	NV	NV	NV	**20.62**	--	**19.98**	**30.32**	--	**21.4**	**21.59**
Grain Size (%)											
Gravel	NV	NV	NV	NV	**22.8**	--	**23.6**	**20.2**	--	**22.7**	--
Very coarse sand	NV	NV	NV	NV	**13.8**	--	**13**	**11.4**	--	**13**	--
Coarse sand	NV	NV	NV	NV	**14.2**	--	**10.7**	**13.2**	--	**15.7**	--
Medium sand	NV	NV	NV	NV	**8.5**	--	**6.1**	**10.5**	--	**11.9**	--
Fine sand	NV	NV	NV	NV	**3.7**	--	**3.2**	**6**	--	**5.1**	--
Very fine sand	NV	NV	NV	NV	**1.4**	--	**1.4**	**3.5**	--	**2**	--
Coarse silt	NV	NV	NV	NV	**7.2**	--	**1.3**	**8.1**	--	**4.1**	--
Medium silt	NV	NV	NV	NV	**5.9**	--	**10.6**	**7.7**	--	**5.1**	--
Fine silt	NV	NV	NV	NV	**6.2**	--	**8.9**	**5.1**	--	**4.5**	--
Very fine silt	NV	NV	NV	NV	**4.8**	--	**6.1**	**4.5**	--	**3.7**	--
Coarse clay	NV	NV	NV	NV	**2.9**	--	**4.3**	**2.1**	--	**2.7**	--
Medium clay	NV	NV	NV	NV	**2.6**	--	**3.7**	**2.4**	--	**2.1**	--
Fine clay	NV	NV	NV	NV	**6.1**	--	**7.2**	**5.4**	--	**7.4**	--
Total fines	NV	NV	NV	NV	**35.6**	--	**42.1**	**35.3**	--	**29.7**	--

NOTES:
Bioaccumulative chemicals defined in WAC 173-333-310 are italicized.
Detections are in **bold** font.
Detections that exceed the CSL are shaded gray. Non-detect results are not shaded.
-- = not analyzed.
CSL = cleanup screening level.
ft bgs = feet below ground surface.
HPAH = high-molecular-weight PAH.
J = Result is an estimated value.
LPAH = low-molecular-weight PAH.
Marine Sediment AETs = SMS management standards, benthic criteria (WAC 173-204).
mg N/kg = milligrams of nitrogen per kilogram.
mg/kg = milligrams per kilogram.
NA = not applicable.
NV = no value.
NWTPH-Dx = total petroleum hydrocarbons—diesel and motor oil.
NWTPH-Gx = total petroleum hydrocarbons—gasoline.
PAH = polycyclic aromatic hydrocarbon.
PCB = polychlorinated biphenyl.
pg/g = picograms per gram (parts per trillion).
SCO = sediment cleanup objective.
SIM = selective ion monitoring.
SLV = screening level value.
SMS = Sediment Management Standards.
SVOC = semivolatile organic compound. When samples were analyzed by both 8270D and 8270D SIM methods, or when samples were reanalyzed, the higher detected value or lower non-detect value was used.
TEQ = toxicity equivalence quotient.
Total PCBs = sum of PCB Aroclors.
U = Result is non-detect at method reporting limit.
ug/kg = micrograms per kilogram.
UJ = Result is non-detect at or above method reporting limit. Reported value is estimated.
WAC = Washington Administrative Code.
[a]Calculated value. Only detected values are summed.

Table 4
Sample Locations and Analyses
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Sample Location	Sample ID	Sample Sublocation	Sample Type	Sample Depth	Analysis	Comments	Northing	Easting
Lumber Shed								
CR-07	CR-07-SSD-Comp	LS-01	Surface Grab	0-10 cm bml	SMS + TPH	Sample sublocations will be field composited prior to analysis.	615268.058	816410.281
		LS-02	Surface Grab	0-10 cm bml			615275.522	816433.986
		LS-03	Surface Grab	0-10 cm bml			615251.579	816415.904
		LS-04	Surface Grab	0-10 cm bml			615259.044	816439.609
Former Boiler								
CR-08a	CR-08a-SSD-Comp	FB-01	Surface Grab	0-10 cm bml	SMS + TPH + Dioxin/Furan + asbestos	Sample sublocations will be field composited prior to analysis.	615451.330	816763.476
		FB-02	Surface Grab	0-10 cm bml			615431.819	816774.054
		FB-03	Surface Grab	0-10 cm bml			615409.263	816780.916
		FB-04	Surface Grab	0-10 cm bml			615462.213	816788.222
	CR-08a-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts or from 0.5 to 1 foot		Cores sample collected from sediment beneath visual impacts at sublocation to be field determined. If no impacts are observed, sample will be collected from 0.5 to 1 foot.	Coordinates for sublocation selected (FB-01 through FB-04)	
CR-08b	CR-08b-SSD-Comp	FB-05	Surface Grab	0-10 cm bml		Sample sublocations will be field composited prior to analysis.	615502.007	816743.614
		FB-06	Surface Grab	0-10 cm bml			615509.961	816761.638
		FB-07	Surface Grab	0-10 cm bml			615481.841	816752.813
		FB-08	Surface Grab	0-10 cm bml			615489.794	816770.836
	CR-08b-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts		Cores sample collected from sediment beneath visual impacts at sublocation to be field determined. If no impacts are observed, sample will be collected from 0.5 to 1 foot.	Coordinates for sublocation selected (FB-05 through FB-08)	
Beach Area								
CR-09a	CR-09a-SSD-Comp	BA-01	Surface Grab	0-10 cm bml	SMS + Dioxin/Furan	Sample sublocations will be field composited prior to analysis.	615567.472	817246.475
		BA-02	Surface Grab	0-10 cm bml			615574.725	817284.852
		BA-03	Surface Grab	0-10 cm bml			615582.831	817324.850
		BA-04	Surface Grab	0-10 cm bml			615590.084	817363.228
CR-09b	CR-09b-SSD-Comp	BA-05	Surface Grab	0-10 cm bml		Sample sublocations will be field composited prior to analysis.	615601.667	817419.820
		BA-06	Surface Grab	0-10 cm bml			615609.007	817455.928
		BA-07	Surface Grab	0-10 cm bml			615616.260	817494.305
		BA-08	Surface Grab	0-10 cm bml			615622.065	817530.643

Table 4
Sample Locations and Analyses
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Sample Location	Sample ID	Sample Sublocation	Sample Type	Sample Depth	Analysis	Comments	Northing	Easting
Shannon Slough Mouth								
CR-10	CR-10-SSD-Comp	SM-01	Surface Grab	0-10 cm bml	SMS	Sample sublocations will be field composited prior to analysis.	615752.928	817850.521
		SM-02	Surface Grab	0-10 cm bml			615732.954	817862.741
		SM-03	Surface Grab	0-10 cm bml			615712.461	817874.929
		SM-04	Surface Grab	0-10 cm bml			615691.946	817887.880
Former Mill Area								
CR-11	CR-11-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts	SMS	Cores advanced to refusal, samples collected from sediment beneath visual impacts.	615321.244	816981.342
CR-12	CR-12-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts	SMS		615333.525	816937.793
CR-13	CR-13-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts	SMS		615392.572	816971.417
CR-14	CR-14-SBSD-Depth[a]	TBD	Sediment Core	below visual impacts	SMS		615401.476	816903.937
CR-11 through CR-14 Composite	CR-11-14-SBSD-Comp	TBD	Sediment Core	within visual impacts	SMS + TPH + Dioxin/Furan + TCLP lead and mercury	Samples collected from within visual impacts	Coordinates for CR-11 through CR-14	
CR-15	CR-15-TBD-SSD[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan	Cores will step out in a transect perpendicular to shore until no visual impacts are observed; only sediment obtained in the outermost core will be analyzed. One surface and subsurface sample will be analyzed per cluster.	615471.822	816876.763
				0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615550.564	816845.357
	CR-15-TBD-SBSD-1[b]			0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615508.238	816862.381
				0.5-1 foot bml	SMS			

Table 4
Sample Locations and Analyses
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Sample Location	Sample ID	Sample Sublocation	Sample Type	Sample Depth	Analysis	Comments	Northing	Easting
CR-16	CR-16-TBD-SSD[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan	Cores will step out in a transect perpendicular to shore until no visual impacts are observed; only sediment obtained in the outermost core will be analyzed. One surface and subsurface sample will be analyzed per cluster.	615475.649	816924.256
				0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615523.339	816902.658
	CR-16-TBD-SBSD-1[b]			0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615564.441	816882.794
				0.5-1 foot bml	SMS			
CR-17	CR-17-TBD-SSD[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan	Cores will step out in a transect perpendicular to shore until no visual impacts are observed; only sediment obtained in the outermost core will be analyzed. One surface and subsurface sample will be analyzed per cluster.	615494.536	816964.550
				0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615581.626	816924.393
	CR-17-TBD-SBSD-1[b]			0.5-1 foot bml	SMS			
		TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615540.158	816944.451
				0.5-1 foot bml	SMS			
CR-18	CR-18-TBD-SSD[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan	Cores will step out in a transect parallel to shore to the west until no visual impacts are observed; only sediment obtained in the outermost core will be analyzed. One surface and subsurface sample will analyzed per cluster.	615488.392	816812.540
				0.5-1 foot bml	SMS			
	CR-18-TBD-SBSD-1[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615498.125	816838.677
				0.5-1 foot bml	SMS			

Table 4
Sample Locations and Analyses
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

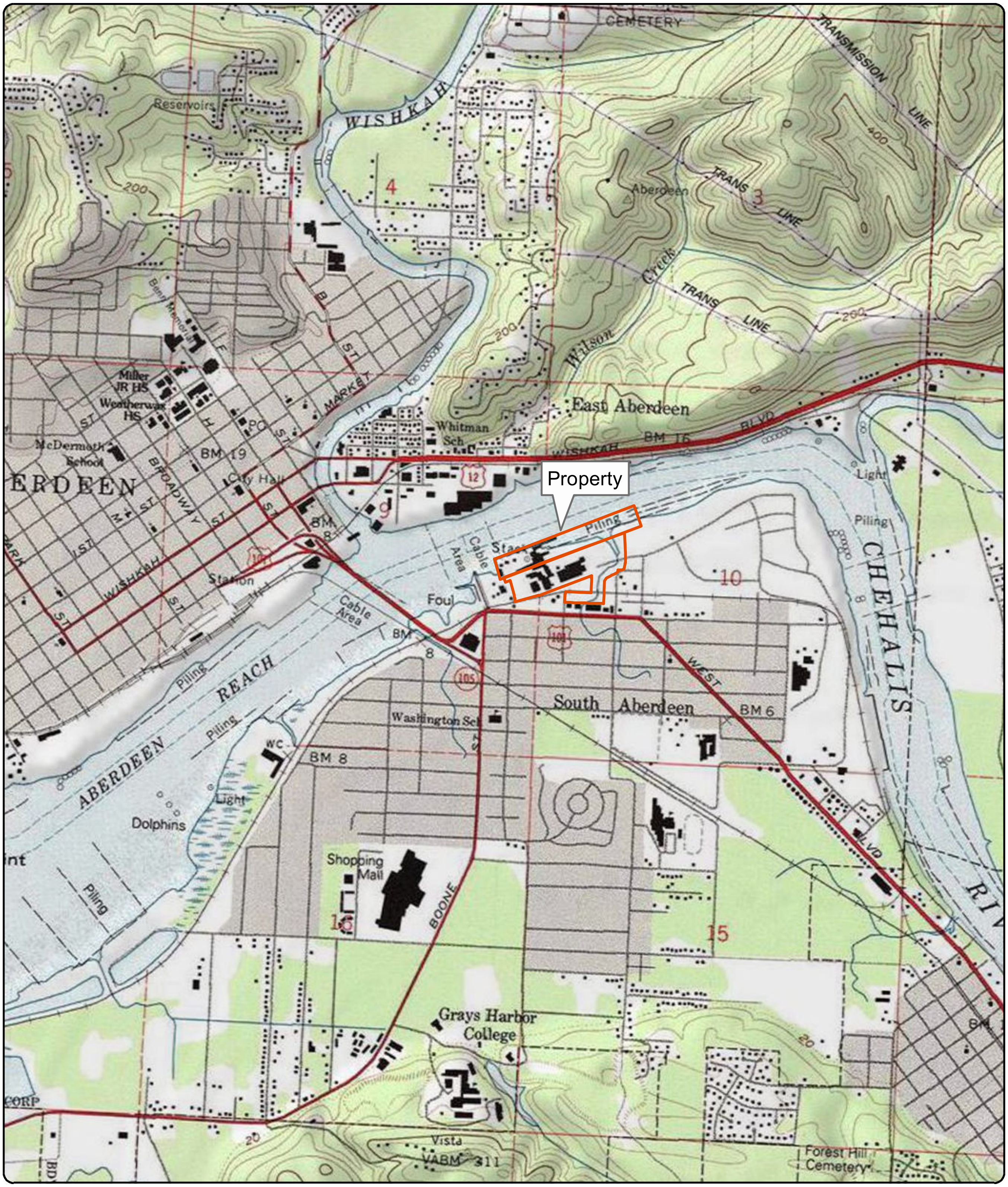
Sample Location	Sample ID	Sample Sublocation	Sample Type	Sample Depth	Analysis	Comments	Northing	Easting
CR-19	CR-19-TBD-SSD[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan	Cores will step out in a transect parallel to shore to the east until no visual impacts are observed; only sediment obtained in the outermost core will be analyzed. One surface and subsurface sample will analyzed per cluster.	615559.754	816991.008
				0.5-1 foot bml	SMS			
	CR-19-TBD-SBSD-1[b]	TBD	Sediment Core	0-10 cm bml	SMS + TPH + Dioxin/Furan		615571.441	817025.816
				0.5-1 foot bml	SMS			
CR-20	CR-20-SBS-Depth[a]	TBD	Upgradient Boring	Soil	TPH, PAH, Phenol, Hg, PCB	Soil collected using GeoProbe™ drill rig.	615297.848	816940.827
	CR-20-GW-Depth[a]	TBD		Groundwater	TPH, SVOA, Hg, PCB	Reconnaissance groundwater collected using GeoProbe™ drill rig.		
CR-21	CR-21-SBS-Depth[a]	TBD	Upgradient Boring	Soil	TPH, PAH, Phenol, Hg, PCB	Soil collected using GeoProbe™ drill rig.	615340.957	817042.271
	CR-21-GW-Depth[a]	TBD		Groundwater	TPH, SVOA, Hg, PCB	Reconnaissance groundwater collected using GeoProbe drill rig.		
CR-22	CR-22-SBS-Depth[a]	TBD	Upgradient Boring	Soil	TPH, PAH, Phenol, Hg, PCB	Soil collected using GeoProbe™ drill rig.	615423.692	817044.443
	CR-22-GW-Depth[a]	TBD		Groundwater	TPH, SVOA, Hg, PCB	Reconnaissance groundwater collected using GeoProbe drill rig.		
Seep-01	Seep-01	--	Opportunistic Seep water	--	TPH, SVOA, Hg, PCB	One opportunistic seep sample may be collected in the Pocket Beach Area.	Where Identified in Pocket Beach	Where Identified in Pocket Beach

Table 4
Sample Locations and Analyses
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Sample Location	Sample ID	Sample Sublocation	Sample Type	Sample Depth	Analysis	Comments	Northing	Easting
Storm-01	Storm-01	--	Stormwater	--	SMS + Dioxin/Furan + TPH	One stormwater sample will be collected from this location.	615330.393	816931.359

NOTES:
- - not applicable.
bml = below mudline.
cm = centimeters.
GW = groundwater.
Hg = mercury.
PAH = polycyclic aromatic hydrocarbon.
PCB = polychlorinated biphenyl.
SBS = subsurface soil.
SBSD = subsurface sediment.
SMS = Sediment Management Standards chemicals of concern.
SSD = surface sediment.
SVOA = semivolatile analytes.
TBD = to be determined.
TCLP=toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons.
[a]Depth is to be determined in field.
[b]Sublocation (TBD) to be determined in field.

FIGURES



Site Address: **
Source: US Geological Survey (1990) 7.5-minute topographic quadrangle: Aberdeen
Section 9 & 10, Township 17 North, Range 9 West

Figure 1
Property Location
Aberdeen, Washington

0 1,000 2,000
Feet

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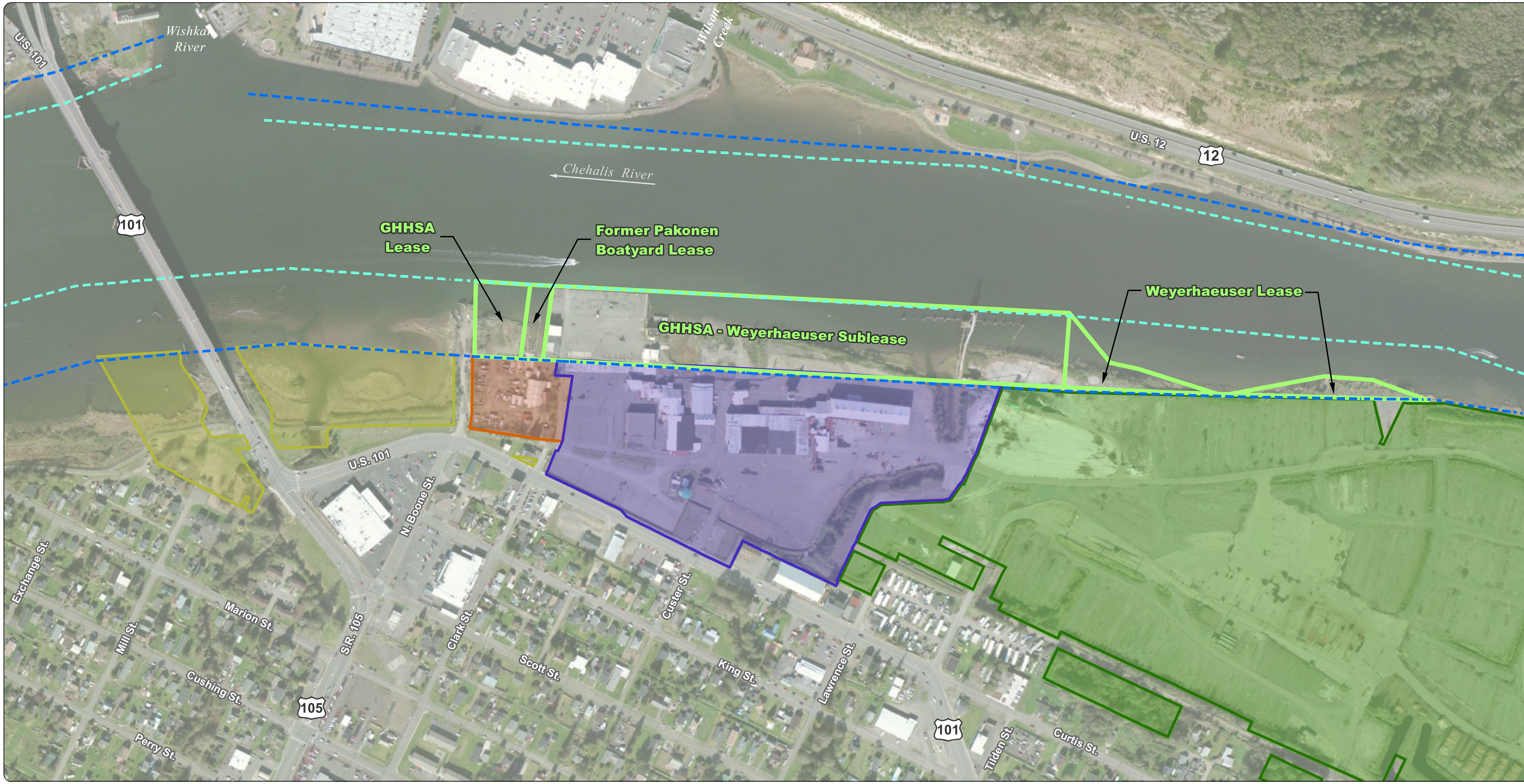

Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Grays Harbor County; harbor lines obtained from Washington Dept. of Natural Resources.

Legend

Area of Property Ownership
- City of Aberdeen
- Pakonen Boatyard
- Seaport Authority
- Weyerhaeuser

- Approximate Aquatic Lease Area
- Inner Harbor Line
- Outer Harbor Line

Figure 2
Property Vicinity
Aberdeen, Washington

Notes:
1. Areas of property ownership have been generalized based on taxlot information obtained from the County and a purchase sale agreement for the Seaport Authority property, and should be considered approximate.
2. Aquatic lease areas were digitized from a print maps of Aberdeen tidelands dated Mar. 22, 2001 and Jan. 15, 1907 on file with the Office of the Commissioner of Public Lands in Olympia, Washington, and should be considered approximate.

GRAYS HARBOR HISTORICAL SEAPORT

0 200 400
Feet

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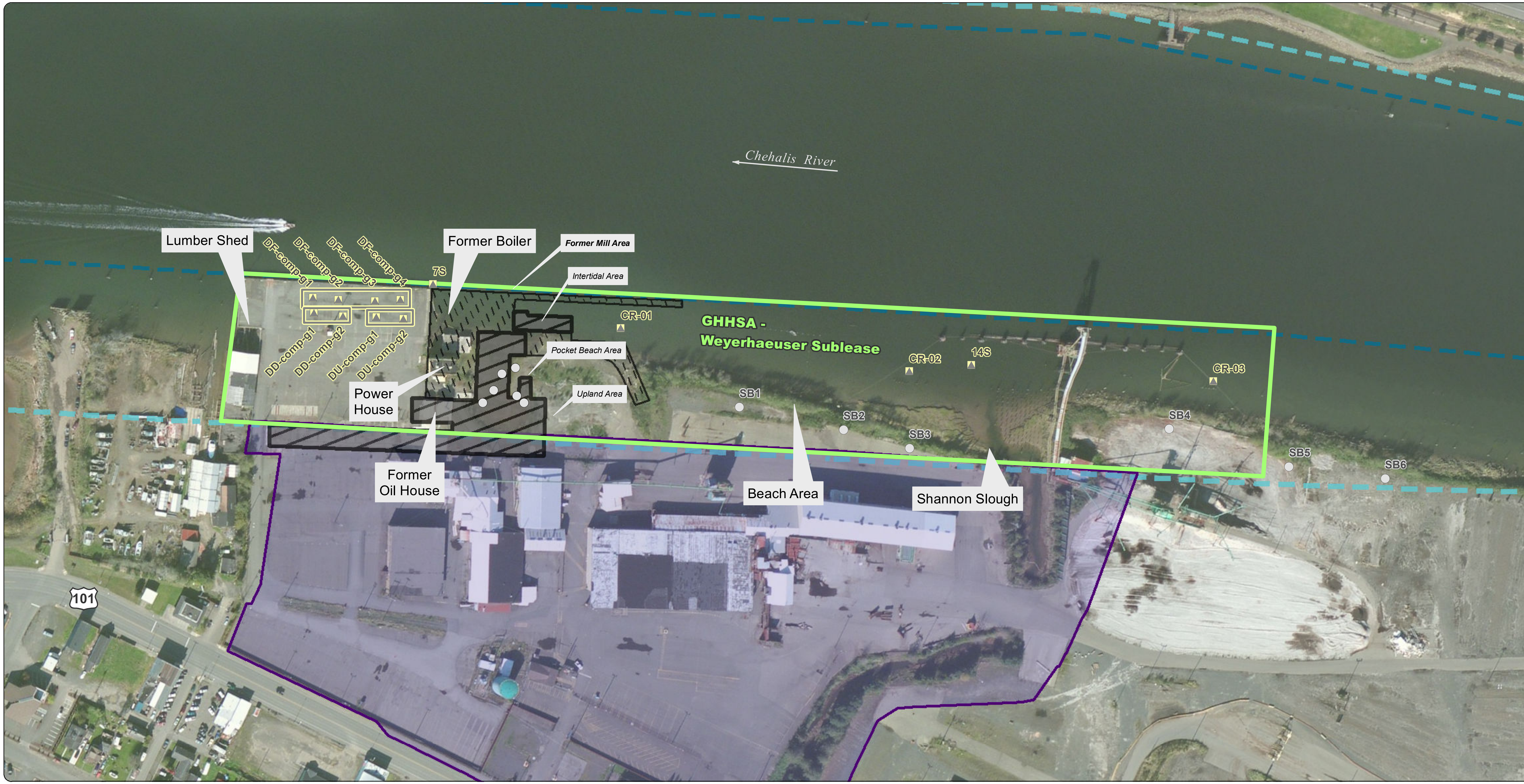
Path: X:\0863.01 Harbor Architects\01\05\Projects\Fig2_Property Vicinity.mxd
Print Date: 9/4/2014 Approved By: mstringer Produced By: jschane Project: 0863.01.01-02



Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Grays Harbor County; harbor lines obtained from Washington Dept. of Natural Resources.

Approximate Aquatic Lease Area
Seaport Authority Property
Former Mill
Former Wharf Extension
Historical Boring Location
Historical Surface Sample Location
Historical Composite Surface Sample

Notes:
1. GHHSA = Grays Harbor Historical Seaport Authority.
2. Aquatic lease areas were digitized from print maps of Aberdeen tidelands dated Mar. 22, 2001 and Jan. 15, 1907 on file with the Office of the Commissioner of Public Lands in Olympia, Washington, and should be considered approximate.

Figure 3
Areas of Interest
Aberdeen, Washington

0 100 200
Feet

Grays Harbor Historical Seaport

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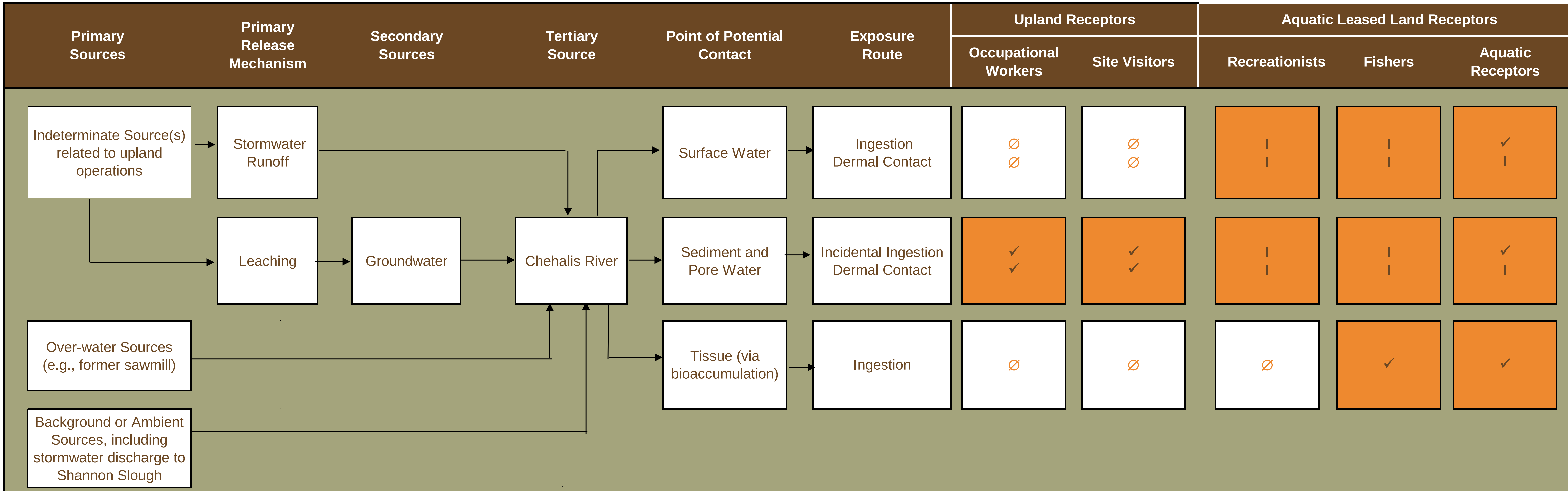
Print Date: 11/6/2014
Approved By: mstringer
Produced By: jschane
Project: 0863.01.01-02

Figure 4
Preliminary Conceptual Site Model
Grays Harbor Historical Seaport Authority
Aberdeen, Washington



Notes:

Primary pathway →
Potentially Complete exposure route ✓
Incomplete exposure route ∅
Insignificant exposure route I

Aquatic receptors include aquatic plants, benthic invertebrates, fish, and piscivorous birds and mammals.

Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Grays Harbor County; harbor lines obtained from Washington Dept. of Natural Resources.

- Approximate Aquatic Lease Area
- Seaport Authority Property
- Former Mill
- Former Wharf Extension
- Historical Boring Location
- Historical Surface Sample Location
- Historical Composite Surface Sample

Sample Locations

- Stormwater Sample Location
- Surface Sample Locations
- Composite Surface Sample

Notes:
1. GHHSA = Grays Harbor Historical Seaport Authority.
2. Aquatic lease areas were digitized from print maps of Aberdeen tidelands dated Mar. 22, 2001 and Jan. 15, 1907 on file with the Office of the Commissioner of Public Lands in Olympia, Washington, and should be considered approximate.

Figure 5
Leased Property
Proposed Surface Sample Locations

Aberdeen, Washington

GRAYS HARBOR HISTORICAL SEAPORT

0 100 200
Feet

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Path: X:\0863.01 Harbor Architects\01\05\Projects\Fig5_Leased Property Surface Sample Locations.mxd
Print Date: 11/13/2014
Approved By: mstringer
Produced By: apadilla
Project: 0863.01.01-02

Figure 6
Former Mill Area
Boring Locations

Aberdeen, Washington

GRAYS HARBOR HISTORICAL SEAPORT

Legend

Sample Locations

- Surface Sample Location
- Boring - Visual Observation (to determine spatial extent of visual and olfactory impacts.) with select laboratory analysis
- Boring - Visual Observation (to determine vertical extent) with select laboratory analysis
- Boring - with laboratory analysis
- Boring - Visual Observation to determine location in the field with laboratory analysis
- Composite Surface Sample
- Locations of borings selected to evaluate spatial extent of visual and olfactory impacts will be field modified to optimize delineation of impacts

0 25 50
Feet

Source: Aerial photograph (2013) obtained from Esri ArcGIS Online

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Path: X:\0863.01 Harbor Architects\01105\Projects\Fig6_Former Mill Area Boring Locations.mxd
Print Date: 11/13/2014
Approved By: M.Murray
Produced By: apadilla
Project: P0863.01.01

APPENDIX A

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS PLAN

ABERDEEN SAWMILL SITE, FACILITY SITE ID 1126, CLEANUP SITE ID 4987
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES AQUATIC LANDS LEASE NO. 22-A02150

Prepared for
GRAYS HARBOR HISTORICAL SEAPORT AUTHORITY
September 29, 2014
Project No. 0863.01.05

Prepared by
Maul Foster & Alongi, Inc.
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FOSTER
ALONGI

SAMPLING AND ANALYSIS PLAN

ABERDEEN SAWMILL SITE, FACILITY SITE ID 1126, CLEANUP SITE ID 4987
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC LANDS LEASE NO. 22-A02150

The material and data in this plan were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

Madi Novak
Senior Environmental Scientist

Michael R. Murray LG
Project Environmental Scientist

CONTENTS

TABLES AND ILLUSTRATIONS

FOLLOWING PLAN:

TABLES

ACRONYMS AND ABBREVIATIONS

°C	degrees centigrade
ARI	Analytical Resources Incorporated
ASTM	American Society for Testing and Materials
bml	below mudline
CFR	Code of Federal Regulations
cm	centimeter(s)
COC	chain of custody
DGPS	differential global positioning unit
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
FS	feasibility study
GHHSA	Grays Harbor Historical Seaport Authority
the Guide	DNR's Draft State Owned Aquatic Lands Sediment Sampling and Analysis Guide
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation-derived waste
LCS	laboratory control sample
the leased property	leased tideland and in-water property
MFA	Maul Foster & Alongi, Inc.
MS/MSD	matrix spike and matrix spike duplicate
OSHA	U.S. Occupational Safety and Health Administration
QC	quality control
RI	remedial investigation
RPM	revolutions per minute
SAP	sampling and analysis plan
site	the leased property and the uplands property
SMS	Sediment Management Standards
TOC	total organic carbon
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1 INTRODUCTION

On behalf of Grays Harbor Historical Seaport Authority (GHHSA), Maul Foster & Alongi, Inc. (MFA) has prepared this sediment sampling and analysis plan (SAP) for the remedial investigation (RI) and feasibility study (FS) of the leased tideland and in-water property (the leased property) located at 500 North Custer Street in Aberdeen, Washington (see the Figure 1 of the RI/FS workplan). The state-owned aquatic lands leased property, on the Chehalis River in Grays Harbor County, is being leased from the Washington State Department of Natural Resources (DNR) by Weyerhaeuser under Lease No. 22-A02150 and is subleased by GHHSA. DNR has requested that an RI/FS work plan be prepared, to which this SAP is an appendix.

1.1 Investigation Objectives

The primary objective of this SAP is to ensure quality control (QC) and consistency of the field aspects of data collection. Sampling is performed during the RI process to evaluate potential sources of contamination identified during document review and to characterize the nature and extent of impacts identified during previous sampling events. This SAP has been prepared consistent with the requirements of DNR's Draft State Owned Aquatic Lands Sediment Sampling and Analysis Guide (the Guide) (Integral, 2011), and according to Washington Administrative Code (WAC) 173-204-600 through WAC 173-204-610, as stipulated by the Washington State Department of Ecology's (Ecology) Sediment Management Standards (SMS).

1.2 Site Setting

The property leased from DNR by Weyerhaeuser (and subleased by GHHSA) encompasses approximately 16.9 acres (see Figure 1 of the RI/FS workplan). The leased property is located in the alluvial meander plain of the Chehalis River in the northwestern margins of the Willapa Hills physiographic region of southwest Washington.

In the Former Mill Area, there is an approximately 100-by-200-foot pocket beach area exposed at low tide, and this area is inundated to an existing bulkhead wall at high tide. Immediately upstream of the Former Mill Area is the Filled Tidelands area, and immediately downstream is the Dock Area containing buildings and a dock structure. The leased property is proposed for future use as the homeport for the *Lady Washington* and *Hawaiian Chieftain* tall ships and as part of a new maritime heritage facility called Seaport Landing.

1.3 Site Background

A sawmill has existed on the uplands property (directly south of the leased property) and the leased property (collectively herein referred to as the site) since before 1900. Weyerhaeuser acquired the site in 1955 and operated several sawmills and associated support facilities through January 2009, when the small log sawmill was permanently closed. There are no active wood-products manufacturing operations at the site. Until the 1960s, when the facility ceased operations, raw logs were brought to the site in log rafts in the Chehalis River and tied up to pilings in the river in front of the Big Mill. After the mid-1960s, raw logs were brought to the site by truck and staged on log decks at various locations in and adjacent to the site. The Big Mill was originally configured to manufacture shingles and slats for housing construction. During World War II, the Big Mill was converted to manufacture ship keels for the war effort. The precursor to the small log mill was added in 1972. The last upgrade to the small log mill was in 2003. In 2006, the Big Mill and attached finger pier were closed; the associated structures were removed from the site between 2006 and 2008. This area is now known as the Former Mill Area. The site continued to operate a second mill, known as the small log mill, into early 2009. The operational history of the site is detailed in the Level I assessment (PES, 2010). GHHSA acquired the property on March 29, 2013.

2 SAMPLING OBJECTIVES AND DESIGN

Samples are proposed in areas of interest given existing sediment analytical data and past property uses.

2.1 Sampling and Analysis Approach

Following discussion with DNR, Ecology, and GHHSA, MFA proposes sampling in each of the following five investigation areas (also identified in the RI/FS work plan):

- Former Mill Area and pocket beach
- Lumber storage shed area
- Former boiler area
- Beach area
- Mouth of Shannon Slough

Sampling and analysis proposed for each of these areas is described below. In addition, information about site physical features will be collected during the field investigation as follows:

- Pilings at the mouth of Shannon Slough will be evaluated for creosote.
- Configuration of the storm system and location of outfalls will be observed to the extent possible.

2.1.1 Former Mill Area

Wood waste, free product, and elevated concentrations of chemicals have been previously identified in the Pocket Beach portion of the Former Mill Area. The Former Mill Area includes a few subareas: the pocket beach area (see Figure 3 in the RI/FS work plan), the subtidal area (offshore of the pocket beach area); and the area immediately upgradient (upland) but within the leased property. These areas and stormwater input to the pocket beach area will be characterized as follows:

Pocket Beach Four sediment cores will be advanced in the pocket beach portion of the Former Mill Area to evaluate the depth of visual impacts previously observed. Sediment cores will be advanced to clean sediment underlying the visual impacts, or to refusal. Subsurface sediment where impacts are not observed (i.e., visual or olfactory) will be submitted to the analytical laboratory for analysis (see Figure 6 and Table 4 of the RI/FS work plan) to confirm the vertical extent of contamination. Additionally, four impacted samples will be collected in the pocket beach area and will be analyzed for toxicity characteristic leaching procedure lead and mercury analysis in order to evaluate material classification for possible disposal.

Intertidal Area Figure 6 of the RI/FS work plan shows approximate boring locations in the intertidal area. Cores will be advanced in multiple locations such that the spatial extent of visual impacts can be delineated to the north, east, and west. Cores will be observed for visual impacts (sheen, product, woodwaste) and samples will be collected and archived at the laboratory. Cores will be stepped out until subsurface impacts are no longer observed. Surface and subsurface sediment at locations where impacts are not observed (the three outermost cores to the north and one outermost cores to the east and west) will be submitted for analysis to confirm that the extent of contamination has been delineated. Additional surface and subsurface samples may also be analyzed upon receipt of results of the initial analysis.

Upland Area Three borings will be advanced in the area immediately upgradient (upland) of the pocket beach retaining wall (see Figure 6 of the RI/FS work plan) in the DNR-leased area. Soil from these three borings will be evaluated in the field for visual impacts and soil samples will be collected. Reconnaissance groundwater samples will be collected from all three borings to evaluate potential upgradient contaminant sources to the pocket beach. Groundwater sampling will be conducted at low river water level and outgoing tide, to the extent possible, to limit the influence of Chehalis River water in the groundwater samples. Groundwater samples will be analyzed for the compounds summarized in Table 4 of the RI/FS work plan.

Stormwater Samples will be collected from the stormwater outfall located in the pocket beach area during a storm event. The stormwater sample location and analyte list are provided in Table 4 and the location is shown in Figure 5 of the RI/FS work plan).

2.1.2 Lumber Storage Shed Area

Four surface (0 to 10 cm below the mudline [bml]) sediment samples will be collected from the lumber storage shed area (see Table 4 and Figure 5 of the RI/FS work plan) and composited into one sample for analysis. The composite sample from this location will be analyzed for all SMS constituents with marine criteria, as listed in WAC 173-204-320 and Table A-1 in the Guide (Integral, 2011). Additionally, based on past operations in this area, the sample will be analyzed for total petroleum hydrocarbons.

2.1.3 Former Boiler Area

Eight surface sediment samples will be collected from the former boiler area (see Table 4 and Figure 5 of the RI/FS work plan) and composited into two samples for analysis. Additionally, a subsurface sediment sample will be collected from one sublocation where visual impacts are observed in each of the two sample areas (see Figure 6 and Table 4 of the RI/FS work plan). Sediment cores will be advanced to clean sediment underlying the visual impacts, or to refusal. Subsurface sediment where impacts are not observed (i.e., visual or olfactory) will be submitted to the analytical laboratory for analysis. Samples will be collected from sediment beneath visual impacts at a sublocation to be determined field in the field. If no visual impacts are observed, a sample will be collected from 0.5 to 1 foot bml.

The samples from this area will be analyzed for all SMS constituents with marine criteria, as listed in WAC 173-204-320 and Table A-1 in the Guide (Integral, 2011). Based on past operations in this area, the samples will also be analyzed for dioxins/furans, total petroleum hydrocarbons, and asbestos.

2.1.4 Beach Area

Eight surface sediment samples will be collected from the beach area (see Table 4 and Figure 5 of the RI/FS work plan) and composited into two samples for analysis. The composite samples from this location will be analyzed for all SMS constituents with marine criteria, as listed in WAC 173-204-320 and Table A-1 in the Guide (Integral, 2011) and dioxins/furans.

2.1.5 Mouth of Shannon Slough

Four surface sediment samples will be collected from the mouth of Shannon Slough (see Table 4 and Figure 5 of the RI/FS work plan) and composited for analysis. The composite sample from this location will be analyzed for all SMS constituents with marine criteria, as listed in WAC 173-204-320 and Table A-1 in the Guide (Integral, 2011).

2.2 Woodwaste Survey

Because of current and past leased-property uses, a woodwaste survey will be performed during surface and subsurface sediment sampling. There is potential for woodwaste deposition on aquatic lands during log-handling operations. Woodwaste may include bark; branches; submerged logs; sawdust; wood chips; and woody, fibrous materials. Woodwastes are commonly found in surface deposits that range from thin to thick and are considered a deleterious substance as defined in WAC 173-204-200(17) (Integral, 2011).

All sediment samples will be evaluated in the field to determine the amount of woodwaste present, which will be reported as a percentage and documented. Sediment samples found to contain more than 25 percent woodwaste may be submitted for analysis of conventional parameters (TOC, total volatile solids, total solids, ammonia, total sulfides, pore water sulfides, and percent fines) (DNR, 2012; Integral, 2011). Sediment retained for conventionals analysis will not be homogenized.

To verify woodwaste extent, woodwaste will also be visually evaluated in the mudflats adjacent to the mouth of Shannon Slough (i.e., to the east and west of the proposed sediment sample locations in the slough). If more than 25 percent woodwaste is present, additional samples may be analyzed for conventional parameters as described above.

3 FIELD SAMPLING METHODS

Surface sediment samples will be collected from the 0- to 10-cm biologically active zone. Additionally, subsurface sediment, stormwater, soil, and reconnaissance groundwater will be collected in the Former Mill Area. Proposed sample locations are presented in Figures 5 and 6 of the RI/FS work plan. Proposed sample locations, compositing schemes, laboratory analysis, and analytical methods are summarized in Table 4 of the RI/FS work plan. Samples will be collected by staff trained and certified in handling potentially contaminated materials (see Section 3.10).

3.1 Surface Sediment Samples

Surface sediment samples will be collected in all investigation areas (see Figures 5 and 6 and Table 4 of the RI/FS work plan). Sample stations will be field located using a differential global positioning unit (DGPS), and collected manually using a decontaminated stainless steel spoon. Sediment will be recovered to 10-cm bml. Sediments that will be composited will be placed into a decontaminated stainless steel bowl and the samples will be homogenized. In the Former Mill Area, surface sediments will be collected using a surface-deployed grab sampler, such as a Ponar, or from the appropriate depth in the sediment cores advanced by the GeoProbe drill rig.

Laboratory-supplied sampling containers will be filled at each sample location. The size and quantity of sampling containers will be specified by the analytical laboratory. Analytical methods are presented in Table A-1.

3.2 Subsurface Sediment Samples

Subsurface sediment sampling will be conducted in the Former Mill Area, using a direct-push drill rig such as a GeoProbe. The GeoProbe method allows for recovery of a continuous sediment profile, using an acetate liner. To maximize recovery, 4-inch tooling will be used, as it is less likely to become clogged with debris. Drive depths and recovery depths will be recorded in the field notebook to correct for sediment compression. GeoProbe rigs also offer significant amounts of downforce (i.e., ability to penetrate debris) compared to other coring methods, such as a vibracorer.

The direct-push rig will be placed on a support vessel such as a barge, and will maneuver to the proposed sample station (see Figure 6 and Table 4 of the RI/FS work plan). Spuds will be used as necessary to hold the barge in place temporarily during drilling. A new acetate liner will be secured to the drill rig tooling and deployed from the vessel. A lead line will be used to confirm water depth at each location, and the GeoProbe rig will advance tooling up to 20 feet bml (or to refusal). Once back on the support vessel, the acetate liner will be separated from the tooling. If refusal is encountered in shallow sediment, the location will be field adjusted by within 20 feet and the boring repeated until adequate material has been recovered.

Following retrieval of an acceptable core, excess water will be removed from the acetate core liner and the core will be capped and stored in a vertical position until processing. Acetate core liners will be placed horizontally on a flat work surface and will be cut longitudinally, using a knife. The cores will be described, noting features such as sheen, woody debris, and biological features, and then photographed. Sediment will be sampled from the appropriate depth (see Table 4 of the RI/FS work plan), with care being taken not to sample material in contact with the acetate liner.

Laboratory-supplied sampling containers will be filled at each sample location. The size and quantity of sampling containers will be specified by the analytical laboratory. Analytical methods are presented in Table A-1.

3.3 Upland Soil Borings

If a seep sample representative of groundwater is collected (see Section 3.4), upland soil borings will not be advanced.

Three borings in the upland portion of the Former Mill Area leased property are proposed for soil and reconnaissance groundwater characterization (see Figure 5 and Table 4 of the RI/FS work plan). Borings will be advanced to the water table, estimated at less than 20 feet below ground surface, using a direct-push drilling rig (e.g., GeoProbe) by a drilling subcontractor licensed in Washington State. A continuous soil profile will be recovered through use of a macro-core sampling device (using an acetate liner).

Soil will be described using the American Society for Testing and Materials (ASTM) designation D2488-84, including color, texture, and grain size. Soil cuttings will be screened in the field with a photoionization detector to identify potential contaminants. New, disposable gloves will be used for collection of each sample. Soil samples will be collected if visual or field screening impacts are observed.

Groundwater samples will be collected from the reconnaissance borings, using a temporary stainless steel well screen. Casing will be advanced by the drill rig into the water table. The casing will be pulled back a minimum of 4 feet across the water table. The temporary screen is a 4-foot-long, slotted-screened interval, with polyethylene tubing installed up to the surface. Each of the temporary well screens will be developed for up to 30 minutes to reduce turbidity to as close to 10 nephelometric turbidity units as possible, and then sampled. Groundwater field parameters, including pH, conductivity, temperature, and turbidity, will be monitored during purging and will be recorded in the project field notebook. These parameters will also be collected from surface water to evaluate the potential influence of surface water on groundwater at these locations. At the conclusion of reconnaissance groundwater sampling, the temporary well screen will be removed. Drilling materials, including the temporary screen, will be decontaminated between boring locations. The borings will be abandoned by the drillers according to Ecology regulations.

Laboratory-supplied sampling containers will be filled at each sample location. The size and quantity of sampling containers will be specified by the analytical laboratory. Analytical methods are presented in Table A-1.

3.4 Stormwater and Seep Samples

One opportunistic seep sample may be collected in the pocket beach area during low tide, provided seep(s) are identified. The sample will be taken from a location close to an observed emergence point i.e., a pool. Photos, written descriptions, and GPS coordinates of the identified seep will be prepared. Water will be drawn into a syringe from a depth approximately one to two inches below the surface of the pool associated with the seep and injected into the sample container(s). A seep may also present as an area of moist sediment without a pool of standing water. In this case, a decontaminated hand trowel will be used to dig out a depression in the sediment in which groundwater can accumulate and from which a sample can be collected. Samples will be immediately labeled and stored in a cooler with ice until they are relinquished to a laboratory courier or shipped to an analytical laboratory. The seep sample will be tested for the same compounds and water quality parameters identified for groundwater (see Table 4 of the RI/FS work plan) to evaluate whether seepage is characteristic of groundwater.

One sample will be collected from the stormwater outfall located in the pocket beach area during a storm event. Stormwater sampling will be coordinated with lower tide stage to ensure the sample is not river water that entered the system during high tide. Samplers will wear clean, powder-free latex gloves while collecting samples. Samples will be collected for total metals and organics. Subsequently, a filter will be affixed and a sample will be collected for dissolved metals. Analytical samples will be collected first, followed by samples for field measurements at each location. If reasonably possible, samples will be collected directly into laboratory-supplied sample containers. Field water quality parameters to be collected include pH, conductivity, temperature, turbidity, dissolved oxygen, and oxidation/reduction potential. These parameters will be compared with surface water parameters collected to further verify that stormwater samples are not influenced by river water back-flow. A visual examination of stormwater discharge shall be performed and observations of color, odor, clarity, floating and settled solids, suspended solids, foam, oil, sheen, and other obvious indicators of stormwater pollution will be documented. In addition, the stormwater outfall will also be observed for dry-weather flow (e.g., due to groundwater infiltration) during appropriately (dry) conditions.

Samples will be analyzed for compounds as summarized in Table 4 of the RI/FS work plan. The size and quantity of sampling containers will be specified by the analytical laboratory. Analytical methods are presented in Table A-1.

3.5 Sample Location

The horizontal coordinates of all sample locations will be surveyed using a Trimble™ DGPS capable of subfoot accuracy, depending on satellite coverage. The target coordinates are shown in Table 4 of the RI/FS work plan. The horizontal datum will be North American Datum 83, Washington State Plane South, reported in feet. The vertical elevation of each overwater sediment station will be measured using a lead line, and the time noted so that tidal corrections can be applied.

3.6 Decontamination Procedures

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sediment sample material must meet high standards of cleanliness. All equipment that comes into direct contact with the sediment collected for analysis will be made of stainless steel and will be cleaned prior to use at each sampling location. Decontamination of all items will follow Puget Sound Estuary Program protocols. The decontamination procedure is:

1. Prewash rinse with tap water.
2. Wash with solution of tap water and Alconox soap (brush).
3. Rinse with tap water.
4. First rinse with distilled water.
5. Rinse three more times with distilled water.
6. Cover (no contact) all decontaminated items with aluminum foil.
7. Store in clean, closed container for next use.

Liquid generated by decontamination will be properly handled, according to procedures described in Section 3.9.

3.7 Sample Processing

Sediment collected using a decontaminated stainless steel spoon will be transferred to a large, decontaminated stainless steel bowl. Before homogenization, sediment will be evaluated for the presence of woody debris, and the sediment will be physically described. The quantity of woody debris will be recorded in the field notebook. Sediment will then be homogenized; for composite samples, aliquots of similar volumes will be combined in the stainless steel bowl and homogenized. Homogenized sediment will then be spooned immediately into appropriate precleaned, prelabeled sample containers; placed in coolers filled with ice; and maintained at approximately 4 degrees centigrade (°C). Sample holding times and preservation methods are presented in Table A-1. Debris and materials more than 2 inches in diameter will be omitted from sample containers. If woodwaste is present in excess of 25 percent, additional nonhomogenized sample volume will be collected where conventional parameter analysis is required.

3.8 Sample Containers and Labels

Sample containers and preservatives will be provided by the analytical laboratory. The analytical laboratory will maintain documentation certifying the cleanliness of the sample containers and the purity of preservatives provided. Specific container requirements will be determined by the analytical laboratory.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identification
- Date and time of sample collection
- Preservative type (if applicable)

Samples will be uniquely identified with a sample identification that, at a minimum, specifies sample number and sample location.

3.9 Field Documentation

After sample collection, the following information will be recorded in the project field notebook:

- The date, the time, and the name of person logging sample
- Weather conditions
- Sample location number
- Percentage of woody debris
- Depth of water at the location
- Sediment penetration and depth

Each sample will be photographed. Sediment will be described in the field, using the visual-manual description procedure (Method ASTM D-2488 modified). This information will also be recorded in the field notebook. Visual-manual characterization includes the following:

- Grain size distribution
- Density/consistency
- Plasticity
- Color and moisture content
- Biological structures (e.g., shells, tubes, macrophytes, bioturbation)
- Presence of debris and quantitative estimate (e.g., wood chips or fibers, paint chips, concrete, sandblast grit, metal debris)
- Presence of oily sheen
- Odor (e.g., hydrogen sulfide)

3.10 Investigation-Derived Waste

Investigation-derived waste (IDW) will consist of decontamination fluids and unused sediment collected by the GeoProbe. IDW will be stored in a designated area on the upland property, in 55-gallon drums approved by the Washington State Department of Transportation.

The drums (tops and sides) will be labeled with their contents, the volume of material, the date of collection, and the origin of the material. The waste drums will be sealed, secured, and transferred to a designated, secured area on the uplands property at the end of field sampling activities. The waste will be stored in the designated holding area until it has been characterized. Hazardous-waste and/or risk labels will be placed on the drum after characterization, if necessary.

An aliquot from the fluid drum may be submitted to the analytical laboratory to characterize the waste fluids if this determination cannot be made from the sediment analytical data. After the work is complete and analytical results are received, IDW will be characterized and disposed of appropriately.

3.11 Compliance with U.S. Occupational Safety and Health Administration Regulations

In accordance with Code of Federal Regulations (CFR) 1910.120, the following safety programs will be incorporated during the sediment sampling event:

- As required under WAC 173-204-550(4), a site-specific health and safety plan (HASP) shall be developed to the standards presented in CFR 1910.120 before field activities begin. The HASP is included as Appendix B of the RI/FS work plan.
- All field staff participating in sediment sampling activities will be U.S. Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trained, with subsequent OSHA eight-hour HAZWOPER refresher courses completed as appropriate.

Further, in order to protect personnel working over water, an overwater workers insurance policy will be in place during the field sampling activities.

3.12 Utility Locations

Buried underground utilities present a unique hazard for subsurface sampling. Private and public utility location services will be used to identify locatable utilities in the subsurface sampling area before field sampling activities begin.

4 SAMPLE HANDLING PROCEDURES

In order to maintain sample integrity between the field collection and the laboratory analysis, the storage, handling, and shipping of sediment samples will follow the procedures described in this section.

4.1 Field Quality Control Samples

Field QC samples will be collected to improve the reliability of the data. DNR recommends collecting field duplicate samples, although this is not required. MFA will collect one each of the following samples:

- **Field Duplicate:** collected to assess the homogeneity of the samples and the precision of the sampling process
- **Rinsate Blank:** used to help identify possible contamination from the sampling environment and/or from decontaminated sampling equipment
- **Temperature Blank:** used to verify that adequate sample storage temperature was maintained

In addition, extra volume for matrix spike and matrix spike duplicate (MS/MSD) analysis will be collected. The rinsate blank and field duplicate QC sample will be analyzed for all sediment chemistry analytes.

4.2 Sample Storage

In order to maintain sample integrity, sample containers will be placed in coolers filled with ice or equivalent immediately after being filled with sediment. Samples will be maintained at approximately 4°C.

4.3 Chain-of-Custody Procedures

Samples in the custodian's possession, in a secured location (under lock) with restricted access or in a container that is secured with official seals such that the sample cannot be reached without breaking the seals, are considered to be under custody. Chain-of-custody (COC) procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form supplied by the analytical laboratory. Each sample will be represented on the COC form. All data entries will be made with an ink pen.

4.4 Delivery of Samples to Analytical Laboratory

All samples will be shipped under COC procedures to the analytical laboratory no later than the day after collection. If samples are collected on Friday, they may be held until the following Monday for shipment, provided that this does not adversely impact holding time requirements. Sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest containing ice or equivalent.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the lab to track sample handling and final disposition.

5 LABORATORY ANALYTICAL METHODS

5.1 Chemical Analyses

The specific chemical analytes described in Section 2 are summarized, along with the numerical screening criteria and chemical-specific limits of quantitation, in Table A-2. Table A-1 presents a summary of the proposed analytical methods, preservation methods, and holding times for sediment and stormwater samples. MFA proposes submitting samples to the Analytical Resources Incorporated (ARI) laboratory in Tukwila, Washington.

Pore water samples will be obtained from sediment by ARI in the laboratory as necessary. Wet sediment will be placed in a centrifuge for 30 minutes at 3,000 revolutions per minute (RPM). This initial water will be decanted and the sediment removed. The decanted water will then be returned to the centrifuge for an additional 30 minutes at 7,000 RPM. Water will be decanted again and retained for pore water analysis.

5.2 Sample Quantitation Limits

Effort will be made to ensure that sample quantitation limits will be below the screening levels presented in Table A-2. Unforeseen matrix interference could cause elevated quantitation limits for some compounds. All reasonable means, including additional cleanup steps and method modifications, will be used to bring sample quantitation limits below the screening levels. In addition, an extra aliquot (8 ounces) of each sediment aliquot and composite sample will be archived and preserved at -18°C in case followup analysis is necessary.

5.3 Holding Times

Samples will be maintained at the analytical laboratory and will be analyzed within the holding times shown in Table A-2.

5.4 Sample Preservation

Chemical preservatives are required only for total sulfides (see Table 1). All samples will be preserved by storage at 4°C.

6 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

6.1 Laboratory Quality Assurance and Quality Control Checks

U.S. Environmental Protection Agency (USEPA) methods include specific instructions for the analysis of QC samples and the completion of QC procedures during sample analysis. These QC samples and procedures verify that the instrument is calibrated properly and remains in calibration throughout the analytical sequence, and that the sample preparation procedures have been effective and have not introduced contaminants into the samples. Additional QC samples are used to identify and quantify positive or negative interference caused by the sample matrix. The following laboratory QC procedures are required for most analytical procedures:

- **Calibration Verification—**Initial calibration of instruments will be performed at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Continuing calibration will be performed as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications. Any project samples analyzed while the instrument was outside control limits will be reanalyzed.
- **Method Blanks—**Method blanks are used to assess possible laboratory contamination of samples associated with all stages of preparation and analysis of samples and extracts. The laboratory will not apply blank corrections to the original data. A minimum of one method blank will be analyzed for every sample extraction group, or one for every 20 samples, whichever is more frequent.
- **MS/MSD Samples—**MS samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. A minimum of one MS will be analyzed for each sample delivery group, or one for every 20 samples, whichever is more frequent. Because

the spike is a duplicate sample, it measures the quality of laboratory preparatory techniques and the heterogeneity of the sample.

- **Surrogate Spike Compounds—**Surrogate spikes are used to evaluate the recovery of an analyte from individual samples. All project samples to be analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analysis method. Recoveries determined using these surrogate compounds will be reported by the laboratory; however, the laboratory will not correct sample results using these recoveries.
- **Laboratory Control Samples (LCSs)—**Analyses of LCSs will be performed by the lab at a frequency that satisfies the analytical methods' requirements.

6.2 Laboratory Calibration and Preventive Maintenance

The laboratory calibration ranges specified in SW-846 (USEPA, 1986) will be followed.

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive maintenance approach for specific equipment will follow the manufacturers' specifications and good laboratory practices.

Precision and accuracy data will be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any of the QC criteria.

7 DATA ANALYSIS AND RECORDKEEPING

7.1 Data Reduction, Validation, and Reporting

The analytical laboratory will submit an electronic data deliverable, which will be incorporated into MFA's EQuIS database. Analytical data will also be made available in pdf format and/or hard copy if requested. The analytical data package will include laboratory quality assurance and QC results to permit independent and conclusive determination of data quality. Only compounds presented in Table 1 will be reported by the analytical laboratory. Data quality will be determined by MFA, using the data evaluation procedures described in this section. The results of the MFA evaluation will be used to determine if the project data quality objectives are being met, and will be presented in a data validation memorandum as an appendix to the final report.

An internal memorandum prepared by MFA chemists provides an approach for dioxin data validation and toxicity equivalent quotient calculation and is included as the appendix to this SAP.

Dioxin analysis will be closely coordinated with the laboratory to minimize estimated maximum possible concentration (EMPC) data qualifiers (e.g., potentially adding additional cleanup steps when appropriate).

7.1.1 Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in USEPA SW-846 manuals for organic analyses (USEPA, 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. All additional data qualifiers will be defined in the laboratory's narrative report associated with each case.

7.1.2 Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hard-copy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC
- Surrogate recoveries
- Method blank results
- MS/MSD results
- Laboratory duplicate results

7.1.3 Data Quality Assurance and Quality Control Review

MFA will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. MFA will perform a Tier II validation, consistent with the USEPA's Superfund risk assessment guide (USEPA, 1989), and will assign data qualifiers to sample results, following applicable sections of the USEPA procedures for data review (USEPA, 1986, 2008, 2010).

Data qualifiers, as defined by the USEPA, are used to classify sample data according to their conformance to QC requirements. The most common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose.
- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can cause the sample data to be qualified. Whenever sample data are qualified, the reasons for the qualification will be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- MS/MSD results
- Laboratory duplicates (if analyzed)
- Field duplicates
- Field blanks
- LCSs
- Method reporting limits above requested levels
- Any additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for the data package. Data qualifiers will be assigned to sample results on the basis of USEPA guidelines, as applicable.

7.1.4 Data Management and Reduction

MFA uses EQuIS to manage all laboratory data. The laboratory will provide the analytical results in electronic EQuIS-deliverable format. Following data evaluation, data qualifiers will be entered into the EQuIS database.

Data may be reduced to summarize particular data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on all hand-entered data, any calculations, and any data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft Excel (spreadsheet)
- EQuIS (database)
- AutoCad and/or Arc GIS (graphics)
- USEPA ProUCL (statistical software)

LIMITATIONS

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

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TABLES

Table A-1
Sediment and Stormwater Analytical Methods
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Sample Type	Sediment Samples				Water Samples		
	Hold Time (4°C)	Hold Time on Archive (-18°C)	Preservative	Method	Hold Time (4°C)	Preservative	Method
SVOAs	14 days	one year	None	USEPA 8270	7 days	None	USEPA 8270
PCBs	14 days	one year	None	USEPA 8082	7 days	None	USEPA 8082
Metals except mercury[1]	six months	two years	None	USEPA 200.8/6010	six months	HNO3	USEPA 200.8/6010
Mercury	28 days	N/A	None	USEPA 7471	28 days	HNO3	USEPA 7470
Lead, TCLP	14 days/6 months	N/A	None	USEPA 1311/6010	--	--	--
Mercury, TCLP	14 days/28 days	N/A	None	USEPA 1311/7470	--	--	--
Dioxins/Furans	one year	one year	None	USEPA 1613	one year	None	USEPA 1613
TOC	14 days	six months	None	Plumb	--	--	--
Ammonia	seven days	N/A	None	USEPA 350.3	--	--	--
Total Sulfides	seven days	N/A	Zinc acetate	PSEP	--	--	--
TVS	six months	N/A	None	PSEP	--	--	--
Total Sulfides (pore water)	seven days	N/A	None	SM4500S	--	--	--
Salinity (pore water)	28 days	N/A	None	SM2520	--	--	--
NWTPH-HCID	--	--	--	--	seven days	None	NWTPH-HCID
NWTPH-G	--	--	--	--	14 days	HCl	NWTPH-G
NWTPH-Dx	--	--	--	--	seven days	None	NWTPH-Dx
Total Suspended Solids	--	--	--	--	seven days	None	SM2540D
Grain Size	six months	N/A	None	PSEP	--	--	--
Total Solids	14 days	N/A	None	PSEP	--	--	--
Archiving	14 days	--	None	Frozen upon receipt at laboratory	--	--	--

NOTES:
[1]Metals in the aqueous matrix will be analyzed for total and dissolved forms.

-- = not analyzed in this matrix.

°C = degrees centigrade.

N/A = not applicable.

PCB = polychlorinated biphenyl.

PSEP = Puget Sound Estuary Program.

SVOA = semivolatile analyte.

TCLP = toxicity characteristic leaching procedure.

TOC = total organic carbon.

TVS = total volatile solids.

USEPA = U.S. Environmental Protection Agency.

Table A-2
Marine Sediment Analyte List
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

	SMS Marine Sediment			Marine Surface Water
Chemical Parameter	SQS	SIZ_{max}, CSL, MCUL	LOQ	Aquatic Life / Human Health[a]
Metals	(mg/kg, dry weight)			(ug/l)
Arsenic	57	93	5.0	0.14
Cadmium	5.1	6.7	0.2	8.8
Chromium	260	270	0.5	50[b]
Copper	390	390	0.2	2.4
Lead	450	530	2.0	8.1
Mercury	0.41	0.59	0.025	0.025
Silver	6.1	6.1	0.3	-
Zinc	410	960	1.0	81
Organic Chemicals	(mg/kg organic carbon)			(ug/l)
Total LPAH	370	780	NA	-
Naphthalene	99	170	0.02	-
Acenaphthylene	66	66	0.02	-
Acenaphthene	16	57	0.02	990
Fluorene	23	79	0.02	5300
Phenanthrene	100	480	0.02	-
Anthracene	220	1,200	0.02	40000
2-methylnaphthalene	38	64	0.02	-
Total HPAH	960	5,300	NA	-
Fluoranthene	160	1,200	0.02	140
Pyrene	1,000	1,400	0.02	4000
Benzo(a)anthracene	110	270	0.02	0.018
Chrysene	110	460	0.02	0.018
Total benzofluoranthenes	230	450	0.04	0.018[c]
Benzo(a)pyrene	99	210	0.02	0.018
Indeno (1,2,3-c,d)pyrene	34	88	0.02	0.018
Dibenzo(a,h)anthracene	12	33	0.02	0.018
Benzo(g,h,i)perylene	31	78	0.02	-
1,2-dichlorobenzene	2.3	2.3	0.02	1300
1,4-dichlorobenzene	3.1	9	0.02	190
1,2,4-trichlorobenzene	0.81	1.8	0.02	70
Hexachlorobenzene	0.38	2.3	0.02	0.00029
Dimethyl phthalate	53	53	0.02	1100000
Diethyl phthalate	61	110	0.02	44000
Di-n-butyl phthalate	220	1,700	0.02	4500
Butyl-benzyl phthalate	4.9	64	0.02	1900
bis(2-ethylhexyl)phthalate	47	78	0.02	2.2
Di-n-octyl phthalate	58	4,500	0.02	-

Table A-2
Marine Sediment Analyte List
Grays Harbor Historical Seaport Authority
Aberdeen, Washington

Chemical Parameter	SQS	SIZ_{max}, CSL, MCUL	LOQ	Aquatic Life / Human Health[a]
Dibenzofuran	15	58	0.02	-
Hexachlorobutadiene	3.9	6.2	0.02	18
n-Nitrosodiphenylamine	11	11	0.02	6
Total PCBs	12	65	0.231	0.000064
Ionizable Organic Compounds	**(ug/kg dry weight)**			**(ug/l)**
Phenol	420	1,200	20	1700000
2-methylphenol	63	63	20	-
4-methylphenol	670	670	20	-
2,4-dimethylphenol	29	29	20	850
Pentachlorophenol	360	690	200	3
Benzyl Alcohol	57	73	20	-
Benzoic Acid	650	650	400	-

NOTES:

CLARC = Washington state department of Ecology cleanup levels and risk calculation.

CSL = cleanup screening level.

HPAH = high molecular weight polycyclic aromatic hydrocarbon.

LOQ = limit of quantitation.

LPAH = low-molecular-weight polycyclic aromatic hydrocarbon.

MCUL = minimum cleanup level.

mg/kg = milligrams per kilogram.

NA = not applicable.

PCB = polychlorinated biphenyl.

SIZ_{max} = Sediment Impact Zone maximum allowable concentration (WAC 173-204-420).

SQS = Sediment Quality Standards (WAC 173-294-320).

ug/kg = micrograms per kilogram.

ug/l = micrograms per liter.

WAC = Washington Administrative Code.

[a]Lower of available marine surface water chronic aquatic life or human health criteria from CLARC. June, 2014.

[b]Value is for hexavalent chromium.

[c]Value is for benzo(b)fluoranthene and benzo(k)fluoranthene.

APPENDIX

DIOXIN AND FURAN ANALYSIS, DATA VALIDATION, AND TEQ CALCULATION RULES

MAUL FOSTER ALONGI

MEMORANDUM

To: File | Date: September 28, 2012

From: Erik Naylor | Project: 9003.01.40

RE: Dioxin and Furan Analysis, Data Validation, and TEQ Calculation Rules

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The term dioxin is used to refer to a family of toxic chemicals that share a similar chemical structure and a common mechanism of toxic action. While there are 210 dioxin congeners, typically only the 17 most toxic congeners are reported by laboratories. The reported concentrations of the 17 dioxin congeners typically are validated to assess usability and then a toxicity equivalent concentration (TEQ) is calculated from the reported results to evaluate the toxicity of these compounds as a whole. The purpose of this memo is to provide an approach for dioxin data validation and TEQ calculation for the former Pacific Wood Treating site. Further, analytical method recommendations and requirements for laboratory deliverables are provided to enable consistent data validation and TEQ calculation using data from a variety of laboratories.

Critical to consistent data use is consistent use of terminology. Terms used in this memorandum are defined below.

- Method Detection Limit (MDL)—The minimum concentration of a compound that can be measured and reported with 99 percent confidence that the value is greater than zero according to the Washington State Department of Ecology's (Ecology), Model Toxics Control Act (MTCA) (Ecology, 2007).
- Estimated Detection Limit (EDL)—The sample- and analyte-specific EDL is an estimate made by the laboratory of the concentration of a given analyte that would have to be present to produce a signal with a peak height of at least 2.5 times the background noise signal level (U.S. Environmental Protection Agency [USEPA], 2005).
- Practical Quantitation Limit (PQL)—The lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using Ecology-approved methods (Ecology, 2007). This value is usually the lowest concentration used to calibrate the instrument after being adjusted for sample volume, sample extract volume, cleanups performed, and injection volume. PQLs should be no greater than 10 times the MDL (Ecology, 2007) and no greater than what is established by the USEPA in 40 Code of Federal Regulations (CFR) 136, 40 CFR 141-143, or 40 CFR 260-270.

- Estimated Maximum Potential Concentration (EMPC)—An EMPC is a value calculated for a reported analyte when the signal-to-noise ratio is at least 2.5:1 for both quantitation ions, but the ion abundance ratio criteria used for analyte confirmation are not met (USEPA, 2005). An EMPC value represents the maximum possible result of an analyte that could not be positively identified. The inability to positively identify the analyte could be a result of matrix interference, a coeluting compound, or low response.

- Toxic Equivalency Factor (TEF)—The factor by which each congener is multiplied in order to calculate its toxicity relative to 2,3,7,8-TCDD (Ecology, 2007). These values are summed to calculate the TEQ. TEFs depend on the endpoint being examined (i.e., birds, fish, mammals).

- TEQs—Concentrations of each congener are adjusted and summed to reflect their potency relative to 2,3,7,8-TCDD, one of the most toxic congeners. The TEQ is the sum of congener results multiplied by their specific TEF (Ecology, 2007).

ANALYTICAL METHODS

Dioxins are analyzed generally by USEPA Method 1613B or 8290, using a high-resolution gas chromatograph paired with a high-resolution mass spectrometer. A laboratory's PQL is usually the same for both methods. While the methods are very similar, Method 1613B is preferred, as it requires more rigorous quality assurance and quality control (QA/QC) through the use of six more internal standards than Method 8290. Because analytical technology and methodology have advanced rapidly since the methods were written, many laboratories combine elements of both methods to obtain the best results possible (Hoffman, E., and D. Fox 2010). Often the preparation and analyses are run using Method 1613B (for the additional QA/QC), while the calculations will be performed by Method 8290 (in order to obtain the sample- and analyte-specific EDLs). Method 1613B with calculated EDLs is the preferred method.

LABORATORY DELIVERABLES

It is important to work closely with the laboratory performing the dioxin analyses because different laboratories report data in different ways. The following items should be requested to ensure that the analytical report and electronic data deliverable (EDD) will contain all of the requisite information to validation the data and calculate TEQs:

- EDLs[1]and PQLs should be included in the final analytical report. EDLs, MDLs, and PQLs should all be included in the EDD.

- Results should be reported to the sample- and analyte-specific EDL. Results below the PQL but above the EDL will be qualified as estimates (J).

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[1] Note that USEPA Method 1613B does not provide for the calculation of EDLs; therefore, the laboratory must use the calculation approach provided in Method 8290 to report the required limits.

- EMPC results should be reported at the EMPC value (EMPC values will be assigned a "U" qualifier [the analyte was not detected at or above the concentration qualified] at the time of validation).

TEQ concentrations will not be requested from the laboratory. If the laboratory provides TEQ concentrations, they will not be used because the data have not been validated TEQs should be calculated only after the data are validated.

VALIDATION

Dioxin data are validated much like other organic data, but there are a few issues that do not typically arise in other organic data sets. In addition to standard validation procedures (USEPA 2005), the following scenarios should be addressed in the fashion described below, consistent with other Ecology sites (Ecology and Environment and G. L. Glass, 2011):

- EMPC reported values should be assigned a U qualifier at the reported EMPC value.
- EMPC values that appear to be significantly elevated should be investigated further with the laboratory and may be assigned an R qualifier (unusable) when applicable.
- Non-detected results should be assigned a U qualifier and reported at the EDL value.

Further dioxin validation guidelines can be found in the National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review (USEPA 2005). Data must be validated before TEQs are calculated.

TEQS

To express the overall toxicity of the 17 reported dioxins, the concentration of each congener is adjusted based on its toxicity relative to the most toxic congener, 2,3,7,8-TCDD, and then all 17 are added together. The adjustment factors, the TEFs, are provided by the 2005 World Health Organization. TEQs are commonly calculated by one of the following two methods:

- Non-detected values (U) are set as one half of the EDL. Values that are detected, even as estimates (J), should be used at face value. Multiply congener values by their corresponding TEF and then sum all of the products.
- Non-detected values (U) are set as 0. Values that are detected, even as estimates (J), should be used at face value. Multiply congener values by their corresponding TEF and then sum all of the products.

These methods result in two different TEQ values that can be shown as TEQ (U=1/2) and TEQ (U=0). TEQs should not be calculated to more significant figures than the original data. The table below illustrates these methods:

Dioxin	Result (ng/kg)	TEC[1] (U=1/2) (ng/kg)	TEC[1] (U=0) (ng/kg)	TEF Mammals
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	44	44	44	0.0003
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3000 J	3000	3000	0.0003
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	41	41	41	0.01
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	510	510	510	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	2.9 U	1.45	0	0.01
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	6.9 U	3.45	0	0.1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	7.4	7.4	7.4	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	5.2 U	2.6	0	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	27	27	27	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.5 U	0.25	0	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	22	22	22	0.1
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	3.4 U	1.7	0	0.03
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	3.2 U	1.6	0	1
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	2.4	2.4	2.4	0.1
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	3 U	1.5	0	0.3
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	1.4 U	0.7	0	0.1
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.23 U	0.115	0	1
Total Heptachlorodibenzofuran (HpCDF)	99	99	99	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	1,100	1100	1100	--
Total Hexachlorodibenzofuran (HxCDF)	97 J	97	97	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	250	250	250	--
Total Pentachlorodibenzofuran (PeCDF)	44	44	44	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	32 J	32	32	--
Total Tetrachlorodibenzofuran (TCDF)	19	19	19	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	8.2	8.2	8.2	--
TEQ (U=1/2)	**15.2**	--	--	--
TEQ (U=0)	**12.3**	--	--	--

NOTES:
-- = no value.
ng/kg = nanograms per kilogram.
[1]TEC is analyte-specific TEF adjusted concentration.

The difference between TEQ (U=1/2) and TEQ (U=0) values gives data reviewers an idea of how much the EDL substitution affects the TEQ summation (Hoffman, E., and D. Fox 2010). While

MTCA does not specify using the TEQ (U=1/2) method, it is the method that has been historically used at the Port of Ridgefield and will continue to be used.

SUMMARY

- USEPA Method 1613B is recommended for dioxin analysis (with Method 8290 EDL calculations).
- The laboratory must report a PQL and EDL for each sample and each congener, and provide a PQL, EDL, and MDL for each sample and each congener in the EDD.
- Results should be reported to the sample- and analyte-specific EDL. Results below the PQL but above the EDL will be qualified as estimates (J).
- EMPC results should be reported at the EMPC value (EMPC values will be assigned a "U" qualifier at the time of validation). However, if the EMPC is significantly elevated, additional qualification may be appropriate.
- Non-detected results should be assigned a U qualifier and reported at the EDL value.
- Laboratory data must be validated before a TEQ is calculated.
- TEQs should be calculated as follows: non-detected values (U) are set as one half of the EDL. Values that are detected, even as estimates (J), should be used at face value. Multiply congener values by their corresponding TEF and then sum all of the products.

REFERENCES

Ecology. 2007. Model Toxics Control Act statute and regulation. Publication No. 94-06. Washington State Department of Ecology. November.

Ecology and Environment Inc. and Gregory L. Glass. 2011. Rayonier Mill off-property soil dioxin study. June.

Hoffman, E., and D. Fox. 2010. Polychlorinated dioxins and furans (PCDD/F): revisions to the supplemental quality assurance project plan (SQAPP). U.S. Environmental Protection Agency. November.

USEPA. 2005. USEPA contract laboratory program national functional guidelines for chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) data review. EPA 540-R-05-001. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. September.

APPENDIX B

SITE-SPECIFIC HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC LANDS LEASE NO. 22-A02150
500 NORTH CUSTER STREET
ABERDEEN, WASHINGTON

Prepared for

GRAY'S HARBOR HISTORICAL SEAPORT AUTHORITY

November 25, 2014
Project No. 0863.01.05

Prepared by
Maul Foster & Alongi, Inc.
411 First Avenue South, Suite 610, Seattle WA 98104

MAUL FOSTER ALONGI

HEALTH AND SAFETY PLAN

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC LANDS LEASE NO. 22-A02150
500 NORTH CUSTER STREET
ABERDEEN, WASHINGTON

The material and data in this report were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

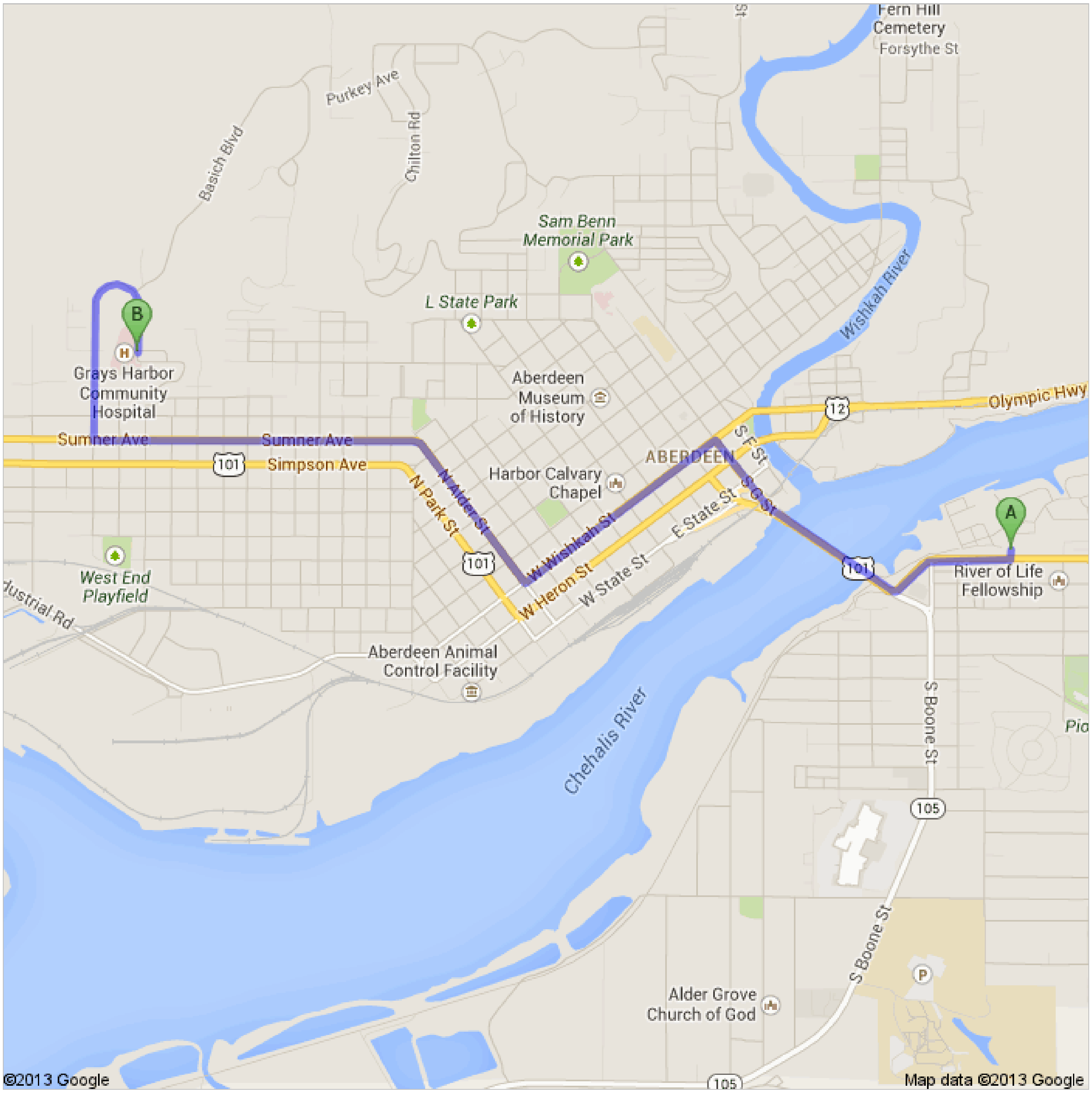
Madi Novak
Senior Environmental Scientist

Michael Murray
Project Environmental Scientist

CONTENTS

CONTENTS (CONTINUED)

Directions to Grays Harbor Community Hospital
915 Anderson Dr, Aberdeen, WA 98520
3.6 mi – about **10 mins**



500 N Custer St, Aberdeen, WA 98520

1.	Head **south** on **N Custer St** toward **W Curtis St**	go 135 ft total 135 ft
2.	Take the 1st right onto **US-101 N/W Curtis St** Continue to follow US-101 N About 3 mins	go 1.0 mi total 1.0 mi
3.	Turn left onto **E Wishkah St** About 3 mins	go 0.6 mi total 1.6 mi
4.	Turn right onto **S Alder St** About 1 min	go 0.5 mi total 2.1 mi
5.	Slight left onto **Sumner Ave** About 2 mins	go 0.9 mi total 2.9 mi
6.	Turn right onto **Oak St** About 1 min	go 0.5 mi total 3.4 mi
7.	Continue onto **Anderson Dr** Destination will be on the right	go 0.2 mi total 3.6 mi

Grays Harbor Community Hospital
915 Anderson Dr, Aberdeen, WA 98520

1 NEAREST HOSPITAL/EMERGENCY MEDICAL CENTER

1.1 Nearest Hospital

Grays Harbor Community Hospital
915 Anderson Dr.
Aberdeen, WA 98520

Phone: (360) 532-8330
Distance: 3.6 miles
Travel Time: 10 minutes

1.2 Emergency Route to Hospital

See first page of document.

1.2.1 Driving Directions

1. Head south on N Custer St toward W Curtis St
2. Take the 1st right onto US-101 N/W Curtis St, Continue to follow US-101 N
3. Turn left onto E Wishkah St
4. Turn right onto S Alder St
5. Slight left onto Sumner Ave
6. Turn right onto Oak St
7. Continue onto Anderson Dr., Destination will be on the right

1.3 Emergency Phone Numbers

Ambulance, Police, Fire	**Dial 911**
Madi Novak Project Manager	Phone: (503) 501-5212 Cell: (971) 227-1060
Michael Murray Project Environmental Scientist	Phone: (503) 501-5226 Cell: (503) 310-0435
Bill Beadie Health and Safety Coordinator	Phone: (503) 501-5237 Cell: (503) 740-6847

2 PROJECT INFORMATION

Date: August 27, 2014
Project: 0863.01.05
Site: Washington State Department of Natural Resources Aquatic Lands Lease No. 22-A02150
Location: Aberdeen, Washington
Project Manager: Madi Novak
Prepared By: Michael Murray

3 KEY PROJECT PERSONNEL

3.1 Site Work Team

Name	Responsibility
Madi Novak	Project Manager
Michael Murray	Field Personnel
Bill Beadie	Health and Safety Coordinator
Justin Pounds	Field Personnel

3.2 Entry Briefing Date

First day of on-site work.

3.3 Special Conditions (e.g., work schedule or limitations)

Any work performed at night must be performed with lights mounted on stands (or equivalent) and using the "buddy system."

Maul Foster & Alongi, Inc. (MFA) personnel are not allowed to perform site activities alone after dark.

3.4 Required Training

MFA employees as well as any contractor employees assigned to perform field activities covered by this procedure must be currently approved for hazardous-waste fieldwork, including:

- Current medical clearance to conduct hazardous-waste fieldwork

- Completion of training as required by Title 29 Code of Federal Regulations (CFR) 1910.120(e), including:

  - Forty hours of hazardous-waste worker basic instruction within the last 12 months, or

  - Eight hours of hazardous-waste worker refresher training within the last 12 months, subsequent to completion of 40 hours of basic hazardous-waste worker training

3.5 Special Training

Copies of all required training certificates and current medical surveillance certificates must be compiled before site entry. This information must also be provided to MFA by all subcontractors for their on-site personnel.

4 PROJECT DESCRIPTION

MFA has prepared this Health and Safety Plan (HASP) for the uplands property (directly south of the leased property) and the leased property (Washington State Department of Natural Resources Aquatic Lands Lease No. 22-A02150 in Aberdeen, Washington). These properties are collectively herein referred to as the site. The physical address of the site is 500 North Custer Street, Aberdeen, Washington. The leased property, on the Chehalis River in Grays Harbor County, is being leased from the Washington State Department of Natural Resources (DNR) by Weyerhaeuser under Lease No. 22-A02150. This HSP has been prepared to instruct MFA personnel working on site. Any clients, contractors or subcontractors involved in the scope of work for this HSP are responsible for developing their own HSPs to ensure that proper health and safety procedures are followed by their personnel.

The site is located in section 10, township 17 north, range 9 west of the Willamette Meridian.

MFA will be conducting sediment sampling activities in the Chehalis River within the site.

The purpose of this plan is to provide information to minimize the potential for adverse exposures or injuries while performing work on the site. A combination of personal protective equipment (PPE), engineering controls, and safe work practices will be used to minimize the risk of physical injuries and chemical exposures. All personnel are advised that this field project may result in exposure to chemical and physical hazards, and that this plan must be followed to minimize and/or eliminate these risks.

The procedures and requirements contained in this plan are intended for MFA personnel performing field activities. All MFA field personnel are responsible for understanding and adhering to this HSP, and should also be alert to any unsafe conditions or practices that may affect their safety. Each day before beginning fieldwork, a site safety officer (SSO) who is familiar with health and safety procedures and the site will be designated by the on-site MFA personnel. All subcontractors have the primary responsibility for the safety of their own personnel on the site. Any safety deficiencies should be immediately communicated to the SSO and to the health and safety coordinator (HSC). If personnel safety is threatened, the SSO, project manager, or MFA HSC must be contacted immediately.

All personnel who will be working on site are required to read and understand this HSP. All personnel entering the work area must sign the Personnel Acknowledgment Sheet (Section 11), certifying that they have read and understand this HSP and agree to abide by it.

4.1 Scope of Work

The MFA scope of work for this project includes the following activities:

- In-river and shore based sediment sampling in the leased property. The majority of the work will be conducted within approximately 100 feet of the Chehalis River shoreline. Drill rigs and/or vibracore devices will be used to assist in sample collection (see Appendix A).

NOTE: This HSP must be reevaluated and updated annually or when site conditions or scope of work changes.

5 FACILITY DESCRIPTION AND BACKGROUND

5.1 Type of Facility

The site includes uplands property (directly south of the leased property) and state-owned aquatic lands located in the Chehalis River in Grays Harbor County. The leased property is being leased from the DNR by Weyerhaeuser under Lease No. 22-A02150. Grays Harbor Historical Seaport Authority (GHHSA) will sublease the state-owned aquatic lands from Weyerhaeuser. The leased property encompasses approximately 16.9 acres along the Chehalis River shoreline.

5.2 Building/Structures

A sawmill has existed on the uplands property (directly south of the leased property) and the leased property since before 1900. In January 2009 the small log sawmill was permanently closed. In 2006, the Big Mill and attached finger pier were closed; the associated structures were removed from the site between 2006 and 2008. This area is now known as the Former Mill Area. In the Former Mill Area, there is an approximately 100-by-200-foot exposed area at low tide, and this area is inundated to an existing bulkhead wall at high tide. Immediately upstream of the Former Mill Area is the Filled Tidelands area, and immediately downstream is the Dock Area containing buildings and a dock structure. There are no active wood products manufacturing operations at the site. The leased property is proposed for future use as the homeport for the Lady Washington and Hawaiian Chieftain tall ships and as part of a new maritime heritage facility called Seaport Landing.

5.3 Access

The uplands property is accessible by foot and via N. Custer St. for vehicular traffic. The leased property is accessible via watercraft and may be accessible by foot during low-tide.

5.4 Topography

The site is situated on the relatively flat lowlands adjacent to the Chehalis River; the site is adjacent to the eastern portion of Grays Harbor.

5.5 General Geologic/Hydrologic Setting

The leased property is located in the alluvial meander plain of the Chehalis River in the northwestern margins of the Willipa Hills physiographic region of southwest Washington.

5.6 Site Status

Light facility maintenance activities, marine vessel maintenance.

5.7 Site History

A sawmill has existed on the site since before 1900. Weyerhaeuser acquired the site in 1955. In 2006, the Big Mill and attached finger pier were closed; the associated structures were removed from the site between 2006 and 2008. When the facility was operational, raw logs were brought to the site in log rafts in the Chehalis River and tied up to pilings in the river in front of the Big Mill until the mid-1960s. After the mid-1960s, raw logs were brought to the site by truck and staged on log decks at various locations in and adjacent to the site. The Big Mill was originally configured to manufacture shingles and slats for housing construction. During World War II, the Big Mill was converted to manufacture ship keels for the war effort. The site continued to operate a second mill, known as the small log mill, into early 2009. GHHSA acquired the property on March 29, 2013.

5.8 Special Conditions/Comments

Work over or adjacent to a waterway poses potential safety hazards. Workers must wear a U.S. Coast Guard-approved life vest while conducting sediment sampling or working along the shoreline.

Drill rigs and/or vibracore devices will be used over and adjacent to water from support vessels.

Commercial and recreation Chehalis River traffic pose a potential safety hazard. Be aware of other water uses.

6 WASTE TYPE(S)/CHARACTERISTICS

6.1 Hazardous Substances

Are hazardous substances known to have been stored/spilled on site?

__X__ YES ______ NO

6.2 Special Considerations/Comments

Before any site work, a copy of this HSP must be read and the Acknowledgment page signed.

7 HAZARD EVALUATION

The following subsections describe the potential physical and chemical hazards associated with implementing this project. The control measures that field personnel must use to eliminate or minimize these hazards, such as air monitoring, PPE, and decontamination procedures, are detailed in subsequent sections of this plan.

7.1 Physical Hazards

Potential physical hazards in site operations include:

- Vehicular traffic, including commercial and recreational river traffic
- Equipment and machinery (drill rigs)
- Fire/explosion
- Falling objects/loads
- Water/drowning hazards

- Uneven walking surfaces
- Noise

7.2 Electrical/Mechanical/Vapor Systems

MFA employees will not be working on electrical or mechanical systems. The contractor will be responsible for administering lockout/tagout procedures, as applicable.

7.3 Activity/Traffic/Pedestrian Control

Be alert for inattentive boaters/recreationists at or near the job site. Keep all nonessential personnel out of the sampling areas.

7.4 Fires and Explosions

In the case of an emergency, fire safety is the responsibility of all persons on site. The following general precautions address site-wide operations:

- A fire extinguisher will be kept in the MFA field vehicle.
- Smoking is not allowed on site by MFA personnel.
- Leaks and spills of flammable or combustible fluids must be cleaned up immediately.

See the air monitoring section for potential explosive-atmosphere precautions.

7.5 Uneven Walking Surfaces

Care should be used when boarding and exiting water craft. Boats may shift without notice. Operating in a water environment, surfaces are likely to be wet and slick. When possible, minimize movement around boat in order to minimize walking hazards. Care should be used when walking in or out of tidal mudflats. Steep grades and loose mud can make walking or standing on these surfaces difficult and potentially hazardous.

7.6 Noise

In addition to interference with oral communication, job performance, and safety, the effects of noise on humans include physiological effects, particularly temporary and permanent hearing loss. The factors that affect the degree and extent of hearing loss are intensity or loudness of the noise, type of noise, period of exposure, and distance from the noise source. When working in close proximity to operating equipment or other loud noise sources, all MFA personnel will be required to use hearing protection.

7.7 Marine Safety

When conducting activities related to the use of water craft, employees will adhere to the requirements in the MFA SOP for marine and boat safety (Appendix B). Any incidents must be reported as indicated in the MFA Accident/Loss Report (Appendix C).

7.8 Falling Overboard

It is anticipated that sampling will be conducted from a vessel. As with any work from a floating platform, there is a chance of falling overboard. A personal flotation device (PFD) for each crew person will be available in the boat at all times. PFDs will be worn and properly buckled and zipped as appropriate, by all personnel on or over water, regardless of work zone. If hydrostatic vests are used, they will be checked daily to ensure that the carbon dioxide cartridge is "green," indicating that it is ready for use.

7.9 MFA Vehicle Use

When operating vehicles on the site, employees will adhere to the requirements in the MFA standard operating procedure (SOP) for vehicle safety operations (Appendix C). Any traffic incidents must be reported as indicated in the MFA Accident/Loss Report (Appendix C).

7.10 Chemical Hazard Evaluation

The following potentially hazardous chemicals are known or suspected to be in site sediments.

Chemical of Concern	OSHA PEL	OSHA STEL	OSHA IDLH	Odor Threshold	LEL (%)	IP(eV)	Other Hazard
Mercury	0.1 mg/m^3	NA	10 mg/m^3	NA	NA	?	C
Polychlorinated biphenyls	0.5 mg/m^3	1 mg/m^3	5 mg/m^3	?	NA	?	C
Pentachlorophenol	0.5 mg/m^3	1.5 mg/m^3	2.5 mg/m^3	NA	NA	NA	C, P
Butyl-benzyl phthalate	NA	NA	NA	NA	NA	NA	P
Bis(2-ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	P
Acenaphthene	NA	NA	NA	NA	NA	NA	P
Fluoranthene	NA	NA	NA	NA	NA	NA	P

Chemical of Concern	OSHA PEL	OSHA STEL	OSHA IDLH	Odor Threshold	LEL (%)	IP(eV)	Other Hazard
Pyrene	0.2 mg/m^3	NA	80 mg/m^3	NA	NA	NA	C
1,4-Dichlorobenzene	450 mg/m^3	NA	900 mg/m^3	NA	2.5	8.98	P
1,2,4-Trichlorobenzene	NA	NA	NA	NA	2.5	NA	P
Dioxins/Furans	NA	NA	NA	NA	NA	NA	C, P

NOTES:

C — carcinogen.
COR — corrosive.
E — explosivity.
F — flammable.
GW — groundwater.
IDLH — immediately dangerous to life and health.
IP (eV) — ionization potential.
LEL — lower explosive limit.
mg/m^3 — milligrams per cubic meter.
NA — not available.
OSHA — Occupational Safety and Health Administration.
P — poison.
PCB — polychlorinated biphenyls.
PEL — permissible exposure level.
ppm — parts per million.
R — reactive.
SC — suspected carcinogen.
STEL — short-term exposure level.
TWA — time-weighted average.

8 SAFETY EQUIPMENT AND PROCEDURES

8.1 Safety Equipment

The following safety equipment will be used as needed on the site:

- Protective clothing—Water resistant clothing.
- Chemical protective gloves—nitrile.
- Decontamination equipment—soap and water.
- Steel-toed boots.
- Hearing protection.
- Safety glasses—safety glasses with side shields are required at all times during active site work. Use splash shields if performing activities where the potential exists for liquids to contact face or eyes.
- Hard hat.
- Type II or III personal floatation vests that are U.S. Coast Guard approved.
- Caution tape, traffic cones, or barriers.
- High-visibility vest or clothing for working in or adjacent to any roadway.
- First-aid kit—located in the MFA field vehicle.
- Fire extinguisher—located in the MFA field vehicle.
- Drinking water and Gatorade or equivalent.

8.2 Communications

A mobile phone will be available to MFA personnel. Field personnel are not permitted to carry mobile phones into a potentially flammable environment, as such instruments are not intrinsically safe.

8.3 Decontamination Procedures

Decontamination procedures are outlined below.

8.3.1 Partial Decontamination Procedure

Partial decontamination procedures will be followed when exiting the exclusion zone and will apply to items used in the exclusion zone.

- Wash and rinse boots and outer gloves in buckets in the contamination-reduction zone.
- Remove outer gloves. Inspect and discard in a labeled container for disposable clothing if ripped or damaged.
- Wash hands and face with soap and water.

8.3.2 Full Decontamination Procedures

Full decontamination procedures will be followed at the end of each work shift and will apply to items used.

- Wash and rinse boots and outer gloves in buckets in the contamination-reduction zone.
- Remove gloves and deposit in a labeled container for disposable clothing.
- Remove work boots without touching exposed surfaces, and put on street shoes. Place work boots in a plastic bag for later reuse.
- Wash hands and face with soap and water.
- Shower as soon after the work shift as practicable.

8.4 Emergency Equipment

A fire extinguisher will be kept in the MFA field vehicle. The extinguisher will be Type ABC, approved by the National Fire Prevention Association. The extinguisher will be inspected monthly and serviced yearly. A first-aid kit will be available in the MFA field vehicle.

Additional emergency equipment required on the boat and described in the marine and boat safety SOP in Appendix B, include a sound-producing distress signal such as a whistle or airhorn, and one wearable Type I, II or III personal flotation device for each passenger. Optional but recommend equipment include oars or paddle, a VHF radio, and a fire extinguisher if the vessel is propelled by a gasoline engine.

9 HEALTH AND SAFETY EQUIPMENT CHECKLIST

REQUIRED SAFETY EQUIPMENT

Equipment	Requirements
Hard Hat	Use when appropriate.
Steel-Toed Boots	Required on all job sites.
Safety Glasses w/side shields	Required on all job sites.
Hearing Protection	Use when appropriate.
Protective Clothing	Water resistant clothing when appropriate.
Personal floatation device	US Coast Guard-approved vest when working near or over water.
Decontamination Equipment	Bring soap and water to wash hands and face if no facilities are available.
Caution Tape, Traffic Cones, or Barriers	Use when working near traffic.
Emergency Eyewash	Located in the MFA field vehicle.
First-Aid Kit	Located in the MFA field vehicle.
Fire Extinguisher	Located in the MFA field vehicle.
Drinking Water	Located in the MFA field vehicle.

10 GENERAL SAFE WORK PRACTICES

Field operations for this project shall be conducted in accordance with the minimum safety practices described below, which are required for MFA employees.

10.1 Safety Practices for Field Personnel

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in any area where the possibility of contamination exists.

2. Field personnel must thoroughly wash hands when leaving a contaminated or suspected contaminated area before eating, drinking, or any other activities.

3. Contaminated protective equipment shall not be removed from the work area until it has been properly decontaminated or containerized on site.

4. Avoid activities that may cause dust. Removal of materials from protective clothing or equipment by blowing, shaking, or any means that may disperse materials into the air is prohibited.

5. Field personnel must use the "buddy system". Communications between members must be maintained at all times. Emergency communications shall be prearranged in case unexpected situations arise. Visual contact must be maintained between pairs on site, and team members should stay close enough to assist one another in the event of an emergency.

6. Personnel should be cautioned to inform one another of subjective symptoms of chemical exposure such as headache, dizziness, nausea, and irritation of the respiratory tract.

7. At sites with known or suspected contamination, appropriate work areas for field personnel support, contaminant reduction, and exclusion will be designated and maintained.

8. MFA field personnel are to be briefed thoroughly on the anticipated hazards, equipment requirements, safety practices, emergency procedures, and communications methods, both initially and in daily briefings.

9. All MFA field vehicles shall contain a first-aid kit and a multipurpose, portable fire extinguisher.

10. All field personnel will, whenever practicable, remain upwind of drilling rigs, open excavations, boreholes, etc.

11. Subsurface work shall not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

12. Field personnel are specifically prohibited from entering excavations, trenches, or other confined spaces deeper than 4 feet. Unattended boreholes must be properly covered or otherwise protected.

11 ACKNOWLEDGMENT

MFA cannot guarantee the health or safety of any person entering this site. Because of the potentially hazardous nature of visits to active sites, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this site. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other site without prior evaluation by trained health and safety personnel.

All MFA personnel are to read, understand, and agree to comply with the specific practices and guidelines as described in this HSP (including attachments for specific activities and the General Work Practices described below) regarding field safety and health hazards.

This HSP has been developed for the exclusive use of MFA personnel. MFA makes this plan available for review by contracted or subcontracted personnel for information only. This plan does not cover the activities performed by employees of any other employer on the site. All contract or subcontracted personnel are responsible for generating and using their own plan, which must have requirements at least as stringent as those listed in this HSP.

I have read and I understand this HSP and all attachments, and agree to comply with the requirements described herein:

Name	Title	Date

APPENDIX A

DRILLING OPERATIONS STANDARD OPERATING PROCEDURE

DRILLING OPERATING PROCEDURE

PURPOSE

This operating procedure (OP) addresses a Maul Foster & Alongi, Inc. (MFA) employee's responsibility and authority for overseeing the use of safe work practices during drilling operations. The OP also includes safety guidelines for:

- Drill-rig mobilization and setup
- Confirm the location of overhead lines, buried utilities, and the work area
- Safety considerations with drilling operations and activities
- Roadside drilling and traffic
- Personal protective equipment
- Drilling tools and downhole equipment
- Fire safety

APPLICATION

The guidelines shall be applied to MFA projects in which engine-powered drill rigs are used. The guidelines are applicable to MFA employees only. The primary responsibility for drilling safety lies with the drilling contractor.

RESPONSIBILITY AND AUTHORITY

Drill-rig safety and maintenance are the responsibility of the drill-rig operator. MFA employees are responsible for their own safety, including recognizing and avoiding drill-rig hazards. MFA employees who observe a drill-rig condition believed to be unsafe shall immediately advise the drill-rig operator and/or the client of the unsafe condition.

SAFETY GUIDELINES

Drill-Rig Mobilization and Setup

The following guidelines should be considered when drilling equipment is mobilized:

- Drilling equipment, tools, and materials must be secured.

- When moving between multiple drilling locations, the drill mast should be lowered and secured. Exceptions may be granted if the distance between holes is small (e.g. a few feet) and the terrain flat.

- To the extent practical, walk the planned route of travel with the drill operator and inspect it for depressions, gullies, ruts, and other obstacles.

- Appropriate driving speeds should be maintained when driving on site, including while driving forklifts, all-terrain vehicles, and other support rigs.

- A spotter should be used when the drill rig is being backed up, pulling onto a busy roadway, in the vicinity of overhead lines, and/or maneuvering in tight spaces.

- No passengers should accompany the drill rig or support truck when these vehicles are moving on variable terrain where rough, steep, or soft conditions exist.

- Driving drill rigs along hillsides or embankments should be avoided; however, if hillside travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright.

When setting up a drill rig over a drilling location, the following conditions should be considered:

- Potential drilling locations should be approved by the client or facility personnel.

- Drilling locations should be confirmed to be free of underground utilities and overhead lines by a professional utility locator. The utility locator should indicate that the location has been approved by physically marking it (see below—Underground Utilities and Overhead Lines).

- After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. The wheel of the vehicle should be blocked and/or other means should be used to prevent the rig from moving.

- A minimum 8-foot by 8-foot workspace area should exist around the borehole and the back of the drill rig. Drill operators should have clear access to enter or exit the work area.

- Appropriate traffic cones should be placed in the front, rear, and sides of the drill rig (see Traffic, below).

- MFA employees should maintain tidy and organized work areas during drilling activities. Obstacles in the work area should be removed or marked. Drilling materials should be placed on level ground and should not restrict access to the drill rig or egress from the drill rig.

- MFA employees should be wary of slip hazards caused by drilling activities and/or weather.

- Open boreholes should be covered to prevent tripping hazards. Appropriate amounts of materials (e.g. bentonite, grout, cement or asphalt) should be used to prevent mounding or caving at the surface.

UNDERGROUND UTILITIES AND OVERHEAD LINES

- The locations of overhead and buried utility lines must be determined before drilling begins, and they should be noted on boring plans and/or assignment sheets. Potential borehole locations should be approved by the client or by site personnel. A public and/or private utility locator should be used to confirm all boring locations are free of underground utilities and overhead lines. In cases where the underground utility line is in question, site workers should carefully advance a hand auger to 5 feet below ground surface as a precaution.

- Site conditions may require hand augering or air-knifing deeper than 5 feet to confirm the elevation of utilities.

- When overhead power lines are close by, the drill-rig mast should not be raised unless the distance between the rig and the nearest power line is at least 20 feet. The drill-rig operator or assistant should walk completely around the rig to make sure that proper distance exists.

- When the drill rig is positioned near an overhead line, the rig operator should be aware that swaying hoist lines and/or power lines may contact each other during windy conditions. When necessary, the utility and/or overhead lines should be shielded, deactivated, or moved by the appropriate agency or personnel.

OVERSEEING USE OF DRILL RIGS

- MFA personnel should always attempt to remain upwind (when practicable) of the drilling location.

- Drill casing should be stacked on wood blocks or drill rod before, during, and after drill activities.

- Use care when lifting drill casing that are caked with clay or cuttings (e.g., auger flights). Drill casing can be extremely heavy and awkward. Moving and handling of drill casing should be conducted by two people.

- Never place hands or fingers under the bottom of drill casing or drill rods when hoisting them over the top of other drill casing or rod, or other hard surfaces such as the drill-rig platform. Never allow feet to get under the drill casing or drill rod while either is being hoisted.

- When the drill is rotating or advancing, stay clear of the drill string and other moving components of the drill rig. Never reach behind or around rotating casing or moving drill string for any reason. MFA employees should never approach the drill casing string unless the drill rig's transmission is in neutral or the engine is off and the casing has stopped rotating.

- Move soil cuttings away from the casing with a long-handled shovel or spade; never use hands or feet. If a cyclone is used during drilling, stay clear of the cyclone opening and hose.

- Never clean a casing attached to the drill rig unless the transmission is in neutral or the engine is off and the casing has stopped rotating.

- Power-washing or steam-cleaning drilling equipment should be conducted by personnel using protective eyewear and rain suits at a minimum. All workers should remain up ward if possible.

- Exercise caution when pulling casing from the borehole with the main winch line or top head. In cases where the winch line or top head is being used to pull downhole casing that is locked in place, the drilling area should be cleared of all personnel except for the drill operator.

- Winch lines and sand lines should be properly secured when not being used. MFA employees should note the condition of the winch lines (e.g., fraying, spliced sections).

- Drill-rod strings should be secured using the mast cage, or placed on blocks on the ground. The length of the drill-rod strings should not exceed the mast height (typically 40 feet).

SAFE USE OF HAND TOOLS

The Occupational Safety and Health Administration (OSHA) regulations regarding hand tools should be observed in addition to the guidelines provided below:

- Each tool should be used only to perform tasks for which it was originally designed.

- Damaged tools should be repaired before use. Discarded tools that's are not repairable.

- Safety goggles or glasses should be at all times. Nearby coworkers and bystanders should be required to wear safety goggles or glasses also, or to move away.

- Tools should be kept cleaned and stored in an orderly manner when not in use.

PROTECTIVE GEAR

Minimum Protective Gear

Items listed below should be worn by all members of the drilling team while engaged in drilling activities.

- Hard hat
- Safety shoes (shoes or boots with steel toes and shanks)
- Gloves
- Safety glasses
- Hearing protection

Note that a photo ionization detector must be used when conducting subsurface work activities.

Other Gear

Items listed below should be worn when conditions warrant their use. Some of the conditions are listed after each item.

- **Respirator:** When working with materials that produce particulate matter such as silica sand or cement grout, the appropriate respirator should be used. When volatile organic vapors are present as described in the site health and safety plan.

- **Safety Harnesses and Lifelines:** Safety harnesses and lifelines shall be worn by all persons working on top of an elevated derrick beam or mast. The lifeline should be secured at a position that will allow a person to fall no more than 6 feet. OSHA Full Protection requirements apply.

- **Life Vests:** Use for work over or adjacent to water.

TRAFFIC SAFETY

Drilling in streets, parking lots, or other areas of vehicular traffic requires definition of the work zones with cones and warning tape and compliance with local police requirements. A minimum buffer that is conducive to a safe work environment should be established around the drilling area. Work with the public right-of-way will require a permit from the regulatory agency.

FIRE SAFETY

- Fire extinguishers shall be kept on or near drill rigs for fighting small fires.

- If methane is suspected in the area, a combustible gas instrument shall be used to monitor the air near the borehole, with all work to stop at 10 percent of the lower explosive limit.

- Work shall stop during lightning storms.

APPENDIX B

MARINE AND BOAT SAFETY STANDARD OPERATING PROCEDURE

MARINE AND BOAT SAFETY

PURPOSE

This operating procedure (OP) establishes guidelines for the safe operation of watercraft during Maul Foster & Alongi Inc.'s (MFA) field activities such as sediment sampling, biological sampling, and bathymetry mapping. The U.S. Coast Guard (USCG) and individual states have additional specific requirements. This OP is intended to apply to the operation of Class A and Class 1 boats.

DEFINITIONS

Class A—a boat less than 16 feet long. Class A has the greatest number of boats. They can all be car-topped or trailered. Due to their lightness and small size, many can become unstable if weight in them is excessive or carelessly loaded. Too much weight makes these boats sluggish, reduces their freeboard (the height of their sides above water), and can swamp (flood) them.

Class 1—a motorized boat from 16 feet to less than 26 feet in length. Though heavier and more powerful than Class A craft, most are still trailerable.

Type III Flotation Aid—generally the most comfortable, they have at least 15.5 pounds of buoyancy in the adult size.

Type IV Throwable Devices—include the horseshoe, rung, and cushion. They have at least 16.5 pounds of buoyancy.

BOARDING SMALL BOATS

Be sure that the boat is secure. With one hand on the boat, quickly lower yourself straight down into the center of the boat. A life preserver should be worn. If others are boarding, have them step along the fore-and-aft centerline of the boat while you hold the boat in place along the pier. Avoid carrying anything aboard. Step down into the boat and load the items off the pier, or have someone hand them to you one by one.

LOADING OF BOATS

Amount and location of weight (persons and gear: the movable ballast) are critical for capsize protection. In a small utility boat, keep weight toward the middle, both fore and aft and side to side. If you see waves approaching, take them on the bow. Overloading a small boat inhibits its ability to rise to oncoming waves. Less freeboard means less clearance above the water's surface to prevent swamping. All craft must be operated within the boat manufacturers' weight limits.

OPERATED CLASS A AND CLASS 1 BOATS

- All persons on the boat will wear a USCG-approved Type III personal flotation vest. The type II vests (typically orange chest type) are not recommended because they are difficult to work in. In addition, throwable Type IV devices will be readily available for use.

- At least one B-1 Type USCG-approved, hand-held, portable fire extinguisher will be on the boat, readily available for use.

- Visual distress-signal flares and a battery-operated light will be in good working order and readily available on the boat.

- A sound-producing distress signal, either bell, whistle, or horn, will be in good working order and readily available on the boat.

- A first-aid kit will be available on the boat.

- All boat fuel (gasoline) will be contained in engine manufacturer's approved containers that supply fuel to the engine via neoprene fuel lines. No fuel transfers between containers are to be conducted aboard the boat.

- A secondary means of propulsion will be available on the boat (oars or paddle).

- A boat hook, anchors, and proper mooring lines will be available on the boat.

SAFE BOATING OPERATIONS

- All boats will be properly registered for use in waterways of local, state, and federal jurisdictions.

- All boat trailers and towing vehicles will be properly licensed and in good working order.

- The boat will be operated only by experienced personnel. The USCG Auxiliary and other organizations regularly sponsor boating-safety courses. In addition to basic boating safety, the courses cover navigation regulations and emergency procedures. The training is recommended, even for experienced boat operators.

- The boat will be operated in a safe manner and all waterway regulations will be obeyed.

- No smoking or alcoholic beverages are permitted on the boat.
- No recreational equipment for fishing, hunting, water skiing, or scuba diving will be allowed on the boat unless specifically authorized as part of the work-related equipment.

BOATING ACCIDENTS

USCG regulations, as well as state regulations, require accident reports if significant injuries or property damage occurs. It is normally best to stay with the boat in case of an accident and use signal flares or a distress horn to summon help. Hypothermia (cold stress) is a risk for those involved in boating accidents due to the rapid conduction of body heat by cold water. Wet or dry suits are recommended for cold weather/cold water (less than 45°F) operations.

APPENDIX C

VEHICLE SAFETY STANDARD OPERATING PROCEDURE AND ACCIDENT REPORT FORM

VEHICLE SAFETY

This operating procedure applies to Maul Foster & Alongi, Inc. (MFA)-owned vehicles, vehicles leased or rented for MFA business, and personal vehicles when used on MFA business. In order to drive a vehicle on behalf of the company, you must have a valid driver's license as well as a driving record that is satisfactory to MFA and its insurance carriers.

Additional policies relating to vehicle use are provided in Part 2, Section 3 of the MFA Policies and Procedures Manual.

COMPANY-OWNED AND COMPANY-RENTED VEHICLES

Company vehicles are to be driven by authorized employees only, except in case of testing by a mechanic. An employee must be familiarized with the vehicle before it is driven. To avoid accidents because an accessory cannot be located during operation (e.g., windshield wipers), it is recommended that the driver locate the horn, windshield-wiper switch, lights, defroster, gauges, hood and gas fill door releases, and seat and mirror adjustments before the vehicle is started. Once the vehicle is started, fluid levels, wiper blades, and lights should be checked. The spare tire should be located, along with instructions and tools for changing a flat tire.

HAZARDOUS SUBSTANCES

Hazardous substances or potentially hazardous substances may not be transported in privately-owned vehicles. Hazardous substances include, but are not limited to, environmental-media samples, air-monitoring meters (photoionization detectors, four-gas meters) and associated calibration gases, investigation-derived waste, decontamination chemicals, fuel, and fuel products.

DRIVER SAFETY GUIDELINES

The use of a vehicle for company business while under the influence of intoxicants or other drugs that could impair driving ability is forbidden and is sufficient cause for disciplinary action, up to and including termination of employment.

Cell-phone use while driving is a major cause of accidents. Drivers should complete calls while the vehicle is parked. While driving, attention to the road and safety must always take precedence over conducting business over the phone.

No driver shall operate a vehicle on company business when his/her ability to do so safely has been impaired by illness, fatigue, injury, or prescription medication.

All drivers and passengers operating or riding in a company vehicle must wear seat belts, even if air bags are available.

No unauthorized personnel are allowed to ride in company vehicles.

Headlights shall be used starting two hours before sunset until two hours after sunrise, during inclement weather, and at any time when the area 500 feet ahead of the vehicle cannot be clearly seen.

Allot enough time for travel to avoid the need to hurry.

Be well rested and alert.

Notify someone of your destination and anticipated time of arrival.

DEFENSIVE-DRIVING GUIDELINES

Drivers are required to maintain a safe following distance at all times. Drivers should keep at least a two-second interval between their vehicle and the vehicle immediately ahead. During slippery road conditions, the following distance should be increased.

Drivers must yield the right of way at all traffic control signals and signs requiring them to do so. Drivers should also be prepared to yield for safety’s sake at any time. Pedestrians and bicycles in the roadway always have the right of way.

Drivers must honor posted speed limits. In adverse driving conditions, reduce speed to a safe operating speed that is consistent with the conditions of the road, weather, lighting, and volume of traffic.

Radar detectors are strictly prohibited in company vehicles. Drivers are to drive at the speed of traffic but are never to exceed the posted speed limit.

Turn signals must be used before every turn or lane change.

When passing or changing lanes, view the entire vehicle in your rearview mirror before pulling into that lane.

Be alert to other vehicles, pedestrians, and bicyclists when approaching intersections. Never speed through an intersection on a caution light. When the traffic light turns green, look both ways for oncoming traffic before proceeding.

When waiting to make left turns, keep your wheels facing straight ahead. If rear-ended, you will not be pushed into the path of oncoming traffic.

When stopping behind another vehicle, leave enough space so you can see the rear wheels of the car in front. This allows room to go around the vehicle, if necessary, and may prevent you from being pushed into the car in front of you if you are rear-ended.

Avoid backing where possible, but when necessary, keep the distance traveled to a minimum and be particularly careful. Check behind your vehicle before backing. Back the vehicle toward the driver's side. Do not back around a corner or into an area of no visibility.

ACCIDENT PROCEDURES

All accidents, in either company vehicles, rented vehicles, or personal vehicles (while on company business), must follow these accident procedures.

In an attempt to minimize the results of an accident, the driver involved in the accident must prevent further damages or injuries and obtain all pertinent information and report it accurately. Call for medical aid, if necessary.

Record names and addresses of driver, witnesses, and occupants of the other vehicles and any medical personnel who may arrive at the scene. Complete the form located in the Vehicle Accident Packet. An employee who is involved in an accident when on MFA business must report it by completing an MFA Accident/Loss Report and submit it to the health and safety coordinator as soon as possible. An Accident/Loss Report form is attached.

Pertinent information to obtain includes: driver's license number of other drivers; insurance company names and policy numbers of other vehicles; make, model, year, and license plate number of other vehicles; date and time of accident; and overall road and weather conditions. Provide the other party with your name, address, driver's license number, and insurance information. Do not discuss the accident with anyone at the scene except the police. Do not accept any responsibility for the accident. Do not argue with anyone.

All accidents, regardless of severity, must be reported to the police and also to the Managing Director or your Group Manager. Accidents are to be reported immediately (from the scene, during the same day, or as soon as practicable if immediate or same-day reporting is not possible). If the driver cannot get to a phone, he/she should write a note giving the location to a reliable-appearing motorist and ask him or her to notify the police. MFA may conduct a review of each accident to determine its cause and how it could have been prevented.

Accidents involving personal injury to an MFA employee must be reported to the Managing Director or your Group Manager so that a workers' compensation claim can be promptly filed and MFA's short-term-disability carrier can be notified, if applicable. Failing to stop after an accident and/or failure to report an accident may result in disciplinary action, up to and including termination of employment.

TRAFFIC VIOLATIONS

Driving motor vehicles is a serious responsibility and must be done safely and in accordance with all traffic laws. Vehicle accidents are costly to our company, but more importantly, they may result in injury to you or others. It is the driver's responsibility to operate the vehicle in a safe manner and to drive defensively to prevent injuries and property damage. MFA endorses all applicable state motor-vehicle regulations relating to driver responsibility and expects each driver to drive in a safe and courteous manner pursuant to the preceding safety rules. The attitude you take when behind the wheel is the single most important factor in driving safely. Traffic and/or parking citations will not be reimbursed by MFA.

ATTACHMENT

ACCIDENT/LOSS REPORT

******THIS REPORT MUST BE COMPLETED IN FULL AND SUBMITTED TO THE MFA MANAGING DIRECTOR******

Date of Accident:________________________________ Company:_____________________________

Time Occurred:__________________________________ Project Number:______________________________

Where Occurred:_________________________________ Name and Location of Project:___________________

PART I—PROPERTY DAMAGE/LOSS

Equipment Involved:____

Names of Persons Involved:____

Describe Incident/Damage:____

____

Estimated Cost of Damage:____

***Copy of Police Report, if filed, must also be submitted.**

DRAW A DIAGRAM OF INCIDENT ON THE BACK OF THIS REPORT

PART II—PERSONAL INJURY *(fill out only if personal injury occurred)*

Name of employee injured:________________________ Age:_____

Address:______________________________________ Occupation:______________________________

What was employee doing when injured:____

Exact location where injury occurred (station number or prominent landmark):______________________

____

Was place of accident or exposure on job site?:____

Describe injury:____

____

How did injury occur?:____

____

Did employee see a doctor or go to the hospital?________ If yes, give name, address, and phone number of Doctor and/or hospital:____

____

Employee Name (print):_______________________________________

Employee Signature: ____

Date of this report: ____