PUBLIC REVIEW DRAFT

April 2019
Upland Area of the Port Gamble Bay and Mill Site

ANCHOR QEA

Supplemental Remedial Investigation and Feasibility Study

Prepared for Pope Resources, LP/OPG Properties, LLC
and the Washington State Department of Ecology

PUBLIC REVIEW DRAFT

April 2019
Upland Area of the Port Gamble Bay and Mill Site

Remedial Investigation/Feasibility Study

Prepared for
Pope Resources/OPG Properties
19950 7th Avenue NE, Suite 200
Poulsbo, Washington 98370

Washington State Department of Ecology
Aquatic Lands Cleanup Unit
300 Desmond Drive
Lacey, Washington 98504

Prepared by
Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, Washington 98101

Project Number: 170388-01.01 T 02
\\FUJI\Anchor\Projects\Port Gamble\2017 - 2019 Upland RIFS\Public Review Draft\RIFS_Port Gamble Mill_Site_Uplands_Final_Public_Review_DRAFT_050119.docx

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
BAF	bioaccumulation factor
Bgs	below ground surface
BMP	best management practice
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
CoCs	chemicals of concern
cPAH	carcinogenic PAH
CSM	conceptual site model
cy	cubic yard
DQO	data quality objective
DRPH	diesel range petroleum hydrocarbons
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
H:V	horizontal to vertical
HCCC	Hood Canal Coordinating Council
HRPH	higher range petroleum hydrocarbons
ICP-MS	inductively coupled plasma mass spectrometry
MAF	Port Gamble Model Airplane Field Limited Purpose Landfill
Mill Site	upland portion of the former sawmill area
MLLW	mean lower low water
MTCA	Model Toxics Control Act
NA	not applicable
ng/kg	nanograms per kilogram
ng/L	nanogram per liter
NPDES	National Pollutant Discharge Elimination System
OPG	OPG Properties, LLC
P&T	Pope & Talbot
PAH	polynuclear aromatic hydrocarbons
pg/L	picogram per liter
ppt	parts per thousand
PQL	practical quantitation limit
PR	Pope Resources
PR/OPG	Pope Resources LP/OPG Properties LLC
RCW	Revised Code of Washington
RI/FS	remedial investigation/feasibility study
SEPA	State Environmental Policy Act

Site	Port Gamble Bay and Mill Site
SMS	Sediment Management Standards
SQAPP	Sampling and Quality Assurance Project Plan
TEQ	toxics equivalents quotient
TPH	total petroleum hydrocarbons
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This draft remedial investigation/feasibility study (RI/FS) has been prepared in accordance with the Model Toxics Control Act (MTCA; Chapter 173-340 of the Washington Administrative Code [WAC]). It addresses contamination of the former sawmill area in Port Gamble, Washington (the "Mill Site").

Releases of hazardous substances to the Mill Site were initially identified by the Washington State Department of Ecology (Ecology) in 1997. In 1998, Ecology notified Pope & Talbot (P&T) of the potential listing of the Mill Site on Ecology's Confirmed and Suspected Contaminated Site List, and in 1999 Pope Resources/OPG Properties (PR/OPG) began working with Ecology to characterize the nature and extent of contamination, supporting interim cleanup actions at the Mill Site. In November 2007, P&T filed for bankruptcy.

From 1999 through 2001, PR/OPG completed multiple soil and groundwater investigations in potential historical source areas at the Mill Site. These investigations informed a 2002 interim remedial action that included excavation of 20,460 tons of soil exceeding MTCA unrestricted use soil cleanup levels from ten upland areas and disposal of these materials at approved off-site landfills.

Post-remediation groundwater monitoring conducted after completion of the 2002 interim action identified two additional areas of contamination that were subsequently characterized, informing a second interim action. Like the earlier action, from 2004 to 2005 PR/OPG excavated an additional 5,850 tons of contaminated soil from two upland areas of the Mill Site and disposed of these materials at approved off-site landfills (a total of 26,310 tons were removed from the Mill Site).

Following several more years of additional post-construction groundwater monitoring, and under a 2008 Agreed Order, in 2012 Ecology and PR/OPG prepared a draft RI/FS, which was provided for public comment. Subsequently, additional characterization of the nature and extent of dioxins/furans at the Mill Site was performed by Ecology and PR/OPG, and a supplemental RI/FS Work Plan was developed under a new 2018 Agreed Order between Ecology and PR/OPG to complete this final RI/FS. These activities are separate from the in-water area addressed in the October 2013 Cleanup Action Plan and included in the Consent Decree between PR/OPG and Ecology (Kitsap County Case No. 13-2-02720-0).

The sequential RI/FS investigations confirmed the protectiveness of the earlier soil removal actions, but also revealed elevated dioxin/furan concentrations in soil at the Mill Site, with the highest concentrations found in the northeastern area of the Mill Site, coinciding with one of the 2004/2005 interim remedial action areas. Former sawmill operations in this area applied a mercury-based "end paint" in common use regionally beginning in the early 1900s, which was subsequently replaced by 1950s with a chlorophenol-based product with characteristic residual dioxin/furan impurities, before being discontinued in the 1970s. Possible spilling of these various lumber treatment paints over time

originally released both mercury and subsequently dioxins/furans to soils in end paint application areas, particularly in a localized northeastern area of the Mill Site where end painting was often focused. Because the 2004/2005 interim action targeted mercury removal without concurrent dioxin/furan testing, some of the soils excavated from the mercury-impacted area that contained elevated dioxin/furan concentrations were inadvertently reused as deep backfill if mercury concentrations in these temporary stockpiles were below the MTCA unrestricted use soil cleanup level. The dioxin/furan congener profile in contaminated subsurface soil samples collected from this location is characteristic of residues from chlorophenolic wood treatment products, consistent with this conceptual site model.

In accordance with MTCA requirements, cleanup and remediation levels are developed in this RI/FS for chemicals of concern remaining at the Mill Site, including dioxins/furans, carcinogenic polynuclear aromatic hydrocarbons, lead, and arsenic. Protective cleanup levels were developed based on unrestricted future land use, also considering site-specific groundwater, surface water, and sediment protection requirements under MTCA.

Using the cleanup and remediation levels, six primary remedial alternatives were developed for detailed MTCA evaluations, including full removal of soils exceeding cleanup levels, along with different combinations of focused removal, capping, and institutional controls. Based on the MTCA evaluation and disproportionate cost analyses, the recommended remedial alternative is as follows:

- Excavate and dispose at approved off-site landfills approximately 5,000 to 7,000 cubic yards of soils in the northeast portion of the Mill Site with dioxin/furan concentrations exceeding remediation levels for terrestrial ecological protection as well as groundwater, surface water, and sediment protection levels.
- Cap approximately 6 acres in four areas of the Mill Site with dioxin/furan soil concentrations below remediation levels, but exceeding MTCA unrestricted use soil cleanup levels, including lower-concentration excavated and treated soils from the northeast portion of the Mill Site (e.g., amended with activated carbon or other treatment agents to further sequester dioxins/furans).
- Record restrictive covenants to preclude use of the shallow aquifer throughout the Mill Site for future drinking water supply, and to ensure that soil caps in the Mill Site maintain their protectiveness.

Following public review of this RI/FS, PR/OPG and Ecology will enter a Consent Decree to implement final remedial actions at the Mill Site, with construction currently targeted to begin as early as 2020. Future redevelopment and /or habitat restoration actions at the Mill Site will also meet MTCA cleanup levels and other performance objectives to ensure protectiveness. As practicable, implementation of final upland cleanup actions will be coordinated with concurrent redevelopment and/or habitat restoration actions to achieve a protective and cost-effective integrated remedy.

1 Introduction

This remedial investigation/feasibility study (RI/FS) has been prepared in accordance with the Model Toxics Control Act (MTCA; Chapter 173-340 of the Washington Administrative Code [WAC]). The Washington State Department of Ecology (Ecology) and Pope Resources/OPG Properties (PR/OPG) prepared this RI/FS to meet the requirements of both the 2008 Agreed Order (DE 5631) and the 2018 Agreed Order (DE 15448) between PR/OPG and Ecology.

As further described in the RI/FS Work Plan attached to the 2018 Agreed Order, this RI/FS addresses the upland area of the Port Gamble Bay and Mill Site (the Site). The Site consists of the in-water area addressed in the October 2013 Cleanup Action Plan included in the Consent Decree between PR/OPG and Ecology (Kitsap County Case No. 13-2-02720-0), together with the upland portion of the former sawmill area and upland areas to the west and south of the former sawmill area in Port Gamble, Washington (Mill Site). The upland areas addressed by this RI/FS refer to that portion of the Site other than the portion addressed in the October 2013 Cleanup Action Plan included in the Consent Decree (Kitsap County Case No. 13-2-02720-0), as generally depicted on Figure 1.

While this RI/FS has been conducted under the 2018 Agreed Order, certain terms from the 2008 Agreed Order are used for consistency.[1]

1.1 Site Background

The Site is in north Kitsap County, Washington, and includes the Mill Site, which is bounded by Hood Canal to the north, Port Gamble Bay to the east, and the Kitsap Peninsula to the west and south (Figure 1). As defined in the Agreed Orders, the Mill Site is generally located at the eastern terminus of Northeast View Drive in Port Gamble, Washington, and includes the uplands landward of the ordinary highwater line. The Mill Site is further defined by the extent of contamination caused by the release of hazardous substances at the Site, as described in this RI/FS. The adjacent tidelands and Port Gamble Bay are covered under a separate RI/FS and Consent Decree as discussed above.

In 1853, the corporate predecessor to P&T established one of the first sawmills on Puget Sound in Port Gamble, and continuously operated a forest products manufacturing facility ("Mill Site"; as depicted on Figure 1) up until 1995. In 1985, P&T transferred ownership of the uplands and adjacent tidelands portion of the sawmill as part of a spinoff that created the new company, Pope Resources (PR). By that time, most of the hazardous substance releases to the Site had already occurred. P&T continued wood products manufacturing at the sawmill until 1995 under a lease with PR. Sawmill operations ceased in 1995, and the facility was dismantled and mostly removed in 1997. OPG Properties, LLC (OPG), formerly known as Olympic Property Group, LLC, was formed in 1998 to

[1] For example, the term "Mill Site" was used in the 2008 Agreed Order and is being used here to refer to a portion of the remaining upland portions of the Site.

manage PR's real estate in Kitsap County and presently manages the Mill Site including making leasing arrangements and property improvements.

In January 1997, Ecology conducted an initial investigation of the Site, which consisted of sampling sediment in four catch basins. The results of that investigation indicated that concentrations of petroleum hydrocarbons and metals were present at levels above MTCA and Sediment Management Standards (SMS; WAC 173-204) chemical criteria for these compounds. In April 1997, PR/OPG removed accumulated materials from 12 catch basins, four valve vaults, and four sumps, and disposed of these materials at approved off-site landfills.

In July 1998, Ecology notified P&T of the potential listing of the Mill Site on Ecology's Confirmed and Suspected Contaminated Site List. Beginning in 1999, PR/OPG performed detailed upland investigations of the Mill Site based on a focused source area sampling strategy, as described in Appendix A. Potential source areas were delineated based on historical Mill Site maps, records, and recollections of former mill workers. Areas containing historical structures or activities where materials were processed or stored and could have released chemicals of concern (CoCs) into the soil or groundwater were identified as potential source areas. Eleven potential CoC source areas were identified at the Mill Site (Figure 2) and included petroleum product storage areas, former transformer locations, wood treatment/end painting areas, and drum storage areas.

From 1999 to 2001, PR/OPG performed multiple soil and groundwater investigations at the Mill Site to characterize the nature and extent of CoCs in potential source areas (Figure 3; Appendix A). Soil explorations documented variable thicknesses of fill materials across the Mill Site, ranging from 2 and 18 feet below ground surface (bgs; Figure 4). Mill Site fill material consists of sand and gravel containing relatively smaller amounts of debris (bricks, wood chips, concrete, and ash).

As an initial interim remedial action in coordination with Ecology under the Voluntary Cleanup Program, in 2002 PR/OPG excavated 20,460 tons of soil exceeding MTCA unrestricted use soil cleanup levels from 10 discrete areas of the Mill Site and disposed of these materials at approved off-site landfills (Figure 5; Appendix A). CoCs addressed by this initial interim action included arsenic, lead, mercury, total petroleum hydrocarbons (TPH), and polynuclear aromatic hydrocarbons (PAH). Monitoring was performed during and following implementation of the interim action to ensure protectiveness and to verify post-construction natural attenuation (e.g., in groundwater).

Informed by the post-construction monitoring, in 2004/2005 PR/OPG removed an additional 5,850 tons of soil exceeding MTCA unrestricted use soil cleanup levels from two discrete areas of the Mill Site and disposed of these materials at approved off-site landfills (Figure 6; Appendix A). CoCs addressed by this second interim action included arsenic, mercury, and PAH. Additional post-construction groundwater monitoring and Ecology reviews were performed from 2005 to 2009 and

again from 2015 to 2016 (EPI 2016) to verify the protectiveness of the interim remedial actions in reducing groundwater CoC concentrations.

In November 2007, P&T filed for bankruptcy (Delaware Case No. 07-11738).

In May 2008, Ecology and PR/OPG entered into Agreed Order No. DE 5631, pursuant to which two focused RI/FS reports for portions of the Port Gamble Bay and Mill Site were completed, submitted, and released for public comment in 2011. In December 2012, the RI/FS for the Mill Site was revised to address public comments (Appendix A). Subsequently, additional characterization of the nature and extent of dioxins/furans at the Site was performed by Ecology and PR/OPG, culminating with a supplemental RI/FS Work Plan developed under a new 2018 Agreed Order (DE 15448) between Ecology and PR/OPG to complete this RI/FS.

As discussed above, in December 2013 Ecology and PR/OPG entered a Consent Decree to design, permit, and construct sediment cleanup actions in Port Gamble Bay. The sediment cleanup design was detailed in the Engineering Design Report (EDR; Anchor QEA 2015a). In-water construction actions were performed from September 2015 to January 2017 (Anchor QEA 2016a and 2018a). Mixed sediment and wood debris dredged from Port Gamble Bay as part of the sediment cleanup project was rinsed ("sparged") on the Mill Site to protectively rinse salinity and ammonia from the stockpiles. All stockpiles were removed from the Mill Site between July and September 2017 and disposed at approved off-site landfills.

In October 2017, following visual confirmation of removal of the stockpiles, five-point surface soil (0 to 1 foot bgs) composite samples from non-hardscape areas of the Mill Site were sampled and analyzed for CoCs, in accordance with the Ecology-approved *Post-Stockpile Removal – Sampling and Quality Assurance Project Plan* (Anchor QEA 2017a). The post-stockpile removal sampling verified successful removal of sediments from the Mill Site consistent with antidegradation requirements; post-stockpile removal soil data have been incorporated into this RI/FS (Appendix B).

2 Land Use

This section summarizes past, current, and future land use of upland areas of the Mill Site.

2.1 Past Property Uses and Facilities

The Mill Site was continuously operated as a sawmill facility for a period of approximately 142 years (1853 to 1995). Over that period, the Mill Site underwent a variety of changes, including expansion by filling, as well as changes in the location and function of buildings and structures. A detailed history of the Mill Site operations is presented in the 1999 Phase I Groundwater and Surface Water Investigation Sampling and Analysis Plan (Parametrix 1999a) and is briefly summarized below.

When the sawmill was first established in 1853, the Mill Site was a relatively small sand spit projecting east from the base of a bluff that forms the western boundary of the mouth of Port Gamble Bay, coincident with a location that was actively used by tribes and possibly other areas of cultural significance. The Port Gamble Bay region is known to be archaeologically sensitive. Archaeological site records on file at the Washington State Department of Archaeology and Historic Preservation indicate that two aboriginal shell midden sites have been recorded on the eastern shore of the bay across from the Mill Site. A third lithic and tool scatter site on the eastern side of the bay has historically been used as a cemetery by the Port Gamble S'Klallam Tribe.

The mill operated as a forest products manufacturing facility from 1853 to 1995. The Mill Site underwent several changes over that period, including filling activities, expanding the upland area, moving building locations, and changing the functions of buildings and structures, including a succession of sawmill buildings.

P&T transferred ownership of the uplands and adjacent tidelands portion of the Site to PR in 1985, and continued wood products manufacturing at the Site until 1995 under a lease with PR. Mill operations ceased in 1995, and the sawmill facility was dismantled and removed in 1997. Since 1997, the Mill Site has been leased to a variety of parties for use as a log sort and wood chipping yard, material handling activities, a marine laboratory, and parking.

2.2 Current Property Status

As discussed in Section 1, cleanup of the in-water area of the Site, including the shoreline intertidal area, was performed from September 2015 to January 2017 (Anchor QEA 2017a). These activities included demolition and removal of all permanent structures at the Mill Site. Overwater structures were removed during these cleanup activities, although removal of these structures was not required by the cleanup. Upland areas of the Mill Site are currently vacant. Surface cover is a combination of hardscape (asphalt and concrete pavement) and gravel.

All storm drains at the Mill Site have been plugged and abandoned. During the in-water construction activities, hardscape areas were perforated with a concrete breaker to facilitate stormwater infiltration. Currently, there is no observable surface water/stormwater runoff from the Mill Site.

The National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit obtained for the in-water construction work remains active, though the Mill Site is stabilized and there are no ongoing construction activities. PR/OPG intends to keep the NPDES permit active until a new permit for the Mill Site is obtained under the future land use.

The Mill Site is currently zoned as Rural Historic Town Waterfront according to the Kitsap County Zoning map. Adjacent properties to the west and south are zoned as Rural Historic Town Commercial and Rural Historic Town Residential.

The Mill Site shoreline is classified as Urban Conservancy under the Shoreline Management Act Guidelines [WAC 173-26-211(2)(a)] by the Kitsap County Department of Community Development.

A portion of the Mill Site is within a High-Risk Area Zone designated area on the Federal Emergency Management Agency Flood Map for Kitsap County Washington. The floodplain designation is "AE," which is the area where base flood elevations are provided for flood insurance maps and where structures are required to be elevated or flood-proofed.

2.3 Future Site Land Use Plans

Future land use plans for the Mill Site are being developed by PR/OPG. The current plans for re-development of the Site (primary plans) include mixed residential and commercial land use. This RI/FS has been developed to support this future land use. The cleanup levels proposed in Section 7.1.1 are protective of human health direct contact and compatible with ground floor residential land use under WAC 173-340-740(3).

2.4 Contingent Future Site Land Use Plans

As part of a separate process (i.e., outside of this cleanup evaluation), PR/OPG is considering future potential open space and habitat restoration land use actions in 16 acres of the southern and eastern Mill Site. However, until a transaction takes place, mixed residential and commercial land uses remain the primary future redevelopment plan for the entire 25-acre upland Mill Site. Remediation levels and remedial alternatives that may be relevant to a contingent future open space and habitat restoration land use are developed in Section 7.1.2 and Section 10, respectively.

3 Early Site Characterization

This section summarizes initial site characterization activities performed at the Mill Site from 1999 to 2001; additional details are provided in Appendix A.

3.1 1999 Source Area Identification

PR/OPG initiated upland investigations at the Mill Site in 1999, following Ecology's notification to P&T of the potential listing of the Mill Site on Ecology's Confirmed and Suspected Contaminated Site List. Initial activities included identifying potential source areas using historical mill site maps, records, and recollections of former mill workers. Areas with historical structures or where hazardous materials were processed or stored were identified as potential source areas, and initial sampling was focused in these areas.

Eleven source areas, depicted on Figure 2, were identified at the Mill Site during these initial investigations. Detailed discussions of these source areas can be found in the *Port Gamble Mill Site, Phase I Groundwater and Surface Water Investigation Sampling and Analysis Plan* (Parametrix 1999a) and the *Interim Report – Phase I Soil Sampling, Pope & Talbot, Inc. Port Gamble Mill Site* (June 28, 1999; Parametrix 1999b).

3.2 1999 to 2001 Investigations

Between 1999 and 2001, PR/OPG performed five sequential soil and groundwater investigations to characterize the nature and extent of contamination at the Mill Site, as follows:

- **1999 Phase I Soil Sampling:** *Interim Report – Pope & Talbot, Inc. Port Gamble Mill Site, Phase I Soil Sampling* (Parametrix 1999b)
- **1999 Phase I Groundwater and Surface Water Investigation:** *Interim Report No. 2 – Pope & Talbot, Inc. Port Gamble Mill Site, Results of Phase I Groundwater and Surface Water Investigation* (Parametrix 1999c)
- **2000 Phase II Groundwater and Surface Water Sampling:** *Interim Report No. 3 – Pope & Talbot, Inc. Port Gamble Mill Site, Phase II Groundwater and Surface Water Sampling Results* (Parametrix 2000a)
- **2001 Phase II Soil Sampling Investigation:** *Port Gamble Mill Site, Phase II Soil Sampling Investigation* (Foster Wheeler 2001)
- **2002 Remedial Investigation:** *Revised Remedial Investigation Report, Former Pope & Talbot Sawmill Property (Mill Site), Port Gamble, Washington* (September 13, 2002; EPI 2002a)

Brief summaries of the findings from these investigations are presented below.

3.2.1 Subsurface Stratigraphy

Soil stratigraphy at the Mill Site is consistent with regional geologic conditions and with the expansion and development history summarized in Section 2.1. Figure 3 shows the orientation of a representative cross-section (C-C') across the Mill Site, which is depicted on Figure 4. Fill materials are present across the Mill Site, from ground surface to depths varying between 2 and 12 feet bgs. The fill material consists of well-graded to poorly graded sand and gravel with limited areas of debris (i.e., brick, wood chips, and concrete). Native material underlies the fill material and consists of well-graded to poorly graded sand with some gravel and shell fragments, deposited in nearshore marine and glaciofluvial environments. Additional descriptions of soil conditions at the Mill Site can be found in the *Interim Report No. 2 – Pope & Talbot, Inc. Port Gamble Mill Site, Results of Phase I Groundwater and Surface Water Investigation* (Parametrix 1999c) and the *Revised Remedial Investigation Report, Former Pope & Talbot Sawmill Property (Mill Site), Port Gamble, Washington* (September 13, 2002; EPI 2002a).

3.2.2 Hydrogeology

The depth to groundwater at the Mill Site ranges from near ground surface in areas of standing water to greater than 12 feet bgs. The *RI/FS Work Plan* (Anchor and EPI 2008) summarizes water level measurements and water level potentiometric contour maps from June 2001 through March 2007. The observed water level measurements indicate that the groundwater flow direction is towards Port Gamble Bay and Hood Canal (toward the east and northeast).

Slug tests were performed on eight monitoring wells, and calculated hydraulic conductivity values ranged from 6.3×10^{-5} to 1.5×10^{-3} feet/second, revealing relatively permeable subsurface soils at the Mill Site. Additional details on the slug tests and hydraulic conductivity can be found in the *Interim Report No. 2 – Pope & Talbot, Inc. Port Gamble Mill Site, Results of Phase I Groundwater and Surface Water Investigation* (Parametrix 1999c).

Consistent with permeable soils, nearshore groundwater elevations at the Mill Site fluctuate in response to tidal influence. In June 1999, four wells and Port Gamble Bay were monitored using continuously recording transducers for a period of 72 hours. Groundwater fluctuations were highest in wells located within approximately 50 feet of the shoreline, while relatively little tidal influence was observed in wells located more than 200 feet from the shoreline. Additional details on the tidal study can be found in *Interim Report No. 2 – Pope & Talbot, Inc. Port Gamble Mill Site, Results of Phase I Groundwater and Surface Water Investigation* (Parametrix 1999).

3.2.3 Soil CoCs

Initial (1999 to 2001) Mill Site soil sampling locations are depicted on Figure 3. Detailed summaries of soil chemical analyses performed on these site characterization samples are presented in

Appendix A. Based on comparisons of Mill Site data with MTCA unrestricted land use soil cleanup levels, CoCs were limited to arsenic, lead, mercury, TPH, PAH, and chromium. As discussed in Section 1.1, informed by the site characterization data, interim remedial actions performed by PR/OPG between 2002 and 2005 successfully removed 26,310 tons of soil exceeding MTCA unrestricted use soil cleanup levels for these CoCs.

3.2.4 Groundwater CoCs

Detailed summaries of groundwater sampling and characterization data beginning in 1999 are presented in Appendix A. Based on comparisons of Mill Site data with MTCA groundwater cleanup levels, CoCs in groundwater during the interim action period were largely limited to arsenic, which exceeded the natural background-based cleanup level of 8 micrograms per liter (µg/L; PTI 1989) in several areas of the Mill Site, including areas targeted for interim actions. Exceedances of MTCA cleanup levels for copper, mercury, and nickel were also noted.

Based on the site characterization data, arsenic concentrations previously detected in Mill Site groundwater above the 8 µg/L background level were primarily attributable to natural geochemical processes. Arsenic geochemistry was previously characterized in *Interim Report No. 3 – Pope & Talbot, Inc. Port Gamble Mill Site, Phase II Groundwater and Surface Water Sampling Results* (Parametrix 2000a). However, as discussed in Section 5.1.10, the most recent (December 2015) groundwater arsenic analyses at the Mill Site revealed that dissolved arsenic concentrations in groundwater are now below the 8 µg/L natural background concentration, and well below the marine surface water chronic criterion of 36 µg/L. Groundwater arsenic concentrations are protective of adjacent surface waters and sediments in Port Gamble Bay.

4 Interim Remedial Actions

This section summarizes the interim upland remedial actions conducted by PR/OPG at the Mill Site from 2002 to 2005, consistent with WAC 173-340-430. These interim actions are described in more detail in Appendix A.

4.1 2002 Interim Actions

In 2002, PR/OPG excavated 20,460 tons of soils from the Mill Site containing CoC concentrations above MTCA unrestricted use cleanup levels and disposed of these materials at approved off-site landfills. Monitoring was performed during and following implementation of the interim action to ensure environmental protection, verify the extent of soil requiring removal, and verify expected natural attenuation of groundwater CoC concentrations resulting from removal of potential source materials. Details of the 2002 interim action can be found in the September 19, 2002 *Revised Cleanup Action Plan, Former Pope & Talbot Sawmill Property (Mill Site)* (EPI 2002b) and in the April 9, 2003 *Remedial Action Report, Former Mill Site* (EPI 2003a).

Prior to and during the 2002 interim action, additional soil characterization samples were collected from test pit excavations at the Mill Site (Appendix A). A summary of the 2002 upland remedial excavation in each area, including targeted CoCs, quantity of soil excavated, results of final performance soils sampling, and referenced Appendix A tables and figures (for data and sample locations) is provided in Chart 1 below.:

Chart 1. 2002 Interim Action Summary

Area	Source	Targeted COPCs	Soil Removed	Soil Performance Sampling Results	Appendix A Tables and Figures
1	Former Sawmill and Nearby Buildings	DRPH HRPH cPAHs Select samples analyzed for hexavalent chromium, lead, and mercury	13,200 tons	No results greater than MTCA soil cleanup levels for unrestricted use	Tables 4-3 to 4-6 Figure 4-4
2	Former Wood Treatment Buildings and Fueling Area	Lead	1,900 tons	Two results greater than MTCA terrestrial ecological evaluation soil cleanup level	Table 4-7 Figure 4-5
3	Area Formerly Used for Diesel Fuel and Oil Storage	cPAHs Arsenic	500 tons	No results greater than MTCA soil cleanup levels for unrestricted use	Tables 4-8 to 4-9 Figure 4-6

Area	Source	Targeted COPCs	Soil Removed	Soil Performance Sampling Results	Appendix A Tables and Figures
4	Area Formerly Used for Oil Storage	cPAHs	570 tons	No results greater than MTCA soil cleanup level for unrestricted use	Table 4-10 Figure 4-7
5	Area Formerly Used for Diesel Fuel and Oil Storage	DRPH HRPH	2,300 tons	No results greater than MTCA soil cleanup levels for unrestricted use	Table 4-11 Figure 4-8
6	Area Formerly Used for Diesel Fuel and Oil Storage	cPAHs	150 tons	No results greater than MTCA soil cleanup level for unrestricted use	Table 4-12 Figure 4-9
7	Area Formerly Used for Oil Storage and Wood Treatment	cPAHs Mercury	1,000 tons	One result marginally greater than former Method B MTCA soil cleanup level for cPAHs but less than the current cleanup level	Tables 4-13 to 4-14 Figure 4-10
8	Area Formerly Used for Wood Treatment	Mercury One sample analyzed for hexavalent chromium	320 tons	No results greater than MTCA soil cleanup levels for unrestricted use	Table 4-15 Figure 4-11
9	Area Formerly Used for Wood Treatment	Mercury	300 tons	No results greater than MTCA soil cleanup level for unrestricted use	Table 4-16 Figure 4-12
10	Area Formerly Used for Wood Treatment and Maintenance	Mercury	220 tons	No results greater than MTCA soil cleanup level for unrestricted use	Table 4-17 Figure 4-13

Groundwater Performance Monitoring

Post-remediation groundwater monitoring was performed to monitor changes in groundwater quality resulting from the 2002 interim action. Groundwater monitoring was also performed to verify that the interim action would eliminate ongoing sources of CoC dissolution to groundwater and result in improved groundwater quality at the Mill Site.

Prior to the start of the 2002 interim action, two monitoring wells (MW-3 and MW-5) were decommissioned. After completion of the interim action, five additional groundwater monitoring wells (MW-9 through MW-13) were installed downgradient of the remedial excavations. Appendix A summarizes all monitoring well data collection at the Site. Monitoring well installation, development, and sampling procedures are described in detail in the September 30, 2003 *Quarterly Groundwater Monitoring Report, Former Mill Site* (EPI 2003b).

4.2 2004/2005 Interim Actions

Several focused investigations were performed in 2004 to characterize potential residual sources of arsenic and mercury remaining at the Mill Site following completion of the 2002 interim action summarized above. These investigations are discussed in the August 17, 2004 *Mill Site Status and Remedial Action Scope of Work Memorandum to Gail Colburn (Ecology)* (EPI 2004) and in Appendix A.

From 2004 to 2005, PR/OPG excavated 5,850 tons of soils from two Mill Site areas containing hydrocarbon, arsenic, or mercury concentrations above MTCA unrestricted use cleanup levels, and disposed of these materials at approved off-site landfills. In the deeper mercury excavation at the northeastern portion of the Mill Site (Figure 6), groundwater from within and/or adjacent to the excavations was discharged back into Mill Site groundwater via an upland infiltration basin. Additional details on the 2004/2005 interim action can be found in Appendix A and in the March 30, 2005 *Supplemental Remedial Action Report, Former Pope & Talbot Sawmill Property (Mill Site)* (EPI 2005). A summary of the remediation at each area is provided in Chart 2 below:

Chart 2. 2004/2005 Interim Action Summary

Area	Source	COPCs	Soil Removed	Performance Sampling Results	Appendix A Tables and Figures
Near MW-8	Formerly Used for Wood Treatment	Arsenic DRPH HRPH	343 tons transported off site 704 cy stockpiled, profiled, and reused as backfill	Below MTCA soil cleanup levels for unrestricted use	Table 4-27 Figure 4-18
Near MW-9/ MW-10	Former Sawmill and End-Paint Wood Treatment Area	Mercury	5,508 tons transported off site Unquantified volume stockpiled, profiled, and reused as backfill	Below MTCA Method A soil cleanup level for unrestricted use	Table 4-28 Figure 4-19

Groundwater Performance Monitoring

Post-remediation performance monitoring was completed to monitor changes in groundwater quality resulting from the 2004/2005 interim action. One monitoring well (MW-10) was decommissioned during construction and after the completion of the interim action, two wells were installed, MW-10R (replacement well for MW-10) and MW-14). As discussed in Appendix A, post-construction monitoring confirmed the protectiveness of the earlier interim actions in reducing groundwater arsenic and mercury concentrations. Follow-on groundwater sampling and analysis is discussed in Section 5.

5 Remedial Investigation Data Collection

This section summarizes site characterization conducted at the Mill Site after the completion of the interim remedial actions summarized in Section 4. These investigations include the data collected under the October 2017 Supplemental RI/FS Work Plan (Anchor QEA 2017c).

5.1 2005 to 2016 Arsenic, Dioxin/Furan and Other Investigations

As discussed in Appendix A and the Supplemental RI/FS Work Plan, between 2005 and 2016, eleven sequential arsenic, dioxin/furan, and other site characterization investigations were conducted at the Site, as follows:

1. 2005 and 2006 PR/OPG arsenic soil and groundwater sampling (Appendix A)
2. 2006 PR/OPG tributyltin and carbamate groundwater sampling (Appendix A)
3. 2009 PR/OPG dioxin/furan and pesticide soil sampling (Appendix A)
4. 2009 PR/OPG groundwater metals sampling (Appendix A)
5. 2011 Port Gamble S'Klallam Tribe dioxin/furan soil sampling (Ridolfi 2011)
6. 2014 Ecology dioxin/furan soil sampling (Leidos 2014)
7. 2014 PR/OPG cadmium, carcinogenic PAH (cPAH), and dioxin/furan soil sampling (Anchor QEA 2015a)
8. 2014 Hood Canal Coordinating Council (HCCC) and Port Gamble S'Klallam Tribe cadmium, cPAH, and dioxin/furan soil sampling (Anchor QEA 2015b)
9. 2015 PR/OPG dioxin/furan bioaccumulation analyses (Anchor QEA 2016b)
10. 2015 and 2016 PR/OPG arsenic groundwater sampling (EPI 2016)
11. 2016 PR/OPG cadmium, cPAH, and dioxin/furan groundwater sampling (Anchor QEA 2017)

Each of these investigations is briefly summarized below.

5.1.1 2005 & 2006 PR/OPG Arsenic Soil and Groundwater Sampling

In 2005 and 2006, PR/OPG advanced 35 direct-push borings to 12 feet bgs in an area of the southern Mill Site (i.e., near MW-8) with locally elevated groundwater arsenic concentrations. Groundwater from these borings was sampled for total and dissolved arsenic, and soil was sampled for arsenic, where it was detected in groundwater. The analytical results for these samples are presented in Appendix A.

As discussed in Appendix A, these investigations did not identify a residual source of arsenic in soils near MW-8 that would explain locally elevated concentrations detected in groundwater in the southern Mill Site. Elevated groundwater arsenic concentrations at MW-8 were further verified to be a result of reducing groundwater geochemical conditions in this area, mobilizing naturally occurring arsenic concentrations in soil.

5.1.2 2006 PR/OPG Tributyltin and Carbamate Groundwater Sampling

Permatox 100 was a wood treatment chemical known to have been used at the Mill Site. In 2006, additional Permatox formulations potentially used at Mill Site were identified. These additional formulations included tributyltin and carbamates which had not previously been analyzed.

During the June 2006 quarterly groundwater sampling event, additional samples were collected and analyzed for tributyltin and carbamates. None of these groundwater samples contained detectable concentrations of tributyltin or carbamates. Analytical results for these samples are presented in Appendix A.

5.1.3 2009 PR/OPG Dioxin/Furan and Pesticide Soil Sampling

To evaluate potential historical releases of dioxins/furans from the former hog fuel burner at the Mill Site, a focused shallow soil investigation was conducted near the former hog fuel burner area. Dioxin/furan soil analytical results are presented in Appendix A. The cumulative dioxin/furan toxics equivalents quotient (TEQ) levels in all samples were less than 4 nanograms per kilogram (ng/kg), below the MTCA Method B soil cleanup level for unrestricted use of 12 ng/kg.

To evaluate potential historical releases of organochlorine pesticides, a focused shallow soil investigation was conducted in areas of potential release areas. Surface soil samples were collected from the northern and southern portions of the former Mill Site. No organochlorine pesticide compounds were detected in any of these samples. Detailed descriptions of these investigations can be found in Appendix A.

5.1.4 2009 PR/OPG Groundwater Metals Sampling

5.1.4.1 Arsenic at MW-8

In May, August, and November 2009, additional soil and groundwater samples were collected from MW-8 to further delineate and determine the source of elevated arsenic concentrations in that area. Two new monitoring wells (MW-15 and MW-16) were also installed to the east and northeast of MW-8 to monitor concentrations of arsenic in groundwater near the shoreline. Appendix A (Figures 7-1 and 7-2) depicts the groundwater sampling locations, hand auger locations, and location of the monitoring wells.

Moderately elevated salinity (approximately 3 to 5 parts per thousand [ppt]) was observed in groundwater collected from the new shoreline monitoring wells (MW-15 and MW-16) relative to interior monitoring well MW-8 (salinity of 0.9 ppt). The elevated salinity observed at MW-15 and MW-16 is consistent with tidal-induced mixing of groundwater and seawater near the Mill Site shoreline, as discussed in Section 3.

To avoid spectral interferences originating from saline matrix interferences and a high bias in arsenic concentrations, the analytical method for arsenic was changed from the standard Inductively Coupled Plasma Mass Spectrometry (ICP-MS) method used in the earlier site investigations to a more reliable hydride method. Comparison of the two methods demonstrated that there was a matrix interference resulting in a high bias using the standard ICP-MS analytical method. Analytical results for total and dissolved arsenic in groundwater are summarized in Appendix A.

Based on the hydride analyses summarized in Appendix A, groundwater total arsenic concentrations during the 2009 site investigation ranged from approximately 1 to 23 µg/L; dissolved arsenic ranged from 0.1 to 14 µg/L. While arsenic was detected in MW-8 at concentrations above the natural background groundwater concentration of 8 µg/L (PTI 1989), all sample results were well below the marine surface water chronic criterion of 36 µg/L. Final groundwater arsenic monitoring at the Mill Site was conducted in 2015 and 2016 (see Section 5.1.10).

5.1.4.2 Mercury and Cadmium at MW-7

Using low-flow purging and sampling methods, representative groundwater samples were collected from MW-7 in February, May, August, and November 2009 to evaluate the effectiveness of earlier interim actions in this area of the Mill Site. Both total and dissolved mercury were below the reporting limit of 0.2 µg/L in all MW-7 samples, confirming the protectives of the remedy (Appendix A).

Between 1999 and 2004, nine quarterly groundwater samples were collected from MW-7 and submitted for cadmium analysis (see Appendix A). Cadmium was detected in February 2004 at a concentration of 24 µg/L (above the marine water chronic criterion for protection of aquatic organisms of 9.3 µg/L). Cadmium concentrations in previous groundwater samples from MW-7 had been non-detect, and the two quarters following the February 2004 sampling event were also non-detect for cadmium. In order to verify four consecutive quarters of cadmium results below the surface water protection level, two additional quarters of sampling were performed at MW-7, in June and September 2010. Cadmium was not detected in groundwater collected from MW-7, at a reporting limit of 0.4 µg/L, during both sampling events, further confirming that cadmium is not a groundwater CoC at the Site (Appendix A).

5.1.5 2011 Port Gamble S'Klallam Tribe Dioxin/Furan Soil Sampling

In 2011, the Port Gamble S'Klallam Tribe collected surface soil (0 to 0.5 foot bgs) samples at five locations west and south of the Mill Site. The soil samples were submitted for dioxin/furan analysis; the resultant TEQ levels ranged from 9 ng/kg to 64 ng/kg, with the highest two sample results (54 and 64 ng/kg) collected south of the Mill Site, adjacent to Highway 104 (Ridolfi 2011; see Figure 7).

The RI/FS Work Plan attached to the 2018 Agreed Order (Anchor QEA 2017c) noted that elevated surface soil dioxin/furan TEQ concentrations detected in the 2011 Port Gamble S'Klallam Tribe samples may have been influenced by differing sources, which could include airborne deposition from historical hog fuel boiler emissions or other anthropogenic sources such as backyard burning, fireplaces and stoves, weed control, and exhaust from diesel engines (Ecology 2011). As discussed in Section 5.3, subsequent delineation of the extent of dioxin/furan releases attributable to the Mill Site was performed as part of the 2017 supplemental site investigations.

5.1.6 2014 Ecology Dioxin/Furan Soil Sampling

In April 2014, Ecology performed an expanded characterization of upland surface and near surface soil dioxin/furan concentrations at the Mill Site (Leidos 2014). Soil borings at 30 approximately equally spaced 200- by 200-foot grid locations across the Mill Site were advanced 2 to 3 feet bgs using a direct push Geoprobe. Discrete surface soil samples were collected from approximately 0 to 1 foot below hardscape cover or bedding materials and submitted for dioxin/furan analyses.

Dioxin/furan TEQ concentrations ranged from 0.05 ng/kg to 226 ng/kg; 6 of the 30 locations sampled as part of this investigation exceeded the 12 ng/kg MTCA Method B soil cleanup level for unrestricted use.

5.1.7 2014 PR/OPG Cadmium, cPAH, and Dioxin/Furan Soil Sampling

In July 2014, PR/OPG collected 13 additional direct push Geoprobe soil samples (up to approximately 10 feet bgs) from the Mill Site shoreline to inform the sediment cleanup remedy design. Six composite samples of near-surface fill soils (8 to 10 feet bgs; two to five core locations per sampling area) were submitted for cadmium, PAH, and dioxin/furan analyses.

Cadmium concentrations ranged from 0.2 milligrams per kilogram (mg/kg) to 0.5 mg/kg (all below the MTCA Method A soil cleanup level for unrestricted use of 2 mg/kg), and cPAH TEQ levels ranged from 4 micrograms per kilogram (µg/kg) to 160 µg/kg (also all below the current MTCA Method B soil cleanup level for unrestricted use of 190 µg/kg). Dioxin/furan TEQ levels ranged from 1.6 ng/kg to 251 ng/kg; 3 of the 6 composite locations sampled as part of this investigation exceeded the 12 ng/kg MTCA Method B soil cleanup level for unrestricted use (Anchor QEA 2015a).

5.1.8 2014 HCCC Cadmium, cPAH, and Dioxin/Furan Soil Sampling

In November 2014, HCCC collected near-surface fill soil composites in the southern Mill Site using a direct push Geoprobe (Anchor QEA 2015b). A total of 12 soil borings were advanced to approximately 15 to 20 feet bgs. The fill layers from four borings within a subarea, ranging from 7 to 18 feet bgs, were composited into a single analytical sample; the resulting three composite samples were submitted for analysis for a wide range of CoCs, including dioxins/furans. Similarly, three

"Z-layer" composite samples representative of the native soils below the fill layer within each sub-area (i.e., below 7 to 18 feet bgs) were also submitted for CoC analyses.

Cadmium concentrations ranged from 0.3 mg/kg to 0.6 mg/kg (all below the MTCA Method A soil cleanup level for unrestricted use of 2 mg/kg), and total cPAH TEQ levels ranged from 5 µg/kg to 42 µg/kg (all below current MTCA Method B cleanup level for unrestricted use of 190 µg/kg). Dioxin/furan TEQ concentrations ranged from 0.1 ng/kg to 64.9 ng/kg; two of the three composite locations sampled as part of this investigation exceeded the 12 ng/kg MTCA Method B soil cleanup levels for unrestricted use.

5.1.9 2015 PR/OPG Dioxin/Furan Bioaccumulation Analyses

In September 2015, PR/OPG collected three additional surface soil samples (up to 2.5 feet bgs) from the Mill Site and submitted these samples for dioxin/furan analyses along with detailed earthworm bioaccumulation testing (Anchor QEA 2016). This work was performed following Ecology-approved work plans under the 2008 Agreed Order (DE 5631) and provided site-specific dioxin/furan bioaccumulation factor (BAF) data to develop protective soil cleanup levels at the Mill Site consistent with MTCA requirements.

Dioxin/furan TEQ concentrations ranged from 6.7 ng/kg to 341.3 ng/kg; two of the three discrete samples and the composite sample exceeded 12 ng/kg MTCA Method B soil cleanup levels for unrestricted use. Based on concurrent earthworm bioaccumulation testing, the site-specific BAF (tissue concentration divided by soil concentration) was determined to be 0.35. Using this BAF, protective soil concentrations were calculated using Ecology's wildlife exposure model for site-specific evaluations (Table 749-4; WAC 173-340-900). The resultant site-specific soil dioxin/furan TEQ for ecological protection (based on potential mammalian predator exposure) was 260 ng/kg. A detailed description of this investigation is provided in Anchor QEA (2016b).

5.1.10 2015 and 2016 PR/OPG Groundwater Arsenic Sampling

Following Ecology's review of the 2012 RI/FS (Appendix A) and during follow-up discussions in May 2015, Ecology requested two additional rounds of sampling at three monitoring wells in the southern portion of the Mill Site (MW-8, MW-15, and MW-16; see Figure 8). These two rounds of sampling were performed on May 15 and August 18, 2015. Sampling and analysis results were presented in EPI (2015).

Ecology (2015a) subsequently requested two additional rounds of groundwater sampling to ensure that arsenic concentration trends in the monitoring wells were either stable or decreasing. These two rounds of sampling were performed on December 15, 2015, and February 11, 2016. The results from these sampling events were presented in EPI (2016).

As described above, between May 2015 and February 2016, PR/OPG performed four consecutive quarters of groundwater monitoring in the southern portion of the Mill Site to support this RI/FS. These data confirmed that total and dissolved arsenic concentrations in groundwater at MW-8 have remained stable at concentrations above natural background (8 µg/L) but below the marine surface water chronic criterion of 36 µg/L (except for the February 2016 total arsenic analysis from MW-8 of 36.8 µg/L). Total and dissolved arsenic concentrations in shoreline wells (MW-15 and MW-16) downgradient of MW-8 ranged between 0.3 and 2.7 µg/L, within the natural background range. The RI/FS monitoring verified that current groundwater arsenic concentrations at the Mill Site are protective of Port Gamble Bay. Groundwater arsenic monitoring data for the southern portion of the Mill Site are summarized in Chart 3 below:

Chart 3. 2015/2016 Groundwater Arsenic Monitoring Summary

Well ID	Date	Total Arsenic (µg/L)	Dissolved Arsenic (µg/L)
MW-8	5/15/2015	34.2	31.8
	8/18/2015	17.8	12.6
	12/15/2015	20.8	7.5
	2/11/2016	36.8	33.9
MW-15	5/15/2015	2.3	2.4
	8/18/2015	1.4	0.8
	12/15/2015	2.0	0.8
	2/11/2016	2.3	1.3
MW-16	5/15/2015	0.5	0.4
	8/18/2015	0.3	0.3
	12/15/2015	2.7	1.8
	2/11/2016	2.6	2.4

5.1.11 2016 PR/OPG Cadmium, cPAH, and Dioxin/Furan Groundwater Sampling

In February 2016, as part of the Model Airplane Field Limited Purpose Landfill permitting, PR/OPG collected additional groundwater samples from MW-8, MW-15, and MW-16 in the southern Mill Site for analysis of cadmium, cPAH TEQ, and dioxin/furan TEQ. Cadmium concentrations in MW-8, MW-15, and MW-16 ranged from 0.01 µg/L to 0.03 µg/L, below the MTCA Method B groundwater cleanup level of 8 µg/L, and cPAH TEQ levels ranged from non-detect at 0.01 nanogram per liter (ng/L) to an estimated concentration 14.8 ng/L, below the below the MTCA Method B groundwater cleanup level of 20 ng/L based on the practical quantitation limit (PQL) and sediment protection (Anchor QEA 2015a). Dioxin/furan TEQ concentrations in MW-8, MW-15, and MW-16 ranged between an estimated

concentration of 1 picogram per liter (pg/L) to 4 pg/L, below the MTCA Method B groundwater cleanup level of 4.4 pg/L (based on the PQL). A detailed description of 2016 groundwater cadmium, cPAH, and dioxin/furan monitoring is provided in Anchor QEA 2015b and 2017.

5.2 2017 Post-Stockpile Removal Investigations

As summarized in Section 1.1, sediment cleanup actions in Port Gamble Bay were performed from September 2015 to January 2017 (Anchor QEA 2016a and 2018a). Mixed sediment and wood debris dredged from Port Gamble Bay as part of the cleanup project were temporarily stockpiled on the Mill Site. In October 2017, following visual confirmation of removal of the stockpiles, 13 five-point surface soil (0 to 1 foot bgs) composite samples from non-hardscape areas of the Mill Site were sampled and analyzed for CoCs (Anchor QEA 2017a). The post-stockpile removal sampling data are presented in Appendix B.

Post-stockpile removal cadmium concentrations ranged from 0.07 mg/kg to 0.16 mg/kg, all below the MTCA Method A soil cleanup level for unrestricted use of 2 mg/kg, and total cPAH TEQ levels ranged from and estimated concentration 31.4 µg/kg to 205 µg/kg, with only one sample marginally above the current MTCA Method B soil cleanup levels for unrestricted use of 190 µg/kg. Dioxin/furan TEQ concentrations ranged from an estimated concentration of 2.12 ng/kg to 757 ng/kg; 5 out of the 13 sample locations exceeded the 12 ng/kg MTCA Method B soil cleanup level for unrestricted use. As discussed in Appendix B, the 2017 post-stockpile removal sampling further refined the extent of dioxin/furan TEQ levels exceeding the 12 ng/kg soil cleanup level and verified that the sediment cleanup project successfully achieved anti-degradation criteria.

5.3 2017 to 2018 Supplemental RI/FS Investigations

As discussed in the RI/FS Work Plan attached to the 2018 Agreed Order (Anchor QEA 2017c) and as summarized above, previously available Mill Site data provided a significant portion of the information needed to complete this RI/FS. The purpose of the 2017 supplemental investigations was to fill remaining data gaps. The effort focused on the following data quality objectives (DQOs):

- Delineate the areal extent of the Mill Site, including potential dioxins/furans from historical wood treatment and/or hog fuel boiler releases, but excluding the influence of other anthropogenic sources. The RI/FS Work Plan identified three surface (0 to 1 foot bgs) soil sampling locations along the southwest end of the Mill Site along the bluff slope approximately 20 feet above the existing grade, and four locations west and south of the Mill Site; these locations are potentially down-wind of the historical hog fuel boiler that operated at the Mill Site (Figure 7) and are largely removed from other anthropogenic sources such as historical dwellings, treated poles, weed control, highway emissions, etc. (Ecology 2011).

- Characterize vertical dioxin/furan profiles in Mill Site areas with higher dioxin/furan concentrations. The RI/FS Work Plan identified nine initial locations for soil borings to delineate vertical distributions.

A discussion of the sample design and steps required to meet these DQOs is included in the RI/FS Work Plan. Procedures to collect surface and subsurface soil samples were detailed in the September 2017 *Supplemental RI/FS Sampling and Quality Assurance Project Plan* (SQAPP; Anchor QEA 2017e).

In October 2017, seven surface soil samples were collected at locations west and south of the Mill Site. Nine Geoprobe borings were advanced and sampled. Consistent with the SQAPP, surface and shallow subsurface soil samples collected to approximately 5 feet bgs were initially submitted for analysis of dioxins/furans. Geoprobe samples from deeper intervals (i.e., 5 to 15 feet bgs) were archived for potential subsequent analysis.

Following receipt of preliminary analytical data in November 2017, Anchor QEA, PR/OPG, Ecology, and tribal stakeholders collectively reviewed the information to determine whether the DQOs set forth in the RI/FS Work Plan had been achieved. The post-stockpile sampling data, discussed in Section 5.2, were also included in this review. Based on this review, archived deeper subsurface soil samples collected from four Mill Site locations were selected for analysis of dioxins/furans. Two additional boring locations at the Mill Site were also identified to complete characterization of the vertical extent of dioxins/furans. These additional Geoprobe borings were advanced and sampled in December 2017. Subsurface soil samples from the Geoprobe borings were collected, processed, and submitted for analysis of dioxins/furans.

Following receipt of the additional data and after further consultation with Ecology and tribal stakeholders, six additional borings were advanced in the end-paint wood treatment area: two within the mercury excavation footprint and four outside of the backfilled excavation area. These additional Geoprobe borings were advanced and sampled in March 2018. Subsurface soil samples from the Geoprobe borings were collected, processed, and submitted for analysis of dioxins/furans.

The final validated analytical results for the 2017 and 2018 Supplemental RI/FS sampling event are presented in Appendix C and summarized in Table 1. Delineation of the Mill Site boundary and the conceptual site model of the nature and extent of contamination at the Mill Site based on the RI/FS data are discussed in Section 6.

6 Conceptual Site Model

This section summarizes the conceptual site model (CSM) of the nature and extent of contamination at the Mill Site based on the 2005 to 2018 site characterization data presented in Section 5.

Under MTCA, a CSM is "a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors." Once developed, a CSM informs the selection of appropriate remedial actions.

All available soil and groundwater data that are representative of current Mill Site conditions, as detailed in Appendices A, B, and C, were compiled and compared to MTCA Method A and B soil and groundwater cleanup levels for unrestricted use. As discussed in Sections 3 and 4, while additional CoCs were present at the Mill Site prior to earlier interim actions, more recent site characterization data summarized in Section 5 reveal that only the following CoCs currently remain at the Mill Site at levels that may trigger remedial action:

- Dioxin/furan TEQ
- cPAH TEQ
- Lead
- Arsenic

Each of these CoCs is discussed below.

As discussed in Section 5.3, delineation of the extent of dioxin/furan releases attributable to the Mill Site was performed as part of the 2017 supplemental site investigations. Specifically, surface soil (0 to 1 foot bgs) samples were collected at three locations southwest of the Mill Site along the bluff slope approximately 20 feet above the existing Mill Site grade, as well as at four additional targeted locations west and south of the Mill Site potentially affected by historical hog fuel boiler emissions, given prevailing wind directions (Figure 7). The objective of the 2017 supplemental sampling was to distinguish Mill Site-related releases from the potential influence of other anthropogenic sources including historical dwellings, treated poles, weed control, highway emissions, etc. (Ecology 2011).

Targeted 2017 sampling locations included the Port Gamble Buena Vista cemetery (with graves dating back to the 1850s), as well as three forested locations around the perimeter of the town near and between stations previously sampled by the Port Gamble S'Klallam Tribe (Ridolfi 2011). Except for a single sample collected on the bluff immediately adjacent to the Mill Site that marginally exceeded the 12 ng/kg MTCA Method B soil cleanup level for unrestricted use (14 ng/kg; Figure 9), the other six 2017 surface soil samples had dioxin/furan TEQ levels at or below 12 ng/kg.

In the most recent national inventory, EPA (2005) identified open burning of yard waste as the largest source of dioxin/furan exposure in the U.S. Historical data and previous archaeological investigations in Port Gamble have documented the historical patterns of residents dumping burned household materials over the edges of bluffs and ravines (see 1878 photograph, at right, showing numerous homes on the top of the bluff). Available studies of dioxin/furan congeners in emissions from backyard burning (e.g., Wevers et al. 2003) reveal a wide range of congener patterns and TEQ levels, limiting the utility of fingerprinting tools in this application to further define sources. Therefore, while the 2011 Port Gamble S'Klallam Tribe samples are valid for exposure assessments, the extent of dioxin/furan releases attributable to the former sawmill facility is likely limited to the immediate vicinity of the Mill Site. (Based on all available data, the average off-site surface soil TEQ level within roughly 1,000 feet of the Mill Site is approximately 17 ng/kg, well below the 45 ng/kg open-space protection criterion; see Section 7.1.2.)

All validated surface soil dioxin/furan TEQ data collected from 2009 to 2018 both within and immediately adjacent to the Mill Site were compiled and plotted on Figure 9 using a standard inverse-distance-weighting interpolation. Areas exceeding the dioxin/furan 12 ng/kg TEQ MTCA Method B soil cleanup level for unrestricted use are highlighted (in yellow) on Figure 9. Four discontinuous areas totaling approximately 6 acres within the northern, central, and southern portions of the Mill Site exceed the 12 ng/kg soil cleanup level. As depicted on 2017/2018 soil core profiles presented on Figure 9, the highest levels of dioxin/furan TEQ (up to an estimated concentration of 6,530 ng/kg) were detected in subsurface soils (9 to 11 feet bgs) at soil boring G18-GP-12, located within the northeast area of the Mill Site, coinciding with one of the 2004/2005 interim remedial action areas that previously addressed mercury releases (Figure 6).

Former sawmill operations in the G18-GP-12 area included application of a mercury-based end paint in common use regionally beginning in the early 1900s, which was subsequently replaced by the 1950s with a chlorophenol-based product with characteristic residual dioxin/furan impurities, before being discontinued in the 1970s (NewFields et al. 2013). Possible spilling of these various lumber treatment paints over time originally released both mercury and dioxins/furans to soils in end paint application areas, particularly in the area around G18-GP-12, where end painting was often focused during the earlier years of sawmill operations (Figure 2). Because the 2004/2005 interim action targeted mercury removal without concurrent dioxin/furan testing, some of the soils excavated from the mercury impacted area that contained elevated dioxin/furan concentrations were inadvertently reused as deep backfill if mercury concentrations in these temporary stockpiles were below the MTCA soil cleanup level for unrestricted use. The dioxin/furan congener profiles in surface and subsurface soil samples throughout the Mill Site with relatively higher dioxin/furan TEQ levels (above

100 ng/kg) are characteristic of residues from chlorophenolic wood treatment products (e.g., TEQ levels are predominantly attributable to the congeners 1,2,3,4,7,8-heptachlorodibenzo-*p*-dioxin and 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin; NewFields 2014), consistent with this CSM.

All validated surface and subsurface soil cPAH TEQ data collected after completion of the 2002 to 2005 interim remedial actions are depicted on Figure 10. One isolated surface soil sample collected within the northern Mill Site (PG-SO-10; 205 µg/kg) exceeded the MTCA Method B soil cleanup level for unrestricted use (190 µg/kg). This sample is also within the footprint of co-located dioxin/furan TEQ levels exceeding the 12 ng/kg MTCA Method B soil cleanup level for unrestricted use (Figure 9).

All validated surface and subsurface soil lead data collected after completion of the 2002 to 2005 interim remedial actions are also depicted on Figure 10. Two isolated post-excavation confirmatory soil samples collected at completion of the 2002 to 2005 interim remedial actions (PS-72B [270 mg/kg], and PS-122S [230 mg/kg]) exceeded the MTCA Method B soil cleanup level for unrestricted use (220 mg/kg; based on a simplified terrestrial ecological evaluation). However, because other adjacent post-excavation soil samples in these areas were well below cleanup levels, lead concentrations remaining at the Mill Site comply with post-removal statistical compliance requirements of MTCA Section 173-340-740(7) (e.g., no more than 10% of the post-excavation samples exceeded the cleanup level, and none of the samples exceeded the cleanup level by more than two-fold; see Appendix A).

The most recent validated groundwater dioxin/furan TEQ and cPAH TEQ monitoring data collected from the Mill Site are depicted on Figure 8 (as discussed in Sections 3 and 5, lead is not a CoC in Mill Site groundwater). All dioxin/furan TEQ and cPAH TEQ groundwater levels measured at the Mill Site have been below MTCA Method B groundwater cleanup levels for unrestricted use, based on PQLs. However, groundwater dioxin/furan TEQ downgradient of the highest levels of soil dioxin/furan TEQ (e.g., soil boring G18-GP-12 located within the northeast area of the Mill Site) have not been characterized. As discussed in more detail later in this RI/FS, soil dioxin/furan TEQ remediation levels were developed to ensure groundwater protection in this area, to be confirmed during future remedial design and/or post-construction verification monitoring.

The most recent validated groundwater arsenic monitoring data collected from the Mill Site are also depicted on Figure 8. As discussed in Section 5.1.10 and depicted on Figure 8, groundwater arsenic concentrations in a relatively isolated area of the southern Mill Site (MW-8) exceed the MTCA Method B groundwater cleanup level for unrestricted use of 8 µg/L, based on natural background levels. As discussed in Section 5.1.1, groundwater arsenic concentrations at MW-8 are the result of localized reducing groundwater geochemical conditions in this area of the Mill Site, mobilizing naturally occurring arsenic concentrations in soil. However, groundwater arsenic concentrations at this location and throughout the Mill Site are below the marine surface water chronic criterion of 36 µg/L. Groundwater

arsenic concentrations in shoreline wells downgradient of MW-8 are within the natural background range. Current groundwater arsenic concentrations at the Mill Site are protective of Port Gamble Bay.

7 Basis for Cleanup Action

This section summarizes the basis for the Mill Site cleanup action, including development of site-specific cleanup standards and identification of locations and media requiring cleanup action evaluation.

7.1 Cleanup Standards

In accordance with MTCA, cleanup standards consist of cleanup levels that are protective of human health and the environment, and the point of compliance at which the cleanup levels must be met.

7.1.1 Cleanup Levels

The cleanup level is the concentration of a CoC that is protective of human health and the environment under site-specific exposure conditions. As discussed in Section 2.3, future land use plans for the Mill Site are currently being developed by PR/OPG. To minimize limitations on future land use, this RI/FS has been prepared assuming unrestricted land use cleanup levels to support a future mixed residential and commercial land use on the 25-acre upland Mill Site.

7.1.1.1 Soil Cleanup Levels

Site-specific cleanup levels for soil that are protective of human health and the environment were developed in accordance with MTCA Method B cleanup requirements, considering the following:

- Natural background concentrations in regional soil
- Soil PQLs
- Applicable state and federal laws
- Soil concentrations protective of direct human contact with soil (including potential future ground floor residential land use (WAC 173-340-740[3])
- Soils concentrations protective of terrestrial ecological receptors (based on site-specific terrestrial ecological evaluations)
- Soil concentrations protective of groundwater, surface water, and sediments (based on site-specific groundwater transport evaluations; see Section 7.1.2)

The MTCA Method B soil cleanup levels for Mill Site CoCs (dioxin/furan TEQ, cPAH TEQ, and lead), along with the basis for each cleanup level, are summarized in Table 2.

7.1.1.2 Groundwater Cleanup Levels

Site-specific cleanup levels for groundwater that are protective of human health and the environment were developed in accordance with MTCA Method B cleanup requirements, considering the following:

- Natural background concentrations in regional groundwater
- Water PQLs
- Applicable state and federal laws (e.g., drinking water maximum contaminant levels)
- Groundwater concentrations protective of potential drinking water exposures under MTCA exposure assumptions
- Groundwater concentrations protective of surface water and sediments (based on site-specific groundwater transport evaluations; see Section 7.1.2)

The MTCA Method B groundwater cleanup levels for Mill Site CoCs (dioxin/furan TEQ, cPAH TEQ, and arsenic), along with the basis for each cleanup level, are summarized in Table 3.

While protective groundwater cleanup levels for the Mill Site conservatively consider potential future drinking water exposures, groundwater at the Mill Site is not potable, as defined under WAC 173-340-720(2):

- Groundwater does not serve as a current source of drinking water (WAC 173-340-720[2][a]).
- Hazardous substances that may be present in groundwater are unlikely to be transported to a current or potential future source of drinking water (WAC 173-340-720[2][I]).
- The Mill Site's proximity to surface water (i.e., Port Gamble Bay) renders groundwater as non-potable due to salinity intrusion (see Section 5.1.4).

Because Mill Site groundwater is not a current or reasonably likely future source of drinking water, cleanup levels at the Mill Site developed to protect groundwater use as a potential source of drinking water are conservative. Additionally, the empirical demonstrations described in Sections 3 and 5 confirm that existing groundwater concentrations at the Mill Site are protective of surface water and sediment, subject to additional confirmatory remedial design and/or post-construction verification monitoring, discussed in Section 6.

7.1.2 Soil Dioxin/Furan TEQ Remediation Levels

While the 12 ng/kg dioxin/furan TEQ MTCA Method B soil cleanup level for unrestricted use delineates Mill Site areas triggering remedial action, under MTCA (WAC 173-340-355) remediation levels are used to identify the concentrations of CoCs at which different cleanup action components will be used (e.g., excavation, containment, or institutional controls). As discussed in Section 6, because the 2002 to 2005 interim remedial actions successfully addressed all soil CoCs except dioxin/furan TEQ, and also because concentrations of groundwater CoCs are either below PQLs (dioxin/furan TEQ and cPAH TEQ) or are attributable to localized geochemical conditions but nevertheless protective of Site-specific surface water exposure conditions (arsenic), final Mill Site remedial actions evaluated in this RI/FS are appropriately focused on soil dioxin/furan TEQ levels.

Soil dioxin/furan TEQ remediation levels for the Mill Site were developed considering the following:

- Soil concentrations protective of human health (direct contact pathway) under a contingent open-space land use scenario for the 16 acres of the southern and eastern Mill Site
- Soil concentrations protective of terrestrial ecological receptors (based on site-specific terrestrial ecological evaluations)
- Soil concentrations protective of groundwater, surface water, and sediment (based on site-specific groundwater transport evaluations)

Ecology (2015b) developed human health-based protective soil concentrations for the Mill Site based on a conservative open-space exposure scenario, assuming a child may access these areas 2 days per week, among other assumptions. The resultant site-specific dioxin/furan human health protection criterion under the contingent open-space land use scenario is 45 ng/kg TEQ.

As discussed in Section 5.1.9, based on the measured site-specific BAF of 0.35, protective soil concentrations were calculated using Ecology's wildlife exposure model for site-specific evaluations (Table 749-4; WAC 173-340-900). The resultant site-specific soil dioxin/furan TEQ for ecological protection (based on potential mammalian predator exposure) is 260 ng/kg.

To support development of protective cap designs for Port Gamble Bay, memorialized in the EDR (Anchor QEA 2015c), contaminant transport modeling from the Mill Site to Port Gamble Bay was conducted using the Reible model recommended for this purpose by the U.S. Environmental Protection Agency, Ecology, and other regulatory agencies (Go et al. 2009, Lampert and Reible 2009, Reible 2012). Specifically, the Reible model simulates the transport of dioxins/furans and cPAHs from underlying soils to ensure that engineered caps constructed in Port Gamble Bay provide long-term protectiveness, defined as meeting site-specific sediment cleanup levels in perpetuity (i.e., for more than 1,000 years). The site-specific sediment cleanup levels for intertidal sediments (top 2 feet) set forth in the Port Gamble Bay Cleanup Action Plan (Ecology 2013) are as follows:

- Maintain average dioxin/furan TEQ levels below the sediment PQL of 5 ng/kg
- Maintain average cPAH TEQ levels below the sediment natural background level of 16 µg/kg

In the EDR, the source terms in the underlying or adjacent nearshore soils were represented in the models as an infinite source beneath a 2-foot-thick cap, using average nearshore soil concentrations measured at the Mill Site, as follows:

- Average nearshore soil dioxin/furan TEQ level: 36 ng/kg
- Average nearshore soil cPAH TEQ level (non-piling zone): 280 µg/kg

Using conservative input parameters (e.g., no chemical degradation over time), the EDR modeling concluded that long-term dioxin/furan TEQ and cPAH TEQ levels in the top 2 feet of nearshore caps in Port Gamble Bay would be maintained below 0.3 ng/kg and 3 µg/kg, respectively. Because these

long-term (steady-state) concentrations were well below site-specific cleanup standards listed above, protectiveness of the nearshore caps under these conditions was assumed to be confirmed.

As depicted on 2017/2018 soil core profiles also presented on Figure 9, higher levels of dioxin/furan TEQ (up to an estimated concentration of 6,530 ng/kg) were detected in subsurface soils (9 to 11 feet bgs) at soil boring G18-GP-12 located within the northeast area of the Mill Site, well above the 36 ng/kg TEQ average used in the EDR modeling (the representativeness of the 280 µg/kg soil cPAH level was confirmed during the Supplemental RI/FS). For this RI/FS, the steady-state models used in the EDR were used to back-calculate the average subsurface soil dioxin/furan TEQ level at the Mill Site that would be protective of nearshore sediment caps. All model input parameters, except the underlying average subsurface soil dioxin/furan TEQ level, were consistent with those used in the EDR. As discussed in the EDR, partitioning of contaminants between soil/sediment and groundwater/ porewater is described in the Reible model by the organic carbon equilibrium partition coefficient, calculated, in this case, based on the relative contributions of the dioxin/furan congeners that contributed to TEQ in the G18-GP-12 sample (6,530 ng/kg) depicted on Figure 9. The steady-state Reible model input parameters, estimates, and outputs are summarized in Table 4. The model revealed that an average nearshore soil dioxin/furan TEQ level (across the entire Mill Site) of approximately 530 ng/kg would ensure compliance with the average nearshore dioxin/furan TEQ cleanup level of 5 ng/kg in the 2-foot-thick cap at steady state. As summarized in Table 5, this soil remediation level is also protective of groundwater and surface water.

Surface water criteria and standards for dioxin/furan TEQ are summarized in Table 5. The EPA surface water quality criterion for dioxin/furan TEQ applicable to Washington State is 0.0051 pg/L (40 CFR 131.45) and the PQL for dioxin/furan TEQ is 4.4 pg/L. Because the surface water quality criterion is lower than the PQL, the MTCA surface water cleanup level is the PQL, in accordance with WAC 173-340-730(5)(c). Compliance with surface water quality criteria also considers site-specific tissue data. Tissue monitoring data collected within Port Gamble Bay immediately adjacent to the Mill Site during and after cleanup (Anchor QEA and Port Gamble S'Klallam Tribe 2015), particularly the observation that post-construction dioxin/furan TEQ shellfish tissue levels adjacent to the Mill Site and in surrounding areas of Port Gamble Bay are within the background range and below health advisory and water quality criteria, has confirmed that significant dioxin/furan partitioning along the soil-groundwater-sediment-surface water transport pathway is unlikely.

To provide an additional evaluation of protectiveness, the Reible Model was used to calculate an upland soil dioxin/furan TEQ level that would be protective of the 0.0051 pg/L EPA surface water quality criterion at the sediment/surface water interface (including point of compliance and area-averaging considerations developed by Ecology as part of the Port Gamble Bay Cleanup Action Plan (CAP). The modeling indicated that a depth- and area-weighted average soil dioxin/furan level of approximately 12 ng/kg TEQ would achieve the 0.0051 pg/L criterion at the sediment/water interface

across Sediment Management Area-1 (SMA-1) and SMA-2. While not an applicable remediation level under MTCA, the 12 ng/kg TEQ level was used to assess the relative protectiveness of remedial alternatives (see Sections 9.2.4 and 10.2.1).

Remediation levels for dioxin/furan TEQ in soil are detailed in Table 5 and are summarized as follows:

Dioxin/Furan TEQ Soil Remediation levels

- **Soil concentration protective of human health direct contact under a contingent open-space land use scenario: 45 ng/kg**, based on Ecology (2015b)
- **Soil concentration protective of terrestrial ecological receptors: 260 ng/kg**; based on site-specific bioaccumulation data
- **Soil concentration protective of groundwater, surface water, and sediment: 530 ng/kg**; based on steady-state Reible model output for protection of sediment and site-specific tissue monitoring data

7.1.3 Point of Compliance

Under MTCA, the point of compliance is the location on a site where the cleanup levels must be attained. The points of compliance at the Mill Site will be finalized by Ecology in a forthcoming CAP. Preliminary points of compliance used to evaluate the cleanup action alternatives in this RI/FS are described below.

The standard point of compliance for the soil cleanup levels listed in Table 2 is throughout the soil column from ground surface to 15 feet bgs, in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). For potential terrestrial ecological exposures, MTCA regulations allow a conditional point of compliance to be established from the ground surface to 6 feet bgs (the biologically active zone according to MTCA default assumptions), provided institutional controls are used to prevent excavation of deeper soil (WAC 173-340-7490[4][a]). Accordingly, in areas of the Mill Site where potential ecological exposures are a concern, and where appropriate institutional controls can be implemented, a conditional point of compliance for soil concentrations protective of terrestrial ecological receptors may be proposed throughout the soil column from the ground surface to 6 feet bgs.

The standard point of compliance for the groundwater cleanup levels listed in Table 3 is throughout the Mill Site. To the extent that groundwater cleanup levels are based on protection of marine surface water, and not protection of groundwater for potential drinking water use, a conditional point of compliance may be proposed at the point of groundwater discharge to Port Gamble Bay. As discussed in Section 6 and depicted on Figure 8, groundwater arsenic concentrations in a relatively isolated area of the southern Mill Site (MW-8) exceed the MTCA Method B groundwater cleanup level for unrestricted use of 8 µg/L, based on natural background levels. Groundwater arsenic concentrations

at MW-8 are the result of localized reducing groundwater geochemical conditions in this area of the Mill Site, mobilizing naturally occurring arsenic concentrations in soil. The reducing groundwater geochemical conditions are associated with varying quantities of wood and other organic matter present in the soil. Thus, it is not practicable to meet the natural background-based groundwater cleanup levels at MW-8 within a reasonable restoration timeframe (see WAC 173-340-720[8][c]) and WAC 173-340-360[2]). However, groundwater arsenic concentrations at this location and throughout the Mill Site are below the marine surface water chronic criterion of 36 µg/L. Because arsenic is not a human health CoC in Port Gamble Bay, as determined by Ecology in the October 2013 Consent Decree addressing the in-water areas of the Site (Section 1), the marine aquatic life protection criterion (36 µg/L) is the appropriate surface water cleanup standard for the Mill Site.

Groundwater arsenic concentrations in shoreline wells downgradient of MW-8 are within the natural background range; the RI/FS data verify compliance prior to the point of groundwater discharge to Port Gamble Bay. Current groundwater arsenic concentrations at the Mill Site are protective of Port Gamble Bay.

Points of compliance for dioxin/furan TEQ cleanup and remediation levels in soil are summarized as follows:

Point of Compliance for Dioxin/Furan TEQ Soil Cleanup and/or Remediation Levels

- **Soil concentration protective of human health – direct contact:** throughout the Mill Site to a depth of 15 feet bgs (standard point of compliance)
- **Soil concentration protective of terrestrial ecological receptors:** throughout the Mill Site to a depth of 6 feet bgs (conditional point of compliance)
- **Soil concentration protective of groundwater, surface water, and sediment:** throughout the Mill Site (standard point of compliance)

Point of Compliance for Dioxin/Furan TEQ Groundwater Cleanup and/or Remediation Levels

- **Groundwater concentration protective of human health:** throughout the Mill Site (standard point of compliance)
- **Groundwater concentration protective of surface water and sediment:** throughout the Mill Site (standard point of compliance)

Point of Compliance for Arsenic Groundwater Cleanup and/or Remediation Levels

- **Groundwater concentrations meeting the natural background cleanup level:** existing shoreline wells MW-15 and MW-16 (conditional point of compliance)

7.2 Site Boundary and Management Areas

7.2.1 Site Boundary

The extent of the Mill Site has been delineated based on exceedance of MTCA Method B soil cleanup levels for unrestricted use. As discussed in Section 6, the boundary of the Mill Site is delineated by dioxin/furan TEQ levels exceeding 12 ng/kg, as depicted on Figure 9.

7.2.2 Soil Management Areas

Soil management areas targeted for further evaluation in this RI/FS were delineated based on exceedance of remediation levels at the point of compliance, as depicted on Figure 11. The four areas highlighted in yellow exceed the 12 ng/kg cleanup level for dioxin/furan TEQ. The single northeastern Mill Site area highlighted in orange exceeds both the 260 ng/kg dioxin/furan TEQ remediation level for protection of terrestrial ecological receptors (0- to 6-foot conditional point of compliance), as well as the 530 ng/kg soil dioxin/furan TEQ remediation level for protection of groundwater, surface water, and sediment (standard point of compliance).

7.2.3 Groundwater Considerations

There are no areas of the Mill Site that currently exceed groundwater cleanup levels at the point of compliance; however, there are no available groundwater data for dioxin/furan TEQ in the northeastern Mill Site. Under a remediation scenario where soils exceeding the 530 ng/kg soil dioxin/furan TEQ remediation level for protection of groundwater, surface water, and sediment are removed, downgradient groundwater will be protected, subject to additional confirmatory remedial design and post-construction verification monitoring, discussed in Section 6.

8 Framework for Cleanup Action Development

8.1 Cleanup Action Objectives

This section summarizes the cleanup action objectives and MTCA compliance requirements for chemical and media-specific goals.

8.1.1 Cleanup Action Objectives for Soil

As discussed in Section 6 and Appendix D, no further remedial action, other than implementing institutional controls, is required for the isolated area of soil with lead concentrations exceeding the simplified terrestrial ecological evaluation level for lead. Soil in this area is within the requirements for statistical compliance as allowed by Section 173-340-740(7) of the MTCA regulation. Cleanup action objectives for soil containing dioxin/furan TEQ and/or cPAH TEQ levels exceeding MTCA Method B soil cleanup levels for unrestricted use include the following:

- Protect human health by removing, or by eliminating the potential for direct contact exposure, Mill Site areas with soil concentrations exceeding 12 ng/kg dioxin/furan TEQ and/or 190 µg/kg cPAH TEQ.
- Protect terrestrial ecological receptors by removing, or eliminating the potential for wildlife exposure, Mill Site areas with soil concentrations exceeding 260 ng/kg dioxin/furan TEQ in the top 6 feet bgs.
- Protect groundwater, surface water, and sediments by removing, or eliminating the potential for groundwater transport, Mill Site areas with soil concentrations exceeding 530 ng/kg dioxin/furan TEQ.

8.1.2 Cleanup Action Objectives for Groundwater

Because groundwater at the Mill Site currently meets cleanup levels either at the conditional point of compliance (arsenic) or the standard point of compliance (dioxin/furan TEQ and cPAH TEQ), subject to additional confirmatory remedial design and/or post-construction verification monitoring discussed in Section 6, the cleanup action objective for groundwater is to further ensure that groundwater is not used as a future source of drinking water, by implementing institutional controls.

8.2 Applicable State and Federal Laws

In addition to cleanup standards developed through the MTCA process, other regulatory requirements must be considered in the selection and implementation of a cleanup action. MTCA requires that cleanup standards to be "at least as stringent as all applicable state and federal laws" (WAC 173-340-700[6][a]). Besides establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for

performing cleanup actions. These requirements are described in WAC 173-340-710. Applicable state and federal laws are discussed below.

While upland cleanup implementation plans are still under development, the cleanup action at the Mill Site will likely be performed pursuant to MTCA under the terms of a Consent Decree between Ecology and PR/OPG. Accordingly, the anticipated cleanup action will likely meet the permit exemption provisions of MTCA, obviating the need to follow procedural requirements of the various local and state regulations that would otherwise apply to the action. While state and federal permits may not be needed, the substantive requirements associated with applicable permits will be adhered to.

8.2.1 MTCA Requirements

The primary law that governs the cleanup of contaminated sites in the state of Washington is MTCA. The MTCA Cleanup Regulation (WAC 173-340) specifies criteria for the evaluation and conduct of a cleanup action, including criteria for developing cleanup standards for soil and groundwater. The MTCA regulations require that cleanup actions must protect human health and the environment, meet environmental standards in other applicable laws, and provide for monitoring to confirm compliance with cleanup levels.

MTCA places certain requirements on cleanup actions involving containment of hazardous substances that must be met for the cleanup action to be considered in compliance with soil cleanup standards. These requirements include implementing a compliance monitoring program that is designed to ensure the long-term integrity of the containment system and applying institutional controls where appropriate to the affected area (WAC 173-340-440).

MTCA also requires that all known, available and reasonable methods of treatment be provided for hazardous substances released to surface waters (WAC 173-340-710[7][a]). As discussed in Section 7.1.2, site-specific monitoring of groundwater, sediments, and tissue of sediment dwelling organisms has confirmed that significant dioxin partitioning from soils-groundwater-sediments-surface waters is unlikely; therefore, this requirement is not applicable.

The key MTCA decision-making document for cleanup actions is this RI/FS, where the nature and extent of contamination and the associated risks are evaluated, and potential alternatives for conducting a cleanup action are identified. The cleanup action alternatives are then evaluated against MTCA remedy selection criteria, and a preferred alternative is selected. After reviewing this RI/FS, and after consideration of public comment, Ecology will select a cleanup action for the Mill Site and document the selection in a CAP. Following public review of the CAP, the cleanup process typically moves forward into remedial design, permitting, construction, and long-term monitoring, as necessary.

8.2.2 Solid and Hazardous Waste Management

The Washington Hazardous Waste Management Act (RCW 70.105) and the implementing regulations, the Dangerous Waste Regulations (WAC 173-303), would apply if dangerous wastes are generated during the cleanup action. There is no indication of dangerous wastes being generated or disposed of at the Mill Site. In the event that dangerous wastes are generated during the cleanup action, they will be disposed at an appropriate off-site landfill or recycling facility. Related regulations include state and federal requirements for solid waste handling and disposal facilities (40 Code of Federal Regulations [CFR] 241, 257; WAC 173-350 and -351) and land disposal restrictions (40 CFR 268; WAC 173-303-340).

8.2.3 State Environmental Policy Act

The State Environmental Policy Act (SEPA; Revised Code of Washington [RCW] 43.21C; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. The SEPA process begins when an application for a permit is submitted to an agency, or an agency proposes to take some official action such as implementing a MTCA CAP. Prior to taking any action on a proposal, agencies must follow specific procedures to ensure that appropriate consideration has been given to the environment. The severity of potential environmental impacts associated with a project determines whether an Environmental Impact Statement is required. A SEPA checklist would be required prior to initiating remedial construction activities. Because the Mill Site cleanup action will likely be performed under a Consent Decree, SEPA and MTCA requirements will be coordinated as practicable.

8.2.4 Shoreline Management Act

The Shoreline Management Act (RCW 90.58) and its implementing regulations establish requirements for substantial developments occurring within water areas of the state or within 200 feet of the shoreline. Local shoreline management master programs are adopted under state regulations, creating an enforceable state law. Because the Mill Site cleanup action will likely be performed under a Consent Decree, compliance with substantive requirements would be necessary, but a shoreline permit would not likely be required.

8.2.5 Construction Stormwater General Permit

Construction activities that disturb 1 acre or more of land need to comply with the provisions of construction stormwater regulations. Ecology has determined that a construction stormwater general permit is not covered under the permit exemption provisions of MTCA, and thus a project-specific construction stormwater permit would be required if land disturbance greater than 1 acre is necessary. A construction NPDES permit was previously obtained for work conducted in the in-water

areas of the Mill Site. This permit remains active and may be used, as applicable, for upland remediation actions at the Mill Site.

8.2.6 Other Potentially Applicable Regulatory Requirements

The following is a list of other potentially applicable regulations for the cleanup action:

- **Grading:** Kitsap County, under Section 12.16 of the Kitsap County Code, holds the authority to issue grading permits. Any cleanup work that requires substantial grading is potentially subject to review and approval by the Kitsap County through their grading permit process. The code specifies requirements for setbacks, drainage, and erosion control for both excavation and fill projects. Exemptions apply for specific activities that disturb less than 1 acre of land.
- **Archaeological and Historical Preservation:** The Archaeological and Historical Preservation Act (16 USCA 496a-1) requirements would be evaluated in more detail during design if the selected remedy includes ground-disturbing activities and would be applicable if any subject materials are discovered during remedial actions (e.g., grading and/or excavation). At a minimum, an Inadvertent Discovery Plan will be required for all ground-disturbing activities.
- **Health and Safety:** Mill Site cleanup-related construction activities would need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926). These applicable regulations include requirements that workers are to be protected from exposure to contaminants and that excavations are to be properly shored.

9 Development and Evaluation of Primary Cleanup Alternatives

This section develops and evaluates the primary remedial alternatives that would meet the unrestricted (e.g., future mixed residential and commercial) land use cleanup action objectives for soil management areas of the Mill Site as summarized in Section 8. A separate set of remedial alternatives that may be relevant to a contingent future open space and habitat restoration land use are developed and evaluated in Section 10.

9.1 Development of Primary Cleanup Alternatives

Building on the RI/FS evaluations summarized above, PR/OPG, Ecology, and stakeholders collaboratively developed six remedial alternatives for more detailed evaluation in this RI/FS. Each of these alternatives is described below.

9.1.1 Alternative 1: Complete Removal with Off-Site Disposal

Under this alternative, all surface and subsurface (at any depth) soils at the Mill Site with soil dioxin/furan levels that exceed 12 ng/kg TEQ would be excavated and disposed of off site, as described below. Institutional controls addressing arsenic in Mill Site groundwater would also be a component of this alternative. Alternative 1, depicted on Figure 12, would include the following:

- Within areas of the Mill Site with soil dioxin/furan levels greater than 12 ng/kg TEQ, surficial hardscape material (asphalt or concrete) would be demolished, processed, and disposed of at approved off-site landfills or recycling facilities, as appropriate.
- Soil excavation depths would extend to approximately 2 to 15 feet bgs, depending on the specific Mill Site area; the estimated depth of excavation for each subarea is shown on Figure 12.
- Excavation prisms would be refined during pre-design investigations, with the intent of delineating soils in each area for complete removal (i.e., all soils exceeding 12 ng/kg).
- Soils from 0 to 5 feet bgs would be excavated using conventional earth moving equipment without shoring or dewatering.
- Soils from 5 to 15 feet bgs would be excavated using conventional earth moving equipment with shoring.
- Excavations deeper than 8 feet bgs would be dewatered by pumping groundwater from within and/or adjacent to the excavations; the pumped water would be stored in tanks to remove suspended solids (along with additional treatment as determined during design), and then discharged back into Mill Site groundwater via an upland infiltration basin, like the 2005 interim action.
- Post-excavation confirmation sampling would be performed to verify removal, and additional excavation performed as necessary.

- Excavated soils would be stockpiled on-site for profiling and further dewatering (as needed)
- Stockpiles with dioxin/furan levels less than 12 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill.
- Stockpiles with dioxin/furan levels greater than 12 ng/kg TEQ but less than 45 ng/kg TEQ would be disposed of at the Port Gamble Model Airplane Field Limited Purpose Landfill (MAF).
- Stockpiles with dioxin/furan levels greater than 45 ng/kg TEQ would be disposed of at an approved off-site commercial landfill.
- Shoreline excavations would be backfilled with clean imported fill and existing shoreline caps would be replaced.
- Restrictive covenants would be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply.

9.1.2 Alternative 2A: Partial Removal and Capping with Off-Site Disposal

Under this alternative, all surface soils (to 2 feet bgs) throughout the Mill Site, along with surface and subsurface (at any depth) nearshore soils within 50 feet of the Port Gamble Bay shoreline with dioxin/furan levels that exceed 12 ng/kg TEQ would be excavated. Surface and subsurface soils (at any depth) that exceed the 260 ng/kg dioxin/furan TEQ remediation level protective of terrestrial ecological receptors would also be excavated. All excavated materials that exceed the 12 ng/kg TEQ cleanup level would be disposed of offsite, as described below. All residual subsurface soils that exceed the 12 ng/kg TEQ cleanup level would be capped. Institutional controls addressing arsenic in Mill Site groundwater would also be a component of this alternative. Alternative 2A, depicted on Figure 13A, would include the following:

- Within all areas of the Mill Site with soil dioxin/furan levels greater than 12 ng/kg TEQ, surficial hardscape material (asphalt or concrete) would be demolished, processed, and disposed of at approved off-site landfills or recycling facilities, as appropriate.
- Soil excavation depths would extend to approximately 2 to 15 feet bgs, depending on the specific Mill Site area the estimated depth of excavation for each subarea is shown on Figure 13A.
- Excavation prisms would be refined during pre-design investigations with the intent of delineating soils in each area, as follows:
  - Areas 1, 2B, 2D, 3A, 3C, 4A, and 4C: complete removal (lateral and vertical extent) of soils with dioxin/furan levels above 12 ng/kg TEQ, including nearshore subsurface sediments currently capped in SMA-1 and SMA-2
  - Areas 2A, 2C, 3B, and 4B: surficial removal (upper 2 feet) of soils with dioxin/furan levels above 12 ng/kg TEQ and capping soils below 2 feet with dioxin/furan levels above 12 ng/kg TEQ and less than 260 ng/kg TEQ
- Soils from 0 to 5 feet bgs would be excavated using conventional earth moving equipment, without shoring or dewatering.

- Soils from 5 to 15 feet bgs would be excavated using conventional earth moving equipment, with shoring.
- Excavations deeper than 8 feet bgs would be dewatered by pumping groundwater from within and/or adjacent to the excavations; the pumped water would be stored in tanks to remove suspended solids (along with additional treatment as determined during design) and then discharged back into Mill Site groundwater via an upland infiltration basin, like the 2005 interim action.
- Post-excavation confirmation sampling would be performed to verify removal, and additional excavation performed as necessary.
- Excavated soils would be stockpiled on-site for profiling and further dewatering (as needed).
- Stockpiles with dioxin/furan levels less than 12 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill.
- Stockpiles with dioxin/furan levels greater than 12 ng/kg TEQ but less than 45 ng/kg TEQ would be disposed of at the MAF.
- Stockpiles with dioxin/furan levels greater than 45 ng/kg TEQ would be disposed of at an approved off-site commercial landfill.
- Shoreline excavations would be backfilled with clean imported fill and nearshore sediment caps in SMA-1 and SMA-2 replaced.
- Minimum 2-foot-thick permeable soil caps (or equivalent structural materials such as asphalt or building foundations) would be placed in areas of the Mill Site with residual dioxin/furan levels greater than 12 ng/kg TEQ.
- After completion of construction (and potentially beginning during remedial design, as practicable), groundwater monitoring would be performed in the northeastern portion of the Mill Site (i.e., downgradient of PG18-GP-12; see Figure 9) to verify that this area complies with the groundwater cleanup levels summarized in Table 3; appropriate contingency plans would be developed during remedial design.
- Restrictive covenants would be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply; restrictive covenants for soil caps would be recorded to ensure the integrity of the upland caps and prevent exposure to capped surficial soils.
- Notice and approval from Ecology would be required under WAC 173-340-440(9), for any future land use activity that is inconsistent with the restrictive covenants.
- The existing Kitsap County permitting (e.g., grading permit) process would be used as an additional administrative mechanism to further ensure that future actions on the Mill Site do not disturb capped areas.

9.1.3 Alternative 2B: Partial Removal and Capping with On-Site Disposal

Alternative 2B would include the same removal, capping, and institutional controls described above for Alternative 2A, except that all excavated materials with dioxin/furan levels between 12 and 260 ng/kg TEQ would be placed at the base of the bluff along the western edge of the Mill Site and covered with a minimum 2-foot-thick permeable soil cap (or equivalent structural materials such as asphalt or building foundations). All excavated materials with dioxin/furan levels above 260 ng/kg TEQ would be disposed of at approved off-site landfills. Alternative 2B is depicted on Figure 13B.

9.1.4 Alternative 3: Focused Removal and Capping

Under this alternative, all near-surface soils (to 6 feet bgs) that exceed the 260 ng/kg TEQ dioxin/furan TEQ remediation level protective of terrestrial ecological receptors, along with surface and subsurface (at any depth) soils that exceed the 530 ng/kg TEQ dioxin/furan remediation level protective of groundwater, surface water, and sediment, would be excavated and disposed of, as described below. All residual subsurface soils with dioxin/furan levels that exceed 12 ng/kg TEQ would be capped. Institutional controls addressing arsenic in Mill Site groundwater would also be a component of this alternative. Alternative 3, depicted on Figure 14, would include the following:

- Within all remedial excavation areas of the Mill Site, surficial hardscape material (asphalt or concrete) would be demolished, processed, and disposed of at approved off-site landfills or recycling facilities, as appropriate.
- Soil excavation depths would extend to approximately 15 feet bgs depending on the specific Mill Site area; the estimated depth of excavation for each subarea is shown on Figure 14.
- Excavation prisms would be refined during pre-design investigations.
- Within areas of the Mill Site with residual soil dioxin/furan levels greater than 12 ng/kg TEQ and less than 260 ng/kg TEQ, surficial hardscape material would be perforated and left in-place (under future mixed residential and commercial land use development plans, existing surficial hardscape would not be removed because clean fill material would be placed to raise the surface elevations to allow for construction of underground utilities).
- Soils from 0 to 6 feet bgs would be excavated using conventional earth moving equipment without shoring or dewatering; minor benching may be required.
- Excavations deeper than 8 feet bgs would be dewatered by pumping groundwater from within and/or adjacent to the excavations; the pumped water would be stored in tanks to remove suspended solids (along with additional treatment as determined during design), and then discharged back into Mill Site groundwater via an upland infiltration basin, like the 2005 interim action.
- Post-excavation confirmation sampling would be performed to verify the lateral extent of removal, and additional excavation performed as necessary.
- Excavated soils would be stockpiled on site for profiling and further dewatering (as needed)

- Stockpiles with dioxin/furan levels less than 12 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill.
- Stockpiles with dioxin/furan levels greater than 12 ng/kg TEQ but less than 45 ng/kg TEQ would be disposed of at the MAF.
- Stockpiles with dioxin/furan levels greater than 45 ng/kg TEQ would be disposed of at an approved off-site commercial landfill.
- Minimum 2-foot-thick permeable soil caps (or equivalent structural materials such as asphalt or building foundations) would be placed over all areas of the Mill Site with residual soil dioxin/furan levels greater than 12 ng/kg TEQ.
- After completion of construction (and potentially beginning during remedial design as practicable), groundwater monitoring would be performed in the northeastern portion of the Mill Site (i.e., downgradient of G18-GP-12; see Figure 9) to verify that this area complies with the groundwater cleanup levels summarized in Table 3; appropriate contingency plans would be developed during remedial design.
- Restrictive covenants would be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply; restrictive covenants for soil caps would be recorded to ensure the integrity of the upland caps and prevent exposure to capped surficial soils
- Notice and approval from Ecology would be required under WAC 173-340-440(9), for any future land use activity that is inconsistent with the restrictive covenants.
- The existing Kitsap County permitting (e.g., grading permit) process would be used as an additional administrative mechanism to further ensure that future actions on the Mill Site do not disturb capped areas.

9.1.5 Alternative 4: Capping

Under this alternative, all surface and subsurface (at any depth) soils at the Mill Site with dioxin/furan levels that exceed 12 ng/kg TEQ would be capped. Institutional controls addressing arsenic in Mill Site groundwater would also be a component of this alternative. Alternative 4, depicted on Figure 15, would include the following:

- Within areas of the Mill Site with soil dioxin/furan levels greater than 12 ng/kg TEQ, surficial hardscape material would be perforated and left in-place.
- Minimum 2-foot-thick permeable soil caps (or equivalent structural materials such as asphalt or building foundations, refined as appropriate based on the terrestrial exposure evaluations outlined above) would be placed over all areas of the Mill Site with soil dioxin/furan levels greater than 12 ng/kg TEQ.
- After completion of construction (and potentially beginning during remedial design as practicable), groundwater monitoring would be performed in the northeastern portion of the Mill Site (i.e., downgradient of G18-GP-12; see Figure 7) to verify that this area complies with

the groundwater cleanup levels summarized in Table 3; appropriate contingency plans would be developed during remedial design.

- Restrictive covenants would be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply; restrictive covenants for soil caps would be recorded to ensure the integrity of the upland caps and prevent exposure to capped surficial soils.
- Notice and approval from Ecology would be required under WAC 173-340-440(9), for any future land use activity that that is inconsistent with the restrictive covenants.
- The existing Kitsap County permitting (e.g., grading permit) process would be used as an additional administrative mechanism to further ensure that future actions on the Mill Site do not disturb capped areas.

9.1.6 Alternative 5: Completed Interim Actions and Institutional Controls

As discussed in Section 4, between 2002 and 2005, PR/OPG excavated 26,310 tons of soils from the Mill Site containing CoC concentrations above MTCA unrestricted use (including mixed residential and commercial land use) cleanup levels and disposed of these materials at approved off-site landfills. Completed interim action areas are depicted on Figure 16. Monitoring following implementation of these interim actions verified expected natural attenuation of groundwater CoC concentrations resulting from removal of potential source materials.

Under this alternative, no further remedial construction would be performed; however, groundwater monitoring would be performed in the northeastern portion of the Mill Site (i.e., downgradient of G18-GP-12; see Figure 7) to verify that this area complies with the groundwater cleanup levels summarized in Table 3. Appropriate contingency plans would be developed with Ecology based on these supplemental evaluations.

Institutional controls addressing arsenic in Mill Site groundwater would also be a component of this alternative. Restrictive covenants would be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply; restrictive covenants for soil caps would be recorded to ensure the integrity of the upland caps and prevent exposure to capped surficial soils maintained and recorded to minimize the potential for future impacts resulting from disturbance of these areas. In addition, the existing Kitsap County permitting (e.g., grading permit) process would be used as an administrative mechanism to further ensure that future actions on the Mill Site do not disturb capped areas. Any future land uses that require intrusive activities that disturb capped soil areas would require notice and approval from Ecology under WAC 173-340-440(9).

9.2 Detailed Evaluation of Primary Cleanup Alternatives

MTCA requires evaluation of cleanup actions that protect human health and the environment by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. Proposed MTCA cleanup actions require achieving protection of human health and

the environment, compliance with cleanup standards and applicable state and federal laws, consideration of public concerns, and monitoring.

For this evaluation, the six alternatives described above are evaluated against minimum MTCA requirements (Section 9.2.1). Then, alternatives are compared using the MTCA disproportionate cost analysis to identify the alternative that uses permanent solutions to the maximum extent practicable (Section 9.2.2). Alternatives that comply with threshold requirements are then evaluated to compare total benefit to associated cost, identifying the alternative that is permanent to the maximum extent practicable, as required by MTCA.

9.2.1 Minimum Requirements

Cleanup actions performed under MTCA must comply with minimum requirements (WAC 173-340-360[2]). These minimum requirements outline Ecology's expectation for potential remedies evaluated for implementation at a site and ensure that evaluated alternatives all can achieve the agency's goal of protection of human health and the environment. The minimum requirements are summarized as follows:

- Protect human health and the environment
- Comply with cleanup standards
- Comply with all applicable state and federal laws
- Provide for compliance monitoring
- Provide a reasonable restoration time frame

These minimum requirements are evaluated below, relative to the six remedial alternatives. Follow-on evaluations on the use of permanent solutions to the maximum extent practicable are conducted in the following section. Public review of this RI/FS will provide an opportunity for review and comment by affected landowners and the public, and for Ecology to consider any concerns identified. Finally, MTCA requires periodic review of non-removal remedies to verify the effectiveness and protectiveness of cleanup actions.

9.2.1.1 Protection of Human Health and the Environment

MTCA requires that cleanup actions protect human health and the environment. This section summarizes how the six remedial alternatives meet this requirement.

Complete Removal (Alternative 1) protects both human health and the environment by physically removing soil that exceeds MTCA cleanup levels throughout all areas of the Mill Site. Under this alternative, residual groundwater impacts that could pose a risk to human health would be addressed with institutional controls preventing the use of groundwater as drinking water. Restrictive covenants on use of Mill Site groundwater as a drinking water source is a component of all five alternatives.

Partial and Focused Removal and Capping (Alternatives 2A, 2B, and 3) use a combination of remediation technologies to protect human health and the environment. Under these alternatives, protection of human health would be addressed by using a combination of removal and capping, the latter in the form of permeable soil caps or equivalent structural materials, along with institutional controls in the form of deed restrictions. Combined removal, capping, and institutional controls would eliminate potential human exposure pathways. Protection of the environment would be addressed by removing soils that exceed site-specific remediation levels.

Capping (Alternative 4) relies on capping and institutional controls to protect human health. Completed Interim Actions and Institutional Controls (Alternative 5) relies on further investigations and institutional controls to protect human health and the environment. Because near-surface (0 to 6 feet bgs) soil dioxin/furan TEQ levels would continue to exceed the 260 ng/kg TEQ remediation level protective of terrestrial ecological receptors, Alternatives 4 and 5 do not comply with MTCA cleanup standards.

9.2.1.2 Compliance with Cleanup Standards

To be protective of human health and the environment, a remedial alternative must achieve cleanup levels at the applicable point of compliance, i.e., cleanup standard. Alternatives 1 through 3 meet cleanup standards as discussed below.

Complete Removal (Alternative 1) meets cleanup standards by removing all Mill Site soils that exceed cleanup standards.

Partial and Focused Removal and Capping (Alternatives 2 and 3, respectively) meet cleanup standards by using a combination of removal and capping, the latter in the form of permeable soil caps or equivalent structural materials.

As discussed in Section 9.2.1.1, Alternatives 4 and 5 do not comply with MTCA cleanup standards.

9.2.1.3 Compliance with Applicable State and Federal Laws

The selected cleanup alternative will be implemented under the terms of a Consent Decree and thus would likely be exempt from certain administrative permitting requirements, though the substantive requirements of state and local regulations must still be met. Upland cleanup actions would not require federal permitting. Other regulatory requirements that must be considered for each of the cleanup alternatives are discussed in Section 8.2. These requirements could be met by all six remedial alternatives.

9.2.1.4 Compliance Monitoring

As outlined in the alternative descriptions above, all six remedial alternatives provide for compliance monitoring.

9.2.2 Reasonable Restoration Time Frame

None of the proposed alternatives rely on an extended restoration time frame to meet cleanup standards.

9.2.3 Disproportionate Cost Analysis

MTCA specifies that preference shall be given to cleanup actions that are permanent solutions to the maximum extent practicable. Identifying an alternative that is permanent to the maximum extent practicable requires weighing costs and benefits. MTCA uses the disproportionate cost analysis (WAC 173-340-360[3][e]) as the tool for comparing each remedial alternative's incremental environmental benefits with its incremental costs and is the primary method by which the alternatives are systematically compared to each other in this RI/FS. Under MTCA, costs are considered disproportionate to benefits when the incremental costs of an alternative exceed the incremental benefits compared to other, lower cost, protective alternatives.

The seven MTCA criteria listed in WAC 173-340-360(3)(f) used to evaluate and compare remedial alternatives in the disproportionate cost analysis are as follows:

- Protectiveness
- Permanence
- Effectiveness over the long term
- Management of short-term risk
- Technical and administrative implementability
- Consideration of public concerns
- Cost

Consistent with recent disproportionate cost analyses performed by Ecology at similar cleanup sites, the first six evaluation criteria were weighted and assigned a score for total benefits, and the total benefit score was then compared with cost. The criteria were ranked using a combination of quantitative and qualitative criteria, following the descriptions in WAC 173-340-360(3)(f). The criteria were ranked numerically from 1 to 10, with 1 representing the lowest score or benefit and 10 representing the highest score or benefit. The scores for each criterion were then averaged to get a score for each of the six benefit criteria. The total benefit scores are a weighted average of the individual benefit criteria, using the following weighting:

- Protectiveness: 30%
- Permanence: 20%
- Effectiveness over the long term: 20%
- Management of short-term risk: 10%
- Technical and administrative implementability: 10%
- Consideration of public concerns: 10%

The weighted averaged benefits are compared to costs for the alternatives. The following sections describe the disproportionate cost analysis for the seven MTCA criteria relative to each remedial alternative.

9.2.4 Protectiveness

MTCA defines protectiveness as:

> Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality. (WAC 173-340-360(3)(f)(i))

The protectiveness of each alternative was evaluated based on its effectiveness in reducing risks and achieving cleanup standards (i.e., cleanup levels at the point of compliance). The basis for protectiveness scores for each alternative is presented in Table 6 relative to the three MTCA sub-criteria: 1) protection of human health; 2) protection of the environment; and 3) risks resulting from implementation.

9.2.4.1 Protection of Human Health

Protection of human health was scored based on whether a complete human exposure pathway would remain after cleanup construction. Because excavation is more protective of human health than capping, complete excavation (Alternative 1) was given the highest score of 10. Conversely, Alternative 5, which only includes institutional controls and does not include caps to physically isolate surficial soils, was given the lowest score of 1 because institutional controls alone do not fully eliminate the human exposure pathway. Alternatives that were predominantly capping (Alternatives 3 and 4) were scored 2, because capping is less protective than removal.

As discussed in Section 7.1.2, while recent monitoring of sediment and tissue of sediment dwelling organisms within Port Gamble Bay (Anchor QEA and Port Gamble S'Klallam Tribe 2015) has confirmed that significant dioxin/furan partitioning along the soil-groundwater-sediment-surface water transport pathway is unlikely, to provide an additional evaluation of protectiveness, the Reible Model was used to calculate an upland soil dioxin/furan TEQ level protective of surface water quality at the sediment/surface water interface. The modeling indicated that achieving a depth- and area-weighted average soil dioxin/furan level of approximately 12 ng/kg TEQ across SMA-1 and SMA-2 would ensure human health protection. While not an applicable remediation level under MTCA, the 12 ng/kg TEQ level was used to assess the relative protectiveness of remedial alternatives.

Approximately 40% of soils within 50 feet of the Mill Site shoreline immediately adjacent to SMA-1 and SMA-2 contain dioxin/furan levels that are above 12 ng/kg TEQ. To provide a conservative

evaluation of relative protectiveness of human health, those alternatives that remove shoreline soils exceeding 22 ng/kg TEQ were scored highest, as summarized in Chart 4 below:

Chart 4. Human Health Protectiveness Scoring Summary

Alternative	Removal Percent Area	Capping Percent Area	Shoreline Removal (Additional Incremental Protectiveness)	Human Health Protection Score
1	100	0	Yes	10.0
2A	40	60	Yes	6.0
2B	40	60	Yes	6.0
3	5	95	No	2.0
4	0	100	No	2.0
5	0	0	No	1.0

9.2.4.2 Protection of the Environment

Protection of the environment was scored based on the whether a complete ecological exposure pathway would remain after cleanup construction. Alternatives 1, 2A, 2B, and 3 each achieve the risk-based remediation level protective of terrestrial ecological receptors (260 ng/kg TEQ) at the point of compliance through excavation/removal. As a result, each of these alternatives were scored 10 for protection of the environment. Alternatives 4 and 5 were given the lowest score of 1 because near-surface (0 to 6 feet bgs) soil dioxin/furan TEQ levels would continue to exceed the 260 ng/kg TEQ remediation level protective of terrestrial ecological receptors.

9.2.4.3 Risks Resulting from Implementation

Each of the alternatives implement standard remediation technologies with well-established best management practices (BMPs) and safety protocols. No significant risks are associated with implementing any of the proposed alternatives. As a result, each alternative was scored 10 for risk resulting from implementation.

9.2.4.4 Overall Protectiveness

Overall protectiveness, based on the average of all three protectiveness scores, is as follows:

- Alternative 1 (Complete Removal): 10
- Alternatives 2A and 2B (Partial Removal and Capping): 8.7
- Alternative 3 (Focused Removal and Capping): 7.3
- Alternative 4 (Capping): 4.3
- Alternative 5 (Completed Interim Actions and Institutional Controls): 4.0

9.2.5 Permanence

MTCA defines permanence as:

> The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated. (173-340-360(3)(f)(ii))

The permanence of each alternative was evaluated based the degree to which toxicity, mobility, and quantity of contaminants would be permanently reduced by each of the alternatives. The basis for permanence scores for each alternative is presented below and in Table 6 relative to the two MTCA sub-criteria: 1) certainty and reliability of each alternative, considering seismic stability and potential climate change vulnerabilities evaluated in Appendix E; and 2) residual risk, considering relative percent mass removal of dioxin/furan TEQ associated with each alternative.

The seismic stability and climate change vulnerabilities used to evaluate certainty and reliability (Appendix E) include the following:

- **Seismic stability of shoreline slopes:** No increased vulnerabilities were identified due to seismic stability of slopes; the steepest and tallest shoreline slopes at the Mill Site (i.e., near the former Pier 4) would deform by less than 6 inches under a conservative design-level earthquake, maintaining their integrity and protectiveness.
- **Stability of shoreline slope under inundated upland conditions:** Inundated upland future conditions could result from sea-level rise and/or increased frequency of severe storms; however, even under inundated conditions on the Mill Site uplands, shoreline slope stability would be maintained well within engineering safety factors targeted in the EDR.
- **Sea-level rise:** A scenario-based evaluation of potential sea-level rise in the next 100 years (i.e., by 2120) was conducted, using a range of sea-level rise predictions following Ecology and other guidance and building on Washington Sea Grant (2018) projections, resulting in a range of sea-level rise estimates, from 2.5 to 4.0 feet; in 100 years, king tides (the highest tides of the year) under the upper end of sea-level rise scenarios considered could extend up to approximately elevation +15.5 feet mean lower low water (MLLW; note that the current Mill Site uplands are above elevation +15.5 feet MLLW and are anticipated to increase in the future to accommodate residential and/or commercial redevelopment).
- **Increase storm intensity:** In 100 years, higher wind speeds could increase the significant storm wave height from approximately 3.5 to 4.5 feet, assuming the current estimated 200-year wind speed is approximately the 100-year wind speed by 2120, potentially requiring 1.0-foot-diameter shoreline armor stone to ensure stability. (note that the current shoreline

cap includes armor stone up to roughly 1.2 feet in diameter placed to the top of bank, in part to accommodate potential future sea-level rise.)

- **Tidal pumping:** Additional modeling was conducted to evaluate risks from increased tidal pumping; using conservative assumptions (doubling tidal pumping of shallow groundwater), modeled dioxin/furan concentrations in groundwater and surface water would be maintained below MTCA cleanup levels.

Potential vulnerabilities as outlined above were used to provide a conservative scoring of certainty and reliability provided by each remedial alternative, as summarized in Chart 5 below:

Chart 5. Certainty and Reliability Scoring Summary

Alternative	Basis for Scoring	Score
1	Complete removal eliminates future risk of exposure or release	10.0
2A	Removal of surficial and shoreline soils nearly eliminates future risk of exposure or release	9.0
2B	Removal of surficial and shoreline soils nearly eliminates future risk of exposure or release	9.0
3	Limited climate change vulnerabilities to shoreline soils (40%) from increase storm intensity	6.0
4	Limited climate change vulnerabilities to shoreline soils (40%) from increase storm intensity	6.0
5	Institutional controls only, result in the highest relative risk of future exposure or release	1.0

The estimated percent mass removal (basis for scoring) for the permanence of each alternative for the residual risk criterion is summarized in Chart 6 below:

Chart 6. Residual Risk Scoring Summary

Alternative	Estimated Mass Removal (percent)	Score
1	100	10.0
2A	75	7.5
2B	75*	6.0
3	50	5.0
4	0	1.0
5	0	1.0

Note:
*With re-location to on-site capped containment

Based on the average of both permanence scores, Alternative 1 (Complete Removal) received the highest score (10), while Alternatives 2A and 2B (Partial Removal and Capping), Alternative 3 (Focused Removal and Capping), Alternative 4 (Capping), and Alternative 5 (Completed Interim Actions and Institutional Controls) received incrementally lower scores (8.3, 7.5, 5.5, 3.5, and 1, respectively).

9.2.6 Long-Term Effectiveness

MTCA defines effectiveness over the long-term as:

> Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes (WAC 173-340-360(3)(iv)).

MTCA provides a hierarchy of remedial technologies with respect to their effectiveness over the long-term. The basis for long-term effectiveness scores for each alternative is presented in Table 6 based on area-weighting of each technology incorporated into the alternative. Because none of the alternatives include the highest preference technologies (reuse/recycling, destruction/detoxification, or immobilization/solidification), the hierarchy was revised to assign a relative degree of long-term effectiveness for the applicable MTCA Cleanup Action Components included in the DCA, as follows:

- Excavation and off-site disposal: 10
- On-site isolation (capping): 5
- Institutional controls and monitoring: 1

The alternatives were scored using the hierarchy above and assigning scores for alternatives that include excavation and capping based on their percent by area, as summarized in Chart 7 below:

Chart 7. Long-Term Effectiveness Scoring Summary

Alternative	Percent Excavation, By Area	Percent Capping, By Area	Incremental Increase to Effectiveness (percent)	Relative Degree of Long-Term Effectiveness
1	100	0	NA	10.0
2A	57	43	57	7.8
2B	57	43	57	7.8
3	5	95	5	5.2
4	0	100	0	5.0
5	NA (Institutional Controls Only)			1.0

9.2.7 Management of Short-Term Risks

MTCA defines management of short-term risk as:

> The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. (WAC 173-340-360(3)(f)(v))

Evaluation of this criterion considers the relative magnitude and complexity of actions required to maintain protection of human health and the environment during implementation of the cleanup. Cleanup actions can carry short-term risks, such as safety risks during construction. Other impacts to short-term effectiveness include noise, vehicle traffic, and air emissions. Some short-term risks can be managed to some degree by BMPs during project design and construction, while other risks are inherent to project alternatives.

The evaluation for management of short-term risk was based on the relative number of truck trips through the small town of Port Gamble and through two-lane county roads. Frequent movement of large trucks and trailers through areas with high numbers of pedestrian tourists has been considered as part of the MTCA evaluation.

The alternative with the fewest truck trips (Alternative 5) was given the highest score (10) for management of short-term risks. Conversely, the alternative with the most truck trips (alternative 1) was given the lowest score (5). The full 10-point range of scoring was not used for this evaluation because BMPs can be used to partially mitigate the risk for high volumes of truck traffic. Alternatives with intermediate numbers of truck trips through town were scored based on a proportional incremental risk within the 10 to 5 scoring range, as summarized in Chart 8 below:

Chart 8. Short-Term Effectiveness Scoring Summary

Alternative	Truck Trips Through Town	Incremental Risk (from 0, no truck trips, to 5, most truck trips)	Relative Risk to Human Health and Safety during Construction
1	8,500	5.0	5.0
2A	6,700	3.9	6.1
2B	5,500	3.2	6.8
3	2,570	1.5	8.5
4	1,880	1.1	8.9
5	0	0	10.0

9.2.8 Technical and Administrative Implementability

Implementability is the criterion expressing the relative difficulty and uncertainty of implementing the cleanup action. MTCA defines technical and administrative implementability as:

> Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions. (WAC 173-340-360(3)(f)(vi))

All the technologies included in the alternatives incorporate well established and proven methods of remediation. As a result, materials are readily available locally, there is a pool of qualified contractors, and no significant permitting challenges are anticipated. Future redevelopment and/or restoration of the Mill Site can be practicably integrated with all remediation alternatives. Thus, as summarized in Table 6, Alternatives 1 (Complete Removal), 2A and 2B (Partial Removal and Capping), and 3 (Focused Removal and Capping) were scored high (10) for both technical and administrative feasibility. Alternative 4 (Capping) has additional technical and administrative challenges associated with demonstrating the condition point of compliance required for, so it was scored low (2) for both technical and administrative feasibility. Alternative 5 (Completed Interim Actions and Institutional Controls) was given the lowest score (1) for both technical and administrative feasibility, because it would not meet all of the technical and administrative requirements.

9.2.9 Consideration of Public Concerns

MTCA defines consideration of public concerns as:

> Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site. (WAC 173-340-360(3)(f)(vii))

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative would address those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, local businesses, and other organizations with an interest in the Mill Site. Potential impacts to cultural resources from a given remedy and potential impacts during remedy implementation are considered under this evaluation criterion. Ecology will continue to evaluate public concerns through the public involvement process as the CAP is developed.

Input from members of the community is used to shape the remedial actions with respect to timing, local or cultural considerations, effects from disturbances including noise, light, and traffic that result from implementation methods or transportation routes, and the like. Different members of the community may have different priorities, and these priorities may or may not be aligned with the goals of the cleanup and/or the specific requirements of MTCA. Based on public comment received on the 2012 Mill Site RI/FS, and consistent with cleanup evaluations conducted by Ecology at other similar cleanup sites, preliminary consideration of public concerns for this disproportionate cost analysis balanced two potentially conflicting public interests:

1. One interest is environmental and generally supports remedial actions that remove the maximum amount of contamination
2. Another interest is economic and generally supports remedial actions that achieve regulatory requirements while minimizing impacts on local businesses

The basis for consideration of public concern scores for each alternative is presented in Table 6 based on the degree that an alternative may balance these potentially conflicting priorities. In contrast to the other disproportionate cost analysis criteria, which tend to favor alternatives at one end of the range or the other, consideration of public concerns tends to score alternatives in the middle the highest, because of these countervailing priorities. Thus, Alternatives 2A and 2B (Partial Removal and Capping) received the highest overall public concern score (10), while Alternative 1 (Complete Removal) and Alternative 3 (Focused Removal and Capping) received a slightly lower score (8); Alternative 4 (Capping) received a lower score (2) than Alternative 3, because it is unlikely to satisfy the public desire for active cleanup; and Alternative 5 (Completed Interim Actions and Institutional Controls) was given the lowest score of 1.

9.2.10 Cost

The analysis of cleanup action alternative costs includes all costs associated with implementing an alternative, including design, construction, long-term monitoring, and institutional controls. Costs between the different alternatives are compared to assist in the overall analysis of relative costs and benefits of the alternatives. The costs to implement an alternative include long-term costs (e.g., operation and maintenance, monitoring, equipment replacement, and maintaining institutional controls), along with agency oversight costs. Cost estimates for excavation and disposal technologies include processing, analytical, labor, and waste management costs.

Detailed costs for each remedial alternative are summarized in Appendix F, informed by recent cleanup projects in the Port Gamble region. Detailed remedial alternative cost estimates for each alternative include line items for site mobilization and demobilization, excavation, material handling and disposal, cap material placement, cultural resource assessment and monitoring, remedial design, permitting,

long-term monitoring, and other elements as appropriate. The cost assumptions for each alternative carried forward were developed to be accurate within the MTCA target range of -30% to +50%.

The estimated costs for the remedial alternatives carried forward into the disproportionate cost analysis range from approximately $0.2 million to $9.6 million, as follows:

- Alternative 1 (Complete Removal with Off-Site Disposal): $9.6 million
- Alternatives 2A and 2B (Partial Removal and Capping with Off- or On-Site Disposal, respectively): $7.9 million and $7.0 million, respectively
- Alternative 3 (Focused Removal and Capping): $2.7 million
- Alternative 4 (Capping): $1.3 million
- Alternative 5 (Completed Interim Actions and Institutional Controls): $0.2 million

As summarized in Appendix F, costs for each of the alternatives are largely driven by excavation volume and the associated cost for off-site transportation and disposal.

9.2.11 Total Benefits and Costs

Total weighted benefit scores for the Mill Site remedial alternatives are summarized in Table 6. Figure 17 graphically depicts the relationship of costs and weighted benefits of the alternatives to identify the alternative that uses permanent solutions to the maximum extent practicable. Alternative 1 (Complete Removal with Off-Site Disposal) received the highest overall weighted benefit score (9.3) and Alternatives 2A and 2B (Partial Removal and Capping with Off- and On-Site Disposal, respectively) received the next highest overall weighted benefit scores (8.4 and 8.3, respectively). Alternative 3 (Focused Removal and Capping) and Alternative 4 (Capping) received slightly lower overall benefit scores of 7.0 and 4.3, respectively. Because of significantly higher projected costs, Alternatives 1, 2A, and 2B are disproportionately costly compared to the incremental benefits provided by Alternatives 3, 4, and 5. As depicted on Figure 17, Alternatives 3 (Focused Removal and Capping) and 4 (Capping) are identified as the alternatives with the most benefits that are not disproportionately costly. Alternative 5 (Completed Interim Actions and Institutional Controls) does not comply with MTCA cleanup standards.

10 Development and Evaluation of Contingent Land Use Alternatives

As discussed in Section 2.4, PR/OPG is considering future potential open space and habitat restoration land use actions in 16 acres of the southern and eastern Mill Site as part of a separate process (i.e., outside of this cleanup evaluation). This section develops and evaluates a secondary set of contingent remedial alternatives, assuming additional restrictive covenants would be recorded to preclude future use of the 16 acres of the Mill Site for residential or commercial development. Land use in the 9-acre northern portion of the Mill Site would remain mixed residential and commercial under any future scenario.

10.1 Development of Contingent Land Use Cleanup Alternatives

Six secondary remedial alternatives (6, 7A, 7B, 8, 9, and 10) were developed to be very similar to the primary alternatives (1, 2A, 2B, 3, 4, and 5) presented in Section 9, but differ only as follows:

- Because additional restrictive covenants would be recorded to preclude future use of 16 acres in the southern and eastern portion of the Mill Site for residential or commercial development under this contingent land use scenario, remedial actions for all alternatives in the 16-acre area are based on the 45 ng/kg open-space remediation level for dioxin/furan TEQ, rather than the 12 ng/kg TEQ unrestricted use cleanup level.
- Except for Alternative 10 (Completed Interim Actions and Institutional Controls), in all nearshore areas (within roughly 50 feet of the existing shoreline) that contain soils with dioxin/furan levels above the 45 ng/kg TEQ open-space remediation level, the contingent land use alternatives would all restore the Mill Site shoreline to a more gradual beach, as generally depicted in Appendix M of the EDR.

Each of these secondary contingent land use alternatives is described below.

10.1.1 Alternative 6: Complete Removal with Shoreline Restoration and Off-Site Disposal

Under this alternative, all surface and subsurface (at any depth) soils in the 16-acre southern and eastern portion of the Mill Site that exceed the 45 ng/kg dioxin/furan TEQ remediation level would be excavated and disposed of offsite. These areas would be over-excavated and backfilled as necessary to achieve an approximate 10 horizontal to 1 vertical (10H:1V) beach slope. Stockpiles with dioxin/furan TEQ levels less than 45 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill. A minimum 2-foot-thick sand and gravel cap would be placed over final excavated shoreline slopes, as generally described in Appendix M of the EDR. Soils in the 9-acre northern portion of the Mill Site that exceed the 12 ng/kg MTCA Method B soil dioxin/furan TEQ

cleanup level for unrestricted land use would also be excavated and disposed of off site. All other elements of Alternative 6 are consistent with Alternative 1, described in Section 9.1.1. Alternative 6 is depicted on Figure 18.

10.1.2 Alternative 7A: Partial Removal and Capping with Shoreline Restoration and Off-Site Disposal

Under this alternative, surface soils (to 2 feet bgs) in the 16-acre southern and eastern portion of the Mill Site, along with surface and subsurface (at any depth) nearshore soils within 50 feet of the Port Gamble Bay shoreline that exceed the 45 ng/kg dioxin/furan TEQ remediation level would be excavated and disposed of off site. These areas would be over-excavated and backfilled as necessary to achieve an approximate 10H:1V beach slope. Stockpiles with dioxin/furan TEQ levels less than 45 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill. A minimum 2-foot-thick sand and gravel cap would be placed over final excavated shoreline slopes, as generally described in Appendix M of the EDR. All residual subsurface soils within the 16-acre area that exceed the 45 ng/kg TEQ remediation level would be capped. All other elements of Alternative 7A are consistent with Alternative 2A, described in Section 9.1.2. Alternative 7A is depicted on Figure 19A.

10.1.3 Alternative 7B: Partial Removal and Capping with Shoreline Restoration and On-Site Disposal

Alternative 7B would include the same removal, capping, restoration, and institutional controls described above for Alternative 7A, except that all excavated materials with dioxin/furan levels between 45 and 260 ng/kg TEQ would be placed at the base of the bluff along the western edge of the Mill Site and covered with a minimum 2-foot-thick permeable soil cap. All excavated materials with dioxin/furan levels above 260 ng/kg TEQ would be disposed of at approved off-site landfills. Alternative 7B is depicted on Figure 19B.

10.1.4 Alternative 8: Focused Removal and Capping with Shoreline Restoration

Under this alternative, all near-surface soils (to 6 feet bgs) that exceed the 260 ng/kg TEQ dioxin/furan TEQ remediation level protective of terrestrial ecological receptors, along with surface and subsurface (at any depth) soils that exceed the 530 ng/kg TEQ dioxin/furan remediation level protective of groundwater, surface water, and sediment, would be excavated and disposed of off-site. Surface and subsurface nearshore soils within 50 feet of the Port Gamble Bay shoreline that exceed the 45 ng/kg dioxin/furan TEQ remediation level would be excavated and backfilled as necessary to achieve an approximate 10H:1V beach slope. Stockpiles with dioxin/furan TEQ levels less than 45 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported

fill. All excavated materials with dioxin/furan levels between 45 and 260 ng/kg TEQ would be placed at the base of the bluff along the western edge of the Mill Site and covered with a minimum 2-foot-thick permeable soil cap. A minimum 2-foot-thick sand and gravel cap would be placed over final excavated shoreline slopes, as generally described in Appendix M of the EDR. Residual subsurface soils that exceed the 45 ng/kg TEQ remediation level would be capped. All other elements of Alternative 8 are consistent with Alternative 3, described in Section 9.1.4. Alternative 8 is depicted on Figure 20.

10.1.5 Alternative 9: Capping with Shoreline Restoration

Under this alternative, surface and subsurface nearshore soils within 50 feet of the Port Gamble Bay shoreline that exceed the 45 ng/kg dioxin/furan TEQ remediation level would be excavated and backfilled as necessary to achieve an approximate 10H:1V beach slope. Stockpiles with dioxin/furan TEQ levels less than 45 ng/kg TEQ would be returned as backfill into the excavations, along with clean imported fill. A minimum 2-foot-thick sand and gravel cap would be placed over final excavated shoreline slopes, as generally described in Appendix M of the EDR. Residual surface and subsurface (at any depth) soils in the southern and eastern portion of the Mill Site that exceed the 45 ng/kg MTCA Method B soil dioxin/furan TEQ remedial level would be capped. All other elements of Alternative 9 are consistent with Alternative 4, described in Section 9.1.5. Alternative 9 is depicted on Figure 21.

10.1.6 Alternative 10: Completed Interim Actions and Institutional Controls

Alternative 10 would be the same as Alternative 5, described in Section 9.1.6. This alternative, depicted on Figure 22, has been included only to provide a baseline for comparison.

10.2 Detailed Evaluation of Contingent Land Use Cleanup Alternatives

The evaluation of the contingent land use cleanup alternatives described above was performed consistent with the evaluation of the primary alternatives in Section 9.2.

10.2.1 Total Benefits and Costs

Total weighted benefit scores for the contingent land use remedial alternatives are summarized in Table 7. Figure 23 graphically depicts the relationship of costs and weighted benefits of the alternatives to identify the alternative that uses permanent solutions to the maximum extent practicable. Detailed costs for each contingent land use remedial alternative are summarized in Appendix G. Alternative 6 (Complete Removal with Shoreline Restoration and Off-Site Disposal) received the highest overall weighted benefit score (9.3), and Alternatives 7A and 7B (Partial Removal and Capping with Shoreline Restoration and Off-Site/On-Site Disposal, respectively) received the next highest overall weighted benefit scores (8.2). Alternative 8 (Focused Removal and Capping with Shoreline Restoration) and Alternative 9 (Capping with Shoreline Restoration) received slightly lower

overall benefit scores (7.0 and 4.6, respectively). Because of significantly higher projected costs, Alternatives 6, 7A, and 7B are disproportionately costly compared to the incremental benefits provided by Alternatives 8, 9, and 10. As depicted on Figure 23, under the contingent land use scenario, Alternatives 8 (Focused Removal and Capping with Shoreline Restoration) and 9 (Capping with Shoreline Restoration) are identified as the alternatives with the most benefits that are not disproportionately costly. Alternative 10 (Completed Interim Actions and Institutional Controls) does not comply with MTCA cleanup standards.

11 Recommended Cleanup Remedy

Section 9 evaluated the primary remedial alternatives using MTCA criteria. As depicted on Figure 17, Alternative 3 (Focused Removal and Capping) is identified as the remedial alternative with the most benefits that are not disproportionately costly. Alternative 3, depicted on Figure 14, will include the following:

- Within all remedial excavation areas of the Mill Site, surficial hardscape material (asphalt or concrete) will be demolished, processed, and disposed of at approved off-site landfills or recycling facilities, as appropriate.
- Soil excavation depths will extend to approximately 15 feet bgs, depending on the specific Mill Site area, the estimated depth of excavation for each subarea is shown on Figure 14.
- Excavation prisms will be refined during pre-design investigations.
- Within areas of the Mill Site with residual soil dioxin/furan levels greater than 12 ng/kg TEQ and less than 260 ng/kg TEQ, surficial hardscape material will be perforated and left in-place (under future mixed residential and commercial land use development plans, existing surficial hardscape would not be removed because clean fill material would be placed to raise the surface elevations and allow for construction of underground utilities).
- Soils from 0 to 6 feet bgs will be excavated using conventional earth moving equipment without shoring or dewatering; minor benching may be required.
- Excavations deeper than 8 feet bgs will be dewatered by pumping groundwater from within and/or adjacent to the excavations; the pumped water will be stored in tanks to remove suspended solids (along with additional treatment as determined during design), and then discharged back into Mill Site groundwater via an upland infiltration basin, like the 2005 interim action.
- Post-excavation confirmation sampling will be performed to verify the lateral extent of removal, and additional excavation performed as necessary.
- Excavated soils will be stockpiled on site for profiling and further dewatering (as needed).
- Stockpiles with dioxin/furan levels less than 12 ng/kg TEQ will be returned as backfill into the excavations, along with clean imported fill.
- Stockpiles with dioxin/furan levels greater than 12 ng/kg TEQ but less than 45 ng/kg TEQ will be disposed of at the MAF.
- Stockpiles with dioxin/furan levels greater than 45 ng/kg TEQ will be disposed of at an approved off-site commercial landfill (alternatively, under a future contingent land use scenario, excavated materials with dioxin/furan levels between 45 and 260 ng/kg TEQ will be placed at the base of the bluff along the western edge of the Mill Site and covered with a minimum 2-foot-thick permeable soil cap).

- Minimum 2-foot-thick permeable soil caps (or equivalent structural materials such as asphalt or building foundations) will be placed over all areas of the Mill Site with residual soil dioxin/furan levels greater than 12 ng/kg TEQ.
- After completion of construction (and potentially beginning during remedial design, as practicable), groundwater monitoring will be performed in the northeastern portion of the Mill Site (i.e., downgradient of G18-GP-12; see Figure 9) to verify that this area complies with the groundwater cleanup levels summarized in Table 3; appropriate contingency plans will be developed during remedial design.
- Restrictive covenants will be recorded to preclude future use of the shallow aquifer at the Mill Site for drinking water supply; restrictive covenants for soil caps will be recorded to ensure the integrity of the upland caps and prevent exposure to capped surficial soils.
- Notice and approval from Ecology will be required under WAC 173-340-440(9), for any future land use activity that that is inconsistent with the restrictive covenants.
- The existing Kitsap County permitting (e.g., grading permit) process will be used as an additional administrative mechanism to further ensure that future actions at the site do not disturb capped areas.

This RI/FS will inform Ecology's selection of the cleanup remedy for the Mill Site in the CAP. Following public review of the RI/FS, CAP and Consent Decree, and entry of Consent Decree in Kitsap County Superior Court, the cleanup will move forward into pre-design sampling, remedial design, permitting, and construction, and finally into post-construction monitoring. Cleanup construction is currently targeted to begin as early as 2020 and may continue for several years, subject to coordination with redevelopment and/or habitat restoration actions to achieve a protective and cost-effective integrated remedy, as discussed below.

Remedial actions at the Mill Site will be performed pursuant to MTCA under the terms of the Consent Decree. The proposed work, which includes a variety of upland activities, would also typically be reviewed under a variety of state and local environmental regulations that would normally trigger a suite of environmental permits. However, WAC 173-340-710 provides an exemption for procedural requirements of all applicable state and local regulations related to the on-site remedial actions. This exemption waives the responsibility to obtain such environmental permits but does not provide relief of the need to perform the work in a manner that satisfies the substantive requirements of those regulations. Upland cleanup actions do not require federal permitting.

Compliance monitoring to ensure the protectiveness of the preferred cleanup remedy will be implemented in accordance with WAC 173-340-410, Compliance Monitoring Requirements. Detailed

monitoring plans will be developed during remedial design. The objectives of compliance monitoring are as follows:

- **Protection Monitoring** is used to confirm that human health and the environment are adequately protected during the construction period of the cleanup action.
- **Performance Monitoring** is used to confirm that the cleanup action has attained cleanup standards and other performance standards.
- **Confirmation Monitoring** is used to confirm the long-term effectiveness of the cleanup action once cleanup standards have been attained.

Future land use plans for the Mill Site are currently being developed by PR/OPG and may include residential and commercial redevelopment as well as open space and habitat restoration. Future redevelopment and/or habitat restoration actions at the Mill Site will be performed to meet MTCA cleanup levels and other performance objectives to ensure protectiveness; these coordination requirements will be detailed in an Operation, Maintenance, and Monitoring plans to be developed during remedial design. As practicable, the schedule(s) for implementation of final upland cleanup actions will be coordinated with concurrent redevelopment and/or habitat restoration actions.

For example, residential and commercial redevelopment may include raising the grade in portions of the Mill Site at least several feet to comply with flood regulations and to facilitate gravity sewers. Placement of redevelopment fill in this situation would be coordinated as practicable with construction of soil caps (or equivalent structural materials such as asphalt or building foundations). Similarly, restoration actions may include excavating portions of the shoreline to restore intertidal beach and adjacent riparian habitat functions to portions of the Mill Site and protectively placing excavated materials further upland at the Mill Site, followed by construction/reconstruction of caps to comply with Port Gamble Bay and Mill Site cleanup requirements. Shoreline excavation actions in this situation would be coordinated as practicable with construction of upland and in-water caps to achieve a protective and cost-effective integrated remedy.

12 References

Anchor and EPI (Anchor Environmental, LLC, and Environmental Partners, Inc.), 2008. *Remedial Investigation/Feasibility Study Work Plan, Former Pope & Talbot Sawmill Site, Port Gamble, Washington*. Prepared for Washington State Department of Ecology and Pope Resources LP/Olympic Property Group LLC. October 2008

Anchor QEA, 2014. *Cultural Resources Survey Report for the Port Gamble Bay Cleanup Project*. Prepared for Pope Resources LP/OPG Properties LLC. October 2014.

Anchor QEA, 2015a. *Mitigation/Restoration Area Sampling: Port Gamble Mill Site*. Prepared for Hood Canal Coordinating Council. March 2015.

Anchor QEA, 2015b. *Mill Site Habitat Embankment Basis of Design Port Gamble Bay*. Prepared for Pope Resources LP/OPG Properties LLC March 2015.

Anchor QEA, 2015c. *Engineering Design Report – Port Gamble Bay Cleanup Project*. Prepared for Washington State Department of Ecology and Pope Resources, LP/OPG Properties LLC. May 2015.

Anchor QEA, 2015d. *Earthworm Bioaccumulation Testing Sampling and Quality Assurance Project Plan*. Prepared for Washington State Department of Ecology and Olympic Property Group. August 2015.

Anchor QEA, 2016a. *Port Gamble Mill Site Earthworm Bioaccumulation Data*. Prepared for Washington State Department of Ecology and Olympic Property Group. March 2016.

Anchor QEA, 2016b. *Final Season 1 Cleanup Action Report*. Prepared for Washington State Department of Ecology and Pope Resources, LP/OPG Properties, LLC. December 2016.

Anchor QEA, 2017a. *Post-Stockpile Removal – Sampling and Quality Assurance Project Plan*. Prepared for Washington State Department of Ecology and Pope Resources, LP/OPG Properties, LLC. January 2017.

Anchor QEA, 2017b. *Model Airplane Field Limited Purpose Landfill Application Port Gamble*. Prepared for Pope Resources LP/OPG Properties LLC, March 2017.

Anchor QEA, 2017c. *Supplemental Remedial Investigation/Feasibility Study—Sampling and Quality Assurance Project Plan*. Prepared for Pope Resources LP/OPG Properties, LLC. September 2017.

Anchor QEA, 2017d. *Supplemental RI/FS Work Plan*. Prepared for Pope Resources LP/OPG Properties, LLC. October 2017.

Anchor QEA, 2017e. *Port Gamble Model Airplane Field Limited Purpose Landfill Permitting Summary Memorandum*. Prepared for Pope Resources LP/OPG Properties, LLC. November 2017.

Anchor QEA, 2018. *Final Season 2 Cleanup Action Report*. Prepared for Washington State Department of Ecology and Pope Resources, LP/OPG Properties, LLC. February 2018.

Anchor QEA and Environmental Partners, 2012. *Remedial Investigation/Feasibility Study, Former Pope & Talbot Sawmill Site, Port Gamble, Washington*. Prepared for Washington State Department of Ecology and Pope Resources/Olympic Property Group. December 2012.

Anchor QEA and Port Gamble S'Klallam Tribe, 2015. *Port Gamble Bay Cleanup Project Shellfish Monitoring Plan*. Prepared for Pope Resources, LP/OPG Properties, LLC. May 2015.

Ecology (Washington State Department of Ecology), 2011. *Urban Seattle Area Soil Dioxin and PAH Concentrations: Initial Summary Report*. Publication No. 11-09-049, Washington State Department of Ecology. September 2011.

Ecology, 2013. *Final Cleanup Action Plan, Port Gamble Bay, Port Gamble, Washington*. December 2013.

Ecology, 2015a. *Response to Port Gamble Uplands Arsenic in Groundwater Sampling Survey Memorandum,* Washington State Department of Ecology. *October* 2015.

Ecology, 2015b. Port Gamble Terrestrial Ecological Evaluation. Correspondence from Arthur Buchan, Washington State Department of Ecology, Toxics Cleanup Program to Clay Patmont, Anchor QEA, LLC. September 3, 2015.

EPA (U.S. Environmental Protection Agency), 2005. *The inventory of sources and environmental releases of dioxin-like compounds in the United States: The Year 2000 update*. EPA/600/p-03/002A. Available at: http://epa.gov.ncea. U.S. Environmental Protection Agency, Washington, DC.

EPI (Environmental Partners, Inc.), 2002a. *Revised Remedial Investigation Report, Former Pope & Talbot Sawmill Property (Mill Site), Port Gamble, Washington*. Prepared for Pope Resources LP/Olympic Property Group LLC. September 2002.

EPI, 2002b. *Revised Cleanup Action Plan, Former Pope & Talbot Sawmill Property (Mill Site)*. Prepared for Pope Resources LP/Olympic Property Group LLC. September 2002.

EPI, 2003a. *Remedial Action Report, Former Mill Site*. Prepared for Pope Resources LP/Olympic Property Group LLC. April 2003.

EPI, 2003b. *Quarterly Groundwater Monitoring Report, Former Mill Site.* Prepared for Prepared for Pope Resources LP/Olympic Property Group LLC. September 30,

EPI, 2004. Memorandum to Gail Colburn, Washington State Department of Ecology. Regarding: Mill Site Status and Remedial Action Scope of Work. August 2004.

EPI, 2005b. *Supplemental Remedial Action Report, Former Pope & Talbot Sawmill Property (Mill Site)*. Prepared for Pope Resources LP/Olympic Property Group LLC. March 2005.

EPI, 2015. *Uplands Area Arsenic in Groundwater Sampling Summary, Port Gamble Mill Site Property, Port Gamble, Washington*. Prepared for Pope Resources LP/Olympic Property Group LLC. October 2015.

EPI, 2016. *Uplands Area Arsenic in Groundwater Sampling Summary, Port Gamble Mill Site Property, Port Gamble, Washington*. Prepared for Pope Resources LP/Olympic Property Group LLC. February 2016.

Foster Wheeler, 2001. Port Gamble Mill Site, Phase II Soil Sampling Investigation. Prepared for Pope Resources LP/Olympic Property Group LLC. January 2001.

Go, J., D.J. Lampert, J.A. Stegemann, and D.D. Reible, 2009. Predicting contaminant fate and transport in sediment caps: mathematical modeling approaches. *Applied Geochemistry* 24(7):1347–1353.

Lampert, D.J., and D. Reible, 2009. An Analytical Modeling Approach for Evaluation of Capping of Contaminated Sediments. *Soil and Sediment Contamination: An International Journal* 18(4):470–488.

Leidos, 2014. *Data Report: Port Gamble Sawmill Area Soil Characterization for Dioxins and Furans*. Prepared for Washington State Department of Ecology. June 2014.

NewFields, Infometrix, and G.L. Glass, 2013. *Port Angeles Harbor Sediment Dioxin Source Study, Port Angeles, WA*. Report prepared for Washington State Department of Ecology Toxics Cleanup Program. February 2013.

NewFields, 2014. *Oakland Bay Sediment Dioxin Source Study, Oakland Bay, Washington*. Prepared for Washington State Department of Ecology. November 2014.

Parametrix, 1999a. *Pope & Talbot Port Gamble Mill Site, Phase I Groundwater and Surface Water Investigation, Sampling and Analysis Plan*. Prepared for Pope Resources LP/Olympic Property Group LLC. January 1999.

Parametrix. 1999b. *Interim Report – Phase I Soil Sampling, Pope & Talbot, Inc. Port Gamble Mill Site*. Prepared for Pope Resources LP/Olympic Property Group LLC. June 1999.

Parametrix, 1999c. Interim Report No. 2 - Pope & Talbot, Inc. Port Gamble Mill Site, Resultsof Phase I Groundwater and Surface Water Investigation. Prepared for Pope Resources LP/Olympic Property Group LLC. October 10, 1999.

Parametrix, 2000a Interim Report No. 3 – Pope & Talbot, Inc. Port Gamble Mill Site, Phase IIGroundwater and Surface Water Sampling Results. Prepared for Pope Resources LP/Olympic Property Group LLC. May 2, 2000.

PTI, 1989. *Draft Report, Sections 1–7 Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State*. Prepared for Washington Department of Ecology April 1989.

Reible, D., 2012. Model of 2 Layer Sediment Cap, Description and Parameters. Version - 2 Layer Analytical Model v.1.18 and Active Cap Layer Model v.4.1. Available at: https://www.depts.ttu.edu/ceweb/groups/reiblesgroup/downloads/2%20layer%20analytical%20model%20description.doc

Ridolfi, Inc., 2011. *Summary and Data Packages for Shellfish, Sediment, and Soil Samples Taken from Point Julia*. Collected in January 2011 and presented on behalf of the Port Gamble S'Klallam Tribe.

Washington Sea Grant, 2018. *Projected Sea Level Rise for Washington State – A 2018 Assessment*. A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, Oregon State University, University of Washington, and US Geological Survey. Prepared for the Washington Coastal Resilience Project. Available at: http://www.wacoastalnetwork.com/files/theme/wcrp/SLR-Report-Miller-et-al-2018.pdf

Wevers, M., R. De Fre, and M. Desmedt, 2003. Effect of backyard burning on dioxin deposition and air concentrations. *Chemosphere*. 54:1351–1356.

Tables

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-01	PG17-GP-01	PG17-GP-01	PG17-GP-02	PG17-GP-02	PG17-GP-02
	Sample ID	PG17-GP-01-00-01-20171004	PG17-GP-01-01-03-20171004	PG17-GP-01-03-05-20171004	PG17-GP-02-00-01-20171004	PG17-GP-02-01-03-20171004	PG17-GP-02-03-05-20171004
	Sample Date	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017
	Depth	0 - 1 ft	1 - 3 ft	3 - 5 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211075	1211075	1211075	1211036	1211036	1211036
	Y	317395	317395	317395	316267	316267	316267
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**95.8**	**87.95**	**97.17**	**94.98**	**94.31**	**77.49**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.371 J**	**1.33**	0.055 U	0.05 U	**0.116 J**	**0.519 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**1.79**	**3.2**	0.123 U	0.152 U	0.089 U	**1.48**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1.55 J**	**2.06**	0.306 U	0.112 U	0.153 U	**0.965 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**13.8**	**5.9**	0.313 U	0.353 U	0.162 U	**2.32**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**4.64**	**3.25**	0.328 U	0.355 U	0.146 U	**1.76**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**96.8**	**33.8**	1.77 U	3.38 U	1.37 U	**18.1**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**632**	**156**	22.8 U	30.9 U	15.2 U	119 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**28.7**	**142**	**0.394 J**	**5.28**	**0.77 J**	**70.1**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**29.4**	**104**	**0.135 J**	**4.34**	**0.468 J**	**60**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**185**	**96.4**	**2.32 J**	**5 J**	**1.23 J**	**59.2**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**196**	**69.1**	**5.5 J**	**7.36 J**	**3.52 J**	**34.4**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.911 J**	**22.4**	0.066 U	**0.152 J**	0.051 U	**3.2**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.65 J**	**6.07**	0.07 U	0.098 U	0.062 U	**1.2 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.794 J**	**5.1**	0.077 U	0.076 U	0.072 U	**0.985 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.42 J**	**2.24 J**	0.11 U	0.066 U	0.085 U	**0.736 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**2.25 J**	**2.32**	0.102 U	**0.088 J**	0.079 U	**0.786 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.499 U	0.434 U	0.138 U	0.082 U	0.097 U	0.252 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**3.51**	**2.66**	0.115 U	0.068 U	0.087 U	**0.864 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**51.4**	**23.1**	0.272 U	1.59 U	0.278 U	**8.98**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**1.69**	**0.778 J**	0.169 U	**0.113 J**	0.097 U	**0.512 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**58.6**	**15.5**	0.696 U	1.99 U	0.503 U	**5.69**
Total Tetrachlorodibenzofuran (TCDF)	--	**21.1**	**310**	**0.422**	**2.37**	**0.31**	**65.2**
Total Pentachlorodibenzofuran (PeCDF)	--	**36**	**76**	0 U	**0.869**	**0.066 J**	**19.1**
Total Hexachlorodibenzofuran (HxCDF)	--	**77.4**	**44.4**	0 U	**1.74 J**	**0.097 J**	**15.3**
Total Heptachlorodibenzofuran (HpCDF)	--	**126**	**53.1**	**0.579 J**	**4.2**	**0.428 J**	**18.3**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**6.93 J**	**11 J**	0.12 U	**0.025 J**	**0.12 J**	**3.67 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-02	PG17-GP-02	PG17-GP-02	PG17-GP-03	PG17-GP-03	PG17-GP-03
	Sample ID	PG17-GP-02-05-07-20171004	PG17-GP-02-09-11-20171004	PG17-GP-02-13-15-20171004	PG17-GP-03-00-01-20171005	PG17-GP-03-01-03-20171005	PG17-GP-03-03-05-20171005
	Sample Date	10/4/2017	10/4/2017	10/4/2017	10/5/2017	10/5/2017	10/5/2017
	Depth	5 - 7 ft	9 - 11 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211036	1211036	1211036	1210827	1210827	1210827
	Y	316267	316267	316267	315764	315764	315764
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**95.7**	**87.92**	**80.35**	**92.43**	**81.17**	**93.76**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.553 U	0.066 U	0.095 U	0.386 U	**13.4**	**0.621 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.132 U	0.102 U	**0.188 J**	**1.01**	**3.44**	**1.43**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.183 UJ	0.13 U	**0.174 J**	**0.643 J**	**2.08**	**0.909 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.19 U	0.137 U	**0.254 J**	**14.1**	**9.93**	**3.98**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.197 U	**0.35 J**	**0.317 J**	**2.23**	**4.48**	**1.58**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	1.88 U	4.99 U	3.76 U	**55.6**	**90.3**	**21.5**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	21.4 U	43.8 U	33.7 U	**109**	**457**	**54.7**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**1.74**	**0.708 J**	**2.92**	**15.7**	**85.8**	**69.7**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	0 U	**1.11**	**2.52**	**18.5**	**70.8**	**50.8**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.491 J**	**4.16 J**	**4.64 J**	**143**	**99.5**	**54.8**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**4.77 J**	**12.6 J**	**9.8 J**	**98.6**	**158**	**34.9**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.539 J**	0.097 U	**0.153 J**	**0.809 J**	**3.02**	**3.03**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.127 J**	**0.131 J**	**0.173 J**	**0.855 J**	**1.75**	**1.16 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.088 U	0.111 U	**0.146 J**	**0.796 J**	**1.6**	**1.11**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.127 U	0.09 U	**0.205 J**	**1.88**	**1.75 J**	**0.867 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.126 U	0.087 U	**0.171 J**	**1.41**	**2.07**	**1.01**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.147 U	0.104 U	0.137 U	**0.956 J**	**0.83 J**	0.09 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.129 U	0.092 U	**0.138 J**	**1.72**	**3.12**	**1.41**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	0.234 U	0.398 U	0.751 U	**45.1**	**49**	**27**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	0.095 U	0.166 U	0.145 U	**0.993 J**	**1.46**	**0.671 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	1.02 U	1.19 U	0.97 U	**27.4**	**33.8**	**17**
Total Tetrachlorodibenzofuran (TCDF)	--	**4.71**	0 U	**2.02**	**14.3**	**56.3**	**57.2**
Total Pentachlorodibenzofuran (PeCDF)	--	**0.127**	**0.131**	**1.69**	**34.5**	**35.5**	**22.5**
Total Hexachlorodibenzofuran (HxCDF)	--	0 U	**0.167**	**1.14**	**90.8**	**71.8**	**35.5**
Total Heptachlorodibenzofuran (HpCDF)	--	**0.753 J**	**1.13 J**	**2.34 J**	**116**	**119**	**65.2**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**0.058 J**	**0.039 J**	**0.38 J**	**4.71 J**	**21.7 J**	**4.2 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-04	PG17-GP-04	PG17-GP-04	PG17-GP-04	PG17-GP-04	PG17-GP-04
	Sample ID	PG17-GP-04-00-01-20171005	PG17-GP-04-01-03-20171005	PG17-GP-04-03-05-20171005	PG17-GP-04-05-07-20171005	PG17-GP-04-09-11-20171005	PG17-GP-04-13-15-20171005
	Sample Date	10/5/2017	10/5/2017	10/5/2017	10/5/2017	10/5/2017	10/5/2017
	Depth	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210788	1210788	1210788	1210788	1210788	1210788
	Y	315710	315710	315710	315710	315710	315710
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**86.4**	**95.52**	**93.05**	**80.75 J**	**81.48 J**	**81.81 J**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**2.91**	0.34 U	0.035 U	**0.18 J**	0.042 U	0.066 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**16.6**	**2.58**	**0.143 J**	**0.115 J**	**0.057 J**	0.064 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**5.06**	**0.716 J**	**0.097 J**	**0.079 J**	0.06 U	0.103 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**158**	**36.5**	**1.78**	**0.223 J**	0.061 U	0.099 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**42.1**	**6.18**	0.539 U	**0.135 J**	0.064 U	0.108 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**663**	**128**	**10.6**	**1.47 J**	**0.14 J**	**0.962 J**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**3440**	**457**	**60**	**7.03 J**	**1.43 J**	**10.7**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**110**	**23.3**	**0.902 J**	**3.05**	**0.897**	**0.13**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**174**	**41.6**	**0.879**	**2.11**	**0.623**	**0.08**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**853**	**170**	**8.44**	**2.13**	**0.544**	**0.344**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**1660**	**224**	**19.6**	**2.4**	**0.56**	**2.24**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**12.3**	**1.58 J**	**0.078 J**	**0.744 J**	**0.135 J**	0.085 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**3.66**	**0.633 J**	0.064 U	**0.328 J**	0.05 U	0.067 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**6.61**	**1.2 J**	0.065 U	**0.311 J**	0.047 U	0.063 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**6.22 J**	**1.52**	**0.159 J**	**0.129 J**	0.048 U	0.059 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**8.11**	**2.04**	**0.184 J**	**0.138 J**	0.049 U	0.059 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**5.87**	**1.59**	0.124 U	0.044 U	0.046 U	0.057 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**17.8**	**4.42**	**0.356 J**	**0.153 J**	0.044 U	0.055 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**243**	**38.4**	**3.66**	**0.606 J**	**0.094 J**	**0.059 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**5.91**	**1.23**	**0.163 J**	**0.055 J**	0.061 U	0.071 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**180**	**26**	**3.41**	**0.533 J**	0.083 U	0.148 U
Total Tetrachlorodibenzofuran (TCDF)	--	**116**	**22**	**1.07**	**13.6**	**2.13**	-- U
Total Pentachlorodibenzofuran (PeCDF)	--	**324**	**58.7**	**2.86**	**3.82**	**0.352**	-- U
Total Hexachlorodibenzofuran (HxCDF)	--	**622**	**98.3**	**7.12**	**1.43**	-- U	-- U
Total Heptachlorodibenzofuran (HpCDF)	--	**633**	**91.2**	**8.55**	**1.36**	**0.167**	**0.059**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**57 J**	**10.2 J**	**0.57 J**	**0.58 J**	**0.073 J**	**0.013 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-05	PG17-GP-05	PG17-GP-05	PG17-GP-05	PG17-GP-05	PG17-GP-05
	Sample ID	PG17-GP-05-00-01-20171005	PG17-GP-05-01-03-20171005	PG17-GP-05-03-05-20171005	PG17-GP-05-05-07-20171005	PG17-GP-05-09-11-20171005	PG17-GP-05-13-15-20171005
	Sample Date	10/5/2017	10/5/2017	10/5/2017	10/5/2017	10/5/2017	10/5/2017
	Depth	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210843	1210843	1210843	1210843	1210843	1210843
	Y	315652	315652	315652	315652	315652	315652
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**94.31**	**93.48**	**87.22**	**85.02**	**63.02**	**74.59**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.538 U	0.373 U	**1.16**	**0.63 J**	0.07 U	0.061 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**3.89**	**1.62**	**6.69**	**4.41**	**0.307 J**	**0.149 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**4.34**	**0.773 J**	**3.47**	**3.55**	0.094 U	**0.106 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**28.6**	**6.18**	**25**	**25.5**	**0.391 J**	0.103 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**9.97**	**2.11**	**8.52**	**9.69**	**0.468 J**	0.11 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**610**	**87**	**386**	**343**	5.95 U	2.68 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**5400 J**	**914**	**4060 J**	**3460**	45.1 U	22.6 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**35.9**	**77.6**	**323**	**200**	**6.18**	**0.441 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**49.7**	**54.9**	**225**	**265**	**5.94**	**0.792**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**419**	**75.7**	**354**	**566**	**7.79 J**	**2.27 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**3710**	**403 J**	**1780**	**1480**	**17.7 J**	**7.17 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**1.81**	**1.06 J**	**3.88**	**2.56**	**0.531 J**	0.082 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**2.12 J**	**0.766 J**	**2.09**	**1.5**	**0.229 J**	0.079 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**1.56**	**0.58 J**	**2.03**	**1.64 J**	**0.301 J**	0.082 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**5.88 J**	**1.09**	**3.98 J**	**2.64**	**0.23 J**	0.07 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**3.53**	**0.96 J**	**4**	**2.57**	**0.215 J**	0.069 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**1.8**	**0.47 J**	**1.53**	**1.35**	**0.117 J**	0.083 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**2.68 J**	**1.72**	**6.58 J**	**4.77**	**0.215 J**	0.073 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**72.8**	**31.6**	**132**	**107**	1.09 U	0.196 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**2.87**	**1.03**	**4.3**	**2.89**	0.084 U	0.08 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**103**	**34.5**	**162**	**139**	1.21 U	0.357 U
Total Tetrachlorodibenzofuran (TCDF)	--	**30.7**	**21.4**	**73.3**	**59**	**11.6**	**1.31**
Total Pentachlorodibenzofuran (PeCDF)	--	**71.8**	**16.3**	**61.8**	**45.5**	**3.44**	0 U
Total Hexachlorodibenzofuran (HxCDF)	--	**184**	**45**	**195**	**144**	**2.27**	0 U
Total Heptachlorodibenzofuran (HpCDF)	--	**213**	**86.8**	**380**	**309**	**1.97 J**	**0.336 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**19 J**	**4.73 J**	**20.7 J**	**16.4 J**	**0.62 J**	**0.16 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-05	PG17-GP-06	PG17-GP-06	PG17-GP-06	PG17-GP-07	PG17-GP-07
	Sample ID	PG17-GP-105-03-05-20171005	PG17-GP-06-00-01-20171004	PG17-GP-06-01-03-20171004	PG17-GP-06-03-05-20171004	PG17-GP-07-00-01-20171004	PG17-GP-07-01-03-20171004
	Sample Date	10/5/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017
	Depth	3 - 5 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft	0 - 1 ft	1 - 3 ft
	Sample Type	FD	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210843	1210892	1210892	1210892	1210896	1210896
	Y	315652	316225	316225	316225	315909	315909
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**89.58**	**95.88**	**96.13**	**93.89**	**95.57**	**96.7**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**1.25**	**0.309 J**	0.052 U	**0.235 J**	**0.446 J**	0.049 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**6.93**	**2.24**	0.306 U	0.079 U	**2.6**	0.131 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**4.92**	**2.11**	0.333 U	0.21 U	**1.82**	0.112 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**32.3**	**30.7**	**3.45**	0.415 U	**15.9**	0.114 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**11.4**	**5.87**	0.76 U	0.367 U	**5.51**	0.12 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**469**	**237**	**24.2**	3.53 U	**95.2**	1.37 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**4590 J**	**360**	36.3 U	16.9 U	**177**	13 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**389**	**9.96**	**1.64 J**	**17.9**	**74.7**	**5.14**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**369**	**18.6**	**1.91**	**13.9**	**64.4**	**5.2**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**989**	**117**	**13.7**	**13.6**	**130**	**3.85 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**2100**	**335**	**33 J**	**7.42 J**	**151**	**3.29 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**3.92**	**0.514 J**	**0.09 J**	**0.997**	**1.57**	**0.258 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**2.12**	**0.765 J**	0.145 U	**0.498 J**	**1.21 J**	0.076 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**2.27**	**0.953 J**	**0.15 J**	**0.407 J**	**1.27**	0.087 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**3.79 J**	**5.68**	**0.725 J**	0.271 U	**2.74**	0.101 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**3.96**	**8.7**	**1.07**	**0.253 J**	**3.78**	0.058 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**1.92**	**5.09**	**0.767 J**	0.09 U	**2.02**	0.079 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**7.01 J**	**17.3**	**2.16**	**0.313 J**	**6.65**	0.068 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**143**	**463**	**50.7**	1.7 U	**123**	0.264 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**4.23**	**9.26**	**1.04 J**	**0.059 J**	**2.78**	0.1 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**177**	**269**	**26.6**	1.01 U	**59.3**	0.384 U
Total Tetrachlorodibenzofuran (TCDF)	--	**77.7**	**16.1**	**1.84**	**22**	**35.9**	**4.02**
Total Pentachlorodibenzofuran (PeCDF)	--	**65.9**	**115**	**13.5**	**7.89**	**59.9**	**0.396**
Total Hexachlorodibenzofuran (HxCDF)	--	**224**	**647**	**68.4**	**4.12**	**181**	**0.287 J**
Total Heptachlorodibenzofuran (HpCDF)	--	**413**	**1170**	**125**	**3.51**	**281**	**0.567 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**23.4 J**	**18 J**	**1.6 J**	**0.53 J**	**9.74 J**	**0.026 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-07	PG17-GP-07	PG17-GP-08	PG17-GP-08	PG17-GP-08	PG17-GP-08
	Sample ID	PG17-GP-07-03-05-20171004	PG17-GP-107-01-03-20171004	PG17-GP-08-00-01-20171004	PG17-GP-08-01-03-20171004	PG17-GP-08-03-05-20171004	PG17-GP-08-05-07-20171004
	Sample Date	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017
	Depth	3 - 3 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft
	Sample Type	N	FD	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210896	1210896	1211034	1211034	1211034	1211034
	Y	315909	315909	315862	315862	315862	315862
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**80.04**	**96**	**96.3**	**97.79**	**79.04**	**96.06**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.284 J**	0.256 U	0.43 U	0.045 U	0.242 U	**0.14 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.403 U	**0.384 J**	**3.12**	**0.835 J**	**0.364 J**	0.141 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.248 U	**0.253 J**	**2.19**	**0.489 J**	**0.165 J**	**0.261 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.481 U	**0.312 J**	**35.6**	**0.741 J**	**0.294 J**	**3.14**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.434 U	0.381 U	**11.3**	0.743 U	0.385 U	**1.45 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	3.31 U	2.79 U	**368**	4.85 U	2.45 U	**21**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	14 U	18.9 U	**3450**	26.9 U	13.4 U	**172**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**15.9**	**13.7**	**35.6**	**46.9**	**13**	**7.7**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**15.4**	**11.3**	**46**	**36.3**	**10.9**	**8.3**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**15**	**8.21**	**311**	**24.5**	**9.72**	**35.2**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**6.75 J**	**6.2 J**	**1060**	**9.64 J**	**5.42 J**	**61.4**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**1.28**	**0.96 J**	**1.64**	**0.76 J**	**1.06**	**0.378 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.522 J**	**0.63 J**	**1.62**	**0.438 J**	**0.456 J**	**0.717 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.389 J**	**0.367 J**	**1.37**	**0.497 J**	**0.348 J**	**0.305 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.403 U	**0.574 J**	**3.17**	**0.265 J**	**0.372 J**	**1.24**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.243 J**	**0.235 J**	**2.78**	**0.271 J**	**0.247 J**	**0.443 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.077 U	0.105 U	**1.48**	0.174 U	0.097 U	**0.264 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.25 J**	**0.201 J**	**4.83**	**0.247 J**	**0.158 J**	**0.381 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	0.868 U	**0.683 J**	**80**	**1.3**	**0.808 J**	**5.38**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**0.078 J**	**0.087 J**	**2.62**	**0.104 J**	0.046 U	**0.24 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	0.988 U	0.561 U	**85.8**	**1.86 J**	0.54 U	**5.75**
Total Tetrachlorodibenzofuran (TCDF)	--	**25.3**	**19.3**	**29.9**	**13.2**	**21.4**	**5.46**
Total Pentachlorodibenzofuran (PeCDF)	--	**6.1**	**4.75**	**61**	**4.73**	**4.8**	**5.18**
Total Hexachlorodibenzofuran (HxCDF)	--	**2.02 J**	**2.15**	**142**	**2.69**	**1.92**	**10.3**
Total Heptachlorodibenzofuran (HpCDF)	--	**1.61 J**	**1.17**	**217**	**2.58**	**1.18**	**13**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**0.59 J**	**0.77 J**	**15.4**	**1.3 J**	**0.72 J**	**1.33 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-08	PG17-GP-08	PG17-GP-09	PG17-GP-09	PG17-GP-09	PG17-GP-09
	Sample ID	PG17-GP-08-09-11-20171004	PG17-GP-08-13-15-20171004	PG17-GP-09-00-01-20171004	PG17-GP-09-01-03-20171004	PG17-GP-09-03-05-20171004	PG17-GP-09-05-07-20171004
	Sample Date	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017	10/4/2017
	Depth	9 - 11 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211034	1211034	1210999	1210999	1210999	1210999
	Y	315862	315862	315697	315697	315697	315697
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**79.95**	**80.62**	**95.44**	**96.75**	**86.54**	**73.26**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.047 U	0.043 U	0.193 U	**11.7**	**2.91**	**3.36**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.089 U	0.125 U	**0.7 J**	**77.1**	**10.3**	**12.3**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.189 J**	**0.09 J**	**0.487 J**	**43.3**	**4.86**	**3.39**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.171 J**	0.119 U	**3.62**	**579**	**17.3**	**31.7**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.248 J**	**0.233 J**	**1.38**	**83.9**	**8.76**	**15.3**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	3.37 U	2.88 U	**29.9**	**1070**	**104**	**69.5**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	28.3 U	30.7 U	**228**	**1700**	**776**	**296**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.619 J**	**0.313 J**	**24**	**2300**	**301**	**180**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**0.958**	**0.171**	**18.5**	**2290**	**265**	**159**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**3.35 J**	**2.05 J**	**41.3**	**3920**	**287**	**271**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**8.9 J**	**7.66 J**	**90.7**	**1740**	**191**	**125**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.07 J**	**0.093 J**	**0.473 J**	**47.6**	**12.6**	**10.5**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.049 U	0.064 U	**0.321 J**	**39.9**	**6.28 J**	**5.65**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.05 U	0.07 U	**0.298 J**	**31.9**	**5.92**	**5.42**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.057 U	0.058 U	**0.405 J**	**57.1 J**	**4.05 J**	**2.48**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.055 U	0.056 U	**0.319 J**	**30.4**	**4.55**	**3.15**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.065 U	0.071 U	0.251 U	**16**	**1.47**	**0.608 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.056 U	0.06 U	**0.536 J**	**35.2 J**	**4.75 J**	**3.16**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	0.193 U	0.168 U	**7.54**	**1250**	**60.9**	**22.6**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	0.172 U	0.119 U	**0.287 J**	**28.5**	**2.11**	**1.13 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	0.38 U	0.745 U	**7.8**	**1920**	**97.8**	**25.9**
Total Tetrachlorodibenzofuran (TCDF)	--	**0.845**	**0.48**	**7.84**	**662**	**215**	**164**
Total Pentachlorodibenzofuran (PeCDF)	--	0 U	0 U	**7.66**	**437**	**91.6**	**72.4**
Total Hexachlorodibenzofuran (HxCDF)	--	0 U	0 U	**14.3**	**1380**	**83.3**	**45.7**
Total Heptachlorodibenzofuran (HpCDF)	--	**0.193 J**	**0.474 J**	**20.1**	**3780**	**167**	**57.1**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**0.068 J**	**0.042 J**	**1.97 J**	**210 J**	**22.9 J**	**25.5 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-09	PG17-GP-09	PG17-GP-10	PG17-GP-10	PG17-GP-10	PG17-GP-10
	Sample ID	PG17-GP-09-09-11-20171004	PG17-GP-09-13-15-20171004	PG17-GP-10-00-01-20171205	PG17-GP-10-01-03-20171205	PG17-GP-10-03-05-20171205	PG17-GP-10-05-07-20171205
	Sample Date	10/4/2017	10/4/2017	12/5/2017	12/5/2017	12/5/2017	12/5/2017
	Depth	9 - 11 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210999	1210999	1211560.137	1211560.137	1211560.137	1211560.137
	Y	315697	315697	316831.647	316831.647	316831.647	316831.647
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**86.85**	**85.42**	**95.68**	**89.19**	**91.43**	**91.61**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.961 J**	0.064 U	**2.98 J**	32.9 U	6 U	23.4 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**9.47**	0.099 U	**10.9**	47.8 U	**12.8 J**	56.2 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**7.4**	0.107 U	**70.2**	125 U	**136**	**228 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**17.4**	0.109 U	**578**	**3450**	**3400**	**5260**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**12.1**	**0.24 J**	**132**	135 U	**144**	**248 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**133**	2.76 U	**19700**	**59300**	**54900**	**96200**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**407**	22.2 U	**570000 J**	**261000**	**243000**	**410000**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**56.6**	**0.675 J**	**46.5**	0 U	**41.2**	0 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**139**	**0.464**	**94.9**	0 U	**140**	0 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**247**	**2.46 J**	**2450**	**6690**	**6660**	**10800**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**258**	**7.58 J**	**33300**	**82600**	**75800**	**134000**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**2.78 J**	**0.142 J**	**1.15 J**	34.4 U	**29.1 J**	**42.7 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**4.56**	**0.082 J**	**2.47 J**	59.2 U	15.8 U	**85 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**7.92**	0.076 U	1.1 U	59.4 U	**19.2 J**	62.8 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**8.65**	0.058 U	**58**	**657 J**	**613**	**1130**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**10.1**	0.056 U	**28.6**	**244 J**	**243**	**439 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**2.18**	0.067 U	**37.7**	197 U	**243**	164 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**13.3**	0.06 U	**70.5**	**868**	**660**	**1090**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**61.7**	0.154 U	**4680**	**60600**	**55200**	**85900**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**3.33**	0.071 U	**194**	**1430 J**	**1790**	**3180**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**15.5**	0.334 U	**6870**	**105000**	**99400**	**179000**
Total Tetrachlorodibenzofuran (TCDF)	--	**66.4**	**0.817**	**12.4**	0 U	**80.9**	**94.7**
Total Pentachlorodibenzofuran (PeCDF)	--	**84.5**	**0.082**	**101**	**357**	**404**	**690**
Total Hexachlorodibenzofuran (HxCDF)	--	**88.8**	0 U	**6100**	**75300**	**72800**	**113000**
Total Heptachlorodibenzofuran (HpCDF)	--	**75.6**	**0.29 J**	**19000**	**238000**	**227000**	**363000**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**22.4 J**	**0.041 J**	**530 J**	**1850 J**	**1800 J**	**2900 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-10	PG17-GP-10	PG17-GP-10	PG17-GP-11	PG17-GP-11	PG17-GP-11
	Sample ID	PG17-GP-10-07-09-20171205	PG17-GP-10-09-11-20171205	PG17-GP-10-13-15-20171205	PG17-GP-11-00-01-20171205	PG17-GP-11-01-03-20171205	PG17-GP-11-03-05-20171205
	Sample Date	12/5/2017	12/5/2017	12/5/2017	12/5/2017	12/5/2017	12/5/2017
	Depth	7 - 9 ft	9 - 11 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211560.137	1211560.137	1211560.137	1211079.243	1211079.243	1211079.243
	Y	316831.647	316831.647	316831.647	316222.937	316222.937	316222.937
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**65.28**	**86.94**	**87.86**	**93.68**	**91.94**	**89.17**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	18.6 U	3.55 U	**0.118 J**	0.6 U	**0.647 J**	**0.401 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	44.3 U	7.66 U	**0.231 J**	**1.82 J**	**7.44**	**1.46**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**118 J**	12.1 U	0.208 U	**3.37 J**	0.82 U	0.305 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1410**	**44.3 J**	0.431 U	**63.2**	**523**	**10.2 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**101 J**	12.6 U	0.378 U	**21.9**	**196**	**4.16**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**23800**	**823**	8.29 U	**1380**	**1990**	**69**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**150000**	**3620**	70.7 U	**16900**	**13900 J**	**477**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**73.6**	0 U	**0.564 J**	**8.25**	**15.8**	**38.5**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	-- U	0 U	**1.02**	**8.86**	**69.2**	**24.7**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**3300**	**89.7**	**5.06 J**	**340**	**3190**	**68.2**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**33900**	**1140**	**18 J**	**2390**	**3930**	**115**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	18.7 U	3.77 U	0.043 U	0.785 U	**1.36**	**4.05**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**53.1 J**	5.61 U	**0.075 J**	0.91 U	**1.09 J**	**2.55**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	38.1 U	5.43 U	0.038 U	0.923 U	**1.76 J**	**2.39 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**341 J**	6.32 U	**0.076 J**	**4.04 J**	**3.73**	**1.63**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**199 J**	6.38 U	**0.07 J**	**2.96 J**	**4.65 J**	**1.26**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**159 J**	8.54 U	0.087 U	1.61 U	**3.61**	**1.24**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**383 J**	6.95 U	**0.097 J**	1.38 U	**9.97**	**1.32**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**23200 J**	**719**	**1.77**	**280**	**306**	**19.3**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**994**	**21.7 J**	**0.162 J**	**11.6 J**	**8.1**	**0.623 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**46200**	**1260**	**3.69**	**483**	**345**	**22.8**
Total Tetrachlorodibenzofuran (TCDF)	--	-- U	0 U	**0.414**	**2.35**	**30.6**	**61.3**
Total Pentachlorodibenzofuran (PeCDF)	--	**971**	**4.55**	**0.169**	**16.4**	**110**	**34.8**
Total Hexachlorodibenzofuran (HxCDF)	--	**27000**	**836**	**2.14**	**319**	**465**	**38.1**
Total Heptachlorodibenzofuran (HpCDF)	--	**88800 J**	**2840**	**6.42**	**1050**	**917**	**52.9**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**810 J**	**21.5 J**	**0.4 J**	**33 J**	**110 J**	**6.08 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-GP-11	PG17-GP-11	PG17-GP-11	PG17-GP-11	PG17-Soil-01	PG17-Soil-02
	Sample ID	PG17-GP-11-05-07-20171205	PG17-GP-11-09-11-20171205	PG17-GP-111-03-05-20171205	PG17-GP-11-13-15-20171205	PG17-Soil-01-20171002	PG17-Soil-02-20171002
	Sample Date	12/5/2017	12/5/2017	12/5/2017	12/5/2017	10/2/2017	10/2/2017
	Depth	5 - 7 ft	9 - 11 ft	3 - 5 ft	13 - 15 ft	0 - 1 ft	0 - 1 ft
	Sample Type	N	N	FD	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211079.243	1211079.243	1211079.243	1211079.243	1210725.670	1210729.521
	Y	316222.937	316222.937	316222.937	316222.937	315524.877	315772.717
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**93.13**	**91.02**	**89.08**	**83.56**	**92.3**	**92.91**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.063 U	0.06 U	**0.477 J**	0.046 U	**1.84**	**0.503 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.213 U	0.156 U	**2.42**	0.148 U	**5.82**	**1.8**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.183 J**	**0.205 J**	**0.789 J**	**0.132 J**	**2.61**	**0.982 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**8.24**	**3.31**	**11.9**	0.262 U	**6.33**	**2.97**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1.87**	**1.24 J**	**4.62**	0.283 U	**4.58**	**1.81**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**15.7**	**24.2**	**75.5**	3.98 U	**41.4**	**22**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	113 U	**148**	**567**	36.5 U	**197**	**117**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**9.14**	**0.687 J**	**46.5**	**0.826 J**	**209**	**40.1**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**6.17**	**1.67**	**33**	**0.949 J**	**175**	**36.6**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**40.8**	**18**	**79.7**	**3.45 J**	**140**	**37.8**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**27.6 J**	**39.8 J**	**130**	**10.1 J**	**76.8**	**43.1**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.496 J**	0.074 U	**7.37**	**0.09 J**	**15.1**	**2.6**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.178 J**	0.07 U	**5.09 J**	**0.097 J**	**5.91**	**1.08**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.122 U	0.071 U	**4.5**	0.052 U	**5.67**	**1.27 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.176 U	0.083 U	**4.42**	**0.075 J**	**1.92 J**	**0.686 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.176 U	0.08 U	**2.52**	0.062 U	**2.29**	**0.804 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.224 U	**0.959 J**	**1.57**	0.076 U	0.656 U	0.352 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.189 U	0.086 U	**2.12**	0.065 U	**2.36 J**	**0.892 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**3.25**	**8.14**	**23.1**	**0.63 J**	**11.9**	**8.71**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	0.155 U	0.213 U	**1.13**	0.09 U	0.68 U	0.407 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**5.33**	**11.2**	**27.4**	1.03 U	**11.5**	**7.96**
Total Tetrachlorodibenzofuran (TCDF)	--	**8.63**	**0.373**	**93.7**	**0.593**	**273**	**47.6**
Total Pentachlorodibenzofuran (PeCDF)	--	**1.29**	**0.616**	**59**	**0.097**	**84.6**	**19.8**
Total Hexachlorodibenzofuran (HxCDF)	--	**3.28**	**10.2**	**48.8**	**0.524**	**29.9**	**13.6**
Total Heptachlorodibenzofuran (HpCDF)	--	**10.3**	**27.2**	**59.3**	**1.63**	**26.5**	**20.1**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**1.3 J**	**0.94 J**	**9.11 J**	**0.039 J**	**13.7 J**	**4.14 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG17-Soil-03	PG17-Soil-04	PG17-Soil-04	PG17-Soil-05	PG17-Soil-06	PG17-Soil-07
	Sample ID	PG17-Soil-03-20171002	PG17-Soil-04-20171002	PG17-Soil-104-20171002	PG17-Soil-05-20171002	PG17-Soil-06-20171002	PG17-Soil-07-20171002
	Sample Date	10/2/2017	10/2/2017	10/2/2017	10/2/2017	10/2/2017	10/2/2017
	Depth	0 - 1 ft	0 - 1 ft	0 - 1 ft	0 - 1 ft	0 - 1 ft	0 - 1 ft
	Sample Type	N	N	FD	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1210697.482	1210104.115	1210104.115	1209958.502	1209354.108	1209914.571
	Y	315308.340	314609.148	314609.148	315582.000	315822.410	317060.283
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**95.61**	**50.03**	**52.42**	**89.02**	**86.13**	**91.89**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.104 J**	**0.925 J**	**0.686 J**	**1.41**	**0.377 J**	**0.788 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.138 U	**4.08**	**2.84**	**5.37**	**1.66**	**1.62**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.113 U	**1.51**	**1.05**	**1.62**	**0.656 J**	**0.822 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.236 U	**5.6**	**3.7**	**6.6**	**2.62**	**1.47**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	0.197 U	**3.9**	**2.57**	**4.34**	**1.86**	1.28 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	2.64 U	**32.2**	**21.9**	**27.4**	**15.4**	**10.3**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	19.1 U	**150**	**113**	**118**	**84.9**	47.7 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**1.66**	**52.2**	**23.6**	**84.9**	**21.8**	**36.9**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**1.71**	**58.4**	**30.4**	**88.6**	**24.3**	**47**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**2.97 J**	**72.4**	**42.9**	**91**	**28.9**	**39.7**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**6.67 J**	**67**	**46.1**	**56.4**	**31.7**	**20.3**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.14 J**	**4.35**	**3.25**	**10.9**	**1.02**	**1.91**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.102 U	**1.99 J**	**1.34 J**	**4.46 J**	0.453 U	**0.864 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.067 J**	**2.35**	**1.55**	**4.99**	**0.658 J**	**0.849 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.036 U	**0.904 J**	**0.596 J**	**1.5**	0.299 U	0.395 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.035 U	**0.962 J**	**0.636 J**	**1.53**	0.276 U	0.407 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.042 U	0.285 U	0.193 U	0.418 U	0.153 U	0.171 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.063 U	**1.04**	**0.713 J**	**1.65 J**	0.327 U	0.432 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	0.286 U	**2.93**	**2.27**	**3.24**	**1.31**	**1.35**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	0.044 U	0.279 U	0.249 U	0.321 U	0.131 U	0.142 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	0.281 U	3.3 U	3.11 U	3.03 U	1.35 U	1.45 U
Total Tetrachlorodibenzofuran (TCDF)	--	**2.15**	**86.2**	**62.1**	**198**	**19**	**26.7**
Total Pentachlorodibenzofuran (PeCDF)	--	**0.804**	**33.3**	**22.2**	**70.6**	**8.02**	**10.4**
Total Hexachlorodibenzofuran (HxCDF)	--	**0.356 J**	**11.4**	**7.64**	**16.8**	**3.43**	**4.08**
Total Heptachlorodibenzofuran (HpCDF)	--	**0.655 J**	**6.11**	**4.77**	**6.23**	**2.65**	**2.76**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**0.14 J**	**8 J**	**5.56 J**	**11.6 J**	**3.04 J**	**3.23 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-12	PG18-GP-12	PG18-GP-12	PG18-GP-12	PG18-GP-12	PG18-GP-12
	Sample ID	PG18-GP-12-00-01-20180305	PG18-GP-12-01-03-20180305	PG18-GP-12-03-05-20180305	PG18-GP-12-05-07-20180305	PG18-GP-12-07-09-20180305	PG18-GP-12-09-11-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	0 - 1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	9 - 11 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211553.424	1211553.424	1211553.424	1211553.424	1211553.424	1211553.424
	Y	316915.678	316915.678	316915.678	316915.678	316915.678	316915.678
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	0.1 J	0.54 J
Total solids	--	92.04	92.21	92.64	93.26	93.05	83.58
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.605 U	0.05 U	0.052 U	0.174 J	0.05 U	7.26 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	2.38 J	0.217 J	0.56 J	0.534 J	0.087 U	105 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	6.08 J	0.492 J	1.38	1.53	0.28 J	722
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	39.2	4.72	19.7	17	1.48	12700
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	17.8	1.6	6	4.95	0.174 J	4750
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	815	96.5	319	321	22.4	362000
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	9620	1180	2730	3210	257	2270000
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	17.5	0.702	2.51	3.69	0.31	2340
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	28.6	1.45	4.83	6.13	0.513	35900
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	321	20.3 J	75.6	74.6	5.05	97500
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	2660	158	476	574	34.3	509000
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	0.772 U	0.055 U	0.085 U	0.145 J	0.099 U	8.64 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.927 U	0.081 U	0.092 U	0.218 J	0.084 U	17.5 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.92 U	0.08 U	0.203 J	0.103 U	0.082 U	17.6 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	3.6 J	0.428 J	1.49	1.61 J	0.324 J	247
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	2.16 J	0.264 J	0.848 J	0.821 J	0.109 U	137
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	2.06 J	0.872 J	3.47	3.11	0.348 J	79.2 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	4.41 J	0.528 J	2.01	1.93	0.371 J	331
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	171	28.2	131	118	20.4	20900
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	8.71 J	1.25	5.41	5.15	0.969 J	789
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	330	57.6	247	226	38.6	39100
Total Tetrachlorodibenzofuran (TCDF)	--	8.47	0.182	0.991	2.46	-- U	267
Total Pentachlorodibenzofuran (PeCDF)	--	12.6	0.678	5.52	4.68	0.422	2050
Total Hexachlorodibenzofuran (HxCDF)	--	201	37.5	161	152	23.1	30100
Total Heptachlorodibenzofuran (HpCDF)	--	603	118	530	473	78.9	81000
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	23 J	2.7 J	9.6 J	9.3 J	0.82 J	6530 J

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-12	PG18-GP-12	PG18-GP-12	PG18-GP-13	PG18-GP-13	PG18-GP-13
	Sample ID	PG18-GP-12-11-13-20180305	PG18-GP-12-13-15-20180305	PG18-GP-62-05-07-20180305	PG18-GP-13-00-01-20180305	PG18-GP-13-01-03-20180305	PG18-GP-13-03-05-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	11 - 13 ft	13 - 15 ft	5 - 7 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft
	Sample Type	N	N	FD	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211553.424	1211553.424	1211553.424	1211634.373	1211634.373	1211634.373
	Y	316915.678	316915.678	316915.678	316890.598	316890.598	316890.598
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	**17.3 J**	**0.96 J**	**--**	**--**	**--**	**--**
Total solids	--	**33.54**	**84.85**	**92.65**	**92.45**	**95.57**	**95.67**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	8.36 U	**0.129 J**	**0.158 J**	0.504 U	0.042 U	0.031 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	24.1 U	**0.247 J**	**0.601 J**	0.848 U	**0.121 J**	0.109 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**56.5 J**	**0.255 J**	**1.96**	**1.43 J**	**0.121 J**	0.18 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1240**	**1.56**	**32.2**	**11.5**	**0.965 J**	**0.722 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**97.6 J**	**0.879 J**	**11.7**	**5.68 J**	**0.452 J**	**0.455 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**23600**	**36.2**	**493**	**228**	**34.8**	**12.4**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**153000**	**218**	**3820**	**2320**	**360**	**99.9**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**267**	**5.15**	**3.62**	**7.94**	**0.357**	**0.477**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**791**	**13.9**	**7.77**	**18.8**	**1.16**	**0.404**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**3990**	**24.9**	**124**	**123**	**15.3**	**5.12**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**33500**	**56.1**	**796**	**967**	**192**	**27.3**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**9.08 J**	**0.125 J**	**0.111 J**	0.535 U	0.054 U	0.038 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**24.7 J**	**0.138 J**	**0.161 J**	0.645 U	0.054 U	0.064 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**15.7 J**	**0.127 J**	0.088 U	0.66 U	0.054 U	0.064 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**271 J**	**0.211 J**	**1.76**	**1.24 J**	**0.127 J**	0.064 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**167 J**	**0.157 J**	**1.27**	0.486 U	**0.111 J**	0.065 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**110 J**	**0.155 J**	**2**	0.574 U	0.15 U	0.079 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**352**	**0.252 J**	**2.7**	**0.605 J**	0.071 U	0.07 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**20600 J**	**6.97**	**141**	**31.7**	**4.7**	**2.5**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**928**	**0.394 J**	**5.74**	**1.83 J**	**0.275 J**	**0.096 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**40700**	**14.4**	**219**	**66.9**	**12**	**5.52**
Total Tetrachlorodibenzofuran (TCDF)	--	**306**	**9.3**	**2.09**	**0.541**	**0.071**	-- U
Total Pentachlorodibenzofuran (PeCDF)	--	**2600**	**1.49**	**10.7**	**4.16**	**0.418**	**0.101**
Total Hexachlorodibenzofuran (HxCDF)	--	**29900**	**8.96**	**169**	**41**	**6.32**	**3.04**
Total Heptachlorodibenzofuran (HpCDF)	--	**78200 J**	**25.6**	**487**	**107**	**17.6**	**10.4**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**750 J**	**1.28 J**	**14 J**	**5.38 J**	**0.81 J**	**0.3 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-13	PG18-GP-13	PG18-GP-13	PG18-GP-13	PG18-GP-14	PG18-GP-14
	Sample ID	PG18-GP-13-05-07-20180305	PG18-GP-13-09-11-20180305	PG18-GP-13-11-13-20180305	PG18-GP-13-13-15-20180305	PG18-GP-14-00-01-20180305	PG18-GP-14-01-03-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	5 - 7 ft	9 - 11 ft	11 - 13 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211634.373	1211634.373	1211634.373	1211634.373	1211637.169	1211637.169
	Y	316890.598	316890.598	316890.598	316890.598	317007.45	317007.45
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**92.87**	**84.58**	**80.79**	**84.46**	**91.74**	**95.84**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.033 U	0.043 U	**1.59**	**2.86**	0.164 U	**4.06**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.079 U	**0.681 J**	**15.4**	**29**	**0.991 J**	**17.2**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.241 J**	**1.56**	**23.3**	**25.3**	**1.58**	**63.7**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1.59**	**12.3**	**95.5**	**94.1**	**12.4**	**170**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.685 J**	**4.2**	**41.8**	**52.9**	**4**	**57.9**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**25.3**	**235**	**1060**	**765**	**224**	**1080**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**243**	**1900**	**7830 J**	**4620 J**	**2670**	**5160 J**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.577**	**9.75**	**140**	**253**	**7.21**	**70.2**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**0.899**	**13.8**	**232**	**494**	**13.5**	**152**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**10.4**	**58.6**	**576**	**901**	**129**	**1190**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**65.4**	**398**	**1630**	**1370**	**1040**	**2000**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	0.031 U	**0.724 J**	**18.5**	**28.5**	**0.453 J**	**1.32 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.052 U	**1.69 J**	**63.4**	**67 J**	**0.425 J**	**1.42 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.051 U	**0.465 J**	**14.1**	**14.5**	0.281 U	**1.32**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.109 J**	**4.84**	**177**	**221 J**	**1.18 J**	**4.47**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.069 J**	**1.33**	**36.7**	**42.8 J**	**1.53 J**	**6.19 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	0.151 U	**0.794 J**	**6.28**	**4.25**	**0.946 J**	**7.01**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.15 J**	**1.55**	**18.3**	**12.5**	**0.739 J**	**10.2**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**5.64**	**73.4**	**722**	**528**	**45.6**	**248**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**0.321 J**	**3.7**	**31.5**	**17.3**	**2.4**	**9.3**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**11.6**	**152**	**1120**	**483**	**78.7**	**313**
Total Tetrachlorodibenzofuran (TCDF)	--	**0.051**	**4.61**	**121**	**139**	**7.74**	**31.3**
Total Pentachlorodibenzofuran (PeCDF)	--	**0.296**	**7.52**	**228**	**218**	**22.3**	**81.3**
Total Hexachlorodibenzofuran (HxCDF)	--	**6.9**	**90.7**	**993**	**613**	**81.3**	**396**
Total Heptachlorodibenzofuran (HpCDF)	--	**22.4**	**289**	**2360**	**1170**	**139**	**752**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**0.67 J**	**7.3 J**	**85.7 J**	**101 J**	**6.83 J**	**69 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-14	PG18-GP-14	PG18-GP-14	PG18-GP-14	PG18-GP-15	PG18-GP-15
	Sample ID	PG18-GP-14-03-05-20180305	PG18-GP-14-05-07-20180305	PG18-GP-14-09-11-20180305	PG18-GP-14-13-15-20180305	PG18-GP-15-00-01-20180305	PG18-GP-15-01-03-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft	0 - 1 ft	1 - 3 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211637.169	1211637.169	1211637.169	1211637.169	1211748.364	1211748.364
	Y	317007.45	317007.45	317007.45	317007.45	316861.228	316861.228
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	**93.99**	**91.52**	**67.97**	**39.13**	**97.9**	**94.44**
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.048 U	**0.175 J**	**0.516 J**	**0.257 J**	0.304 U	0.093 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**0.293 J**	0.11 U	**3.6**	**0.526 J**	0.801 U	**1.07**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**0.92 J**	0.105 U	**2.07**	**0.241 J**	1.37 U	**0.882 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**25.5**	**0.331 J**	**3.87**	**0.336 J**	**4.45**	**26.6**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**8.02**	**0.284 J**	**3.87**	**0.403 J**	1.46 U	**9.98**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**106**	5.84 U	**17.2**	4.8 U	**73.8**	**264**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**175**	37.7 U	38.3 U	32.8 U	**709**	**3270**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**1.41**	**1.69**	**30.7**	**9.67**	-- U	**13.5**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**4.4**	**2.62**	**38.3**	**6.48**	**0.806**	**18.7**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**117**	**3.4**	**41.1**	**6.32**	**36.5**	**167**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**163**	**11.6**	**28.1**	**10.6**	**257**	**511**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**0.082 J**	**0.099 J**	**18.8**	**1.19**	0.342 U	**0.421 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.156 J**	0.069 U	**35.3 J**	**0.434 J**	0.66 U	**0.494 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**0.113 J**	0.07 U	**7.64**	**0.39 J**	0.718 U	**0.402 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**0.873 J**	0.062 U	**51.2 J**	**0.335 J**	0.862 U	**1.86 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.14**	0.061 U	**11 J**	**0.195 J**	0.918 U	**2.19**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**3.75**	0.1 U	**1.13 J**	0.118 U	1.29 U	**1.48**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**2.38**	0.063 U	**3.23**	**0.083 J**	1.01 U	**3.73**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**96.2**	**1.06**	**51.9**	**1.61 J**	**6.75**	**99**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**2.48**	0.078 U	**2.32**	0.089 U	2.1 U	**3.3**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**83.4**	**2.23**	**14.9**	**1.93 J**	**17.2**	**122**
Total Tetrachlorodibenzofuran (TCDF)	--	**1.31**	**1.32**	**120**	**23.4**	**2.75**	**8.26**
Total Pentachlorodibenzofuran (PeCDF)	--	**8.39**	**0.286**	**120**	**5**	**9.81**	**26.4**
Total Hexachlorodibenzofuran (HxCDF)	--	**113**	**1.26**	**95.9**	**2.76**	**17.6**	**148**
Total Heptachlorodibenzofuran (HpCDF)	--	**270**	**3.3**	**59.5**	**4.18**	**18.5**	**304**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**6.7 J**	**0.26 J**	**17.7 J**	**1.2 J**	**1.47**	**11 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-15	PG18-GP-15	PG18-GP-15	PG18-GP-15	PG18-GP-15	PG18-GP-16
	Sample ID	PG18-GP-15-03-05-20180305	PG18-GP-15-05-07-20180305	PG18-GP-15-09-11-20180305	PG18-GP-15-13-15-20180305	PG18-GP-65-03-05-20180305	PG18-GP-16-00-01-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft	3 - 5 ft	0 - 1 ft
	Sample Type	N	N	N	N	FD	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211748.364	1211748.364	1211748.364	1211748.364	1211748.364	1211569.693
	Y	316861.228	316861.228	316861.228	316861.228	316861.228	316744.525
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	92.75	95.72	66.12	36.98	93.26	89.52
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.756 J	0.076 U	0.385 J	0.073 U	0.809 J	0.062 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	7.1	0.153 U	3.66	0.535 J	6.96	0.503 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	8.01	0.362 J	7.56	0.353 J	7.63	1.59
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	231	2.83	81.7	0.827 J	217	10.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	72.7	0.655 U	11.8	0.721 U	70.9	4.09
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	1080	72.2	1700	8.84 U	1080	369
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	4380 J	522	11300	88	4860	3220
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	121	0.422	14.3	4.85	133	4.56
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	106	1.39	36.7	7.99	123	8.53
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	1200	13.5	217	14.1	1120	163
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	1750	126	2470	19.7	1770	2180
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	2.77	0.089 U	0.832 J	0.56 J	3.08	0.194 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	3.13 J	0.151 J	1.25	0.594 J	3.21	0.144 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	3.93 J	0.082 J	0.906 J	0.553 J	4.36 J	0.136 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	12.2	0.498 J	12	0.645 J	14.1 J	0.611 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	18.9	0.216 J	5.74	0.651 J	22.6	0.328 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	9.78	0.363 J	11.8	0.232 J	9.22	0.4 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	30.4	0.225 J	13.4	0.782 J	35.5	0.41 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	711	24.5	1060	3.88	758	32.8
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	23.2	1.38	39.2	0.273 J	26.8	1.48
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	694	76.8	2710	4.76	700	111
Total Tetrachlorodibenzofuran (TCDF)	--	79.1	0.423	16	12.9	83	3.31
Total Pentachlorodibenzofuran (PeCDF)	--	210	1.79	37.6	7.6	232	3.12
Total Hexachlorodibenzofuran (HxCDF)	--	983	28.8	1120	7.22	1020	35.3
Total Heptachlorodibenzofuran (HpCDF)	--	1840	113	4210	9.7	1910	136
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	67.4 J	1.6 J	51 J	1.2 J	67 J	7.4 J

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-16	PG18-GP-16	PG18-GP-16	PG18-GP-16	PG18-GP-16	PG18-GP-17
	Sample ID	PG18-GP-16-01-03-20180305	PG18-GP-16-03-05-20180305	PG18-GP-16-05-07-20180305	PG18-GP-16-09-11-20180305	PG18-GP-16-13-15-20180305	PG18-GP-17-00-01-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	1 - 3 ft	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft	0 - 1 ft
	Sample Type	N	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO	SO
	X	1211569.693	1211569.693	1211569.693	1211569.693	1211569.693	1211426.703
	Y	316744.525	316744.525	316744.525	316744.525	316744.525	316931.377
	MTCA Method B Unrestricted						
Conventional Parameters (pct)							
Total organic carbon	--	--	--	--	--	--	--
Total solids	--	93.36	95.08	92.86	68.78	23.38	95.15
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.571 J	0.451 J	0.328 J	0.47 J	0.147 U	3.82
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	4.43	2.59	2.23	4.14	0.248 U	19.2
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	4.8	2.76 J	2.44	3.39	0.327 U	10.7
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	45.2	36.7	21.8	39.3	0.326 U	40.7
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	14.3	13.6	7.28	4.51	0.308 U	21
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	488	257	217	690	5.12 U	453
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	4520	1780	1910	4130	27 U	2600
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	54.8	52.3	43.8	39.1	2.33	490
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	62.7	46.4	38.8	50.1	2.28	543
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	376	236	170	137	3.64	546
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	2470	832	1000	1020	10.8	925
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	1.34	1.62	0.897 J	2.24	0.518 J	16.2
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.969 J	1.01 J	0.585 J	1.55	0.478 J	11.8 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.945 J	1.2	0.594 J	1.33	0.321 J	9.37
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	2.11	1.75	1.09	7.99	0.152 U	15 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	2.64	2.3	1.26 J	3.5	0.156 U	12.6
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	1.87	1.39	0.72 J	9.93	0.187 U	2.65
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	0.126 U	3.94	2.29	8.51	0.157 U	17.8 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	129	121	52.2	484	1.82 J	269
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	3.91	2.98	1.69 J	20.3	0.27 U	8.36
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	213	195	90.3	977	2.52 J	321
Total Tetrachlorodibenzofuran (TCDF)	--	28.5	35	20.5	44.9	9.79	314
Total Pentachlorodibenzofuran (PeCDF)	--	33.2	30.7	18.3	35.6	2	169
Total Hexachlorodibenzofuran (HxCDF)	--	144	119	63.1	593	1.81	357
Total Heptachlorodibenzofuran (HpCDF)	--	368	333	150	1950	5.22	662
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	20.2 J	14.2 J	9.84 J	26 J	0.181 J	48 J

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task	2017RIFS	2017RIFS	2017RIFS	2017RIFS	2017RIFS
	Location ID	PG18-GP-17	PG18-GP-17	PG18-GP-17	PG18-GP-17	PG18-GP-17
	Sample ID	PG18-GP-17-01-03-20180305	PG18-GP-17-03-05-20180305	PG18-GP-17-05-07-20180305	PG18-GP-17-09-11-20180305	PG18-GP-17-13-15-20180305
	Sample Date	3/5/2018	3/5/2018	3/5/2018	3/5/2018	3/5/2018
	Depth	1 - 3 ft	3 - 5 ft	5 - 7 ft	9 - 11 ft	13 - 15 ft
	Sample Type	N	N	N	N	N
	Matrix	SO	SO	SO	SO	SO
	X	1211426.703	1211426.703	1211426.703	1211426.703	1211426.703
	Y	316931.377	316931.377	316931.377	316931.377	316931.377
	MTCA Method B Unrestricted					
Conventional Parameters (pct)						
Total organic carbon	--	--	--	--	--	--
Total solids	--	**90.4**	**86.78**	**73.42**	**41.43**	**83.91**
Dioxin Furans (ng/kg)						
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	0.058 U	**0.322 J**	**0.19 J**	**0.685 J**	**0.087 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	0.256 U	**1.37 J**	**0.704 J**	**3.26**	0.197 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**1.2**	**5.33**	**1.18 J**	**2.89**	0.084 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**27**	**36.3**	**11.2**	**5.82**	0.394 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**8.18**	**13.9**	**4.57**	**4.94**	0.381 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**443**	**540**	**272**	**66**	4.72 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**3910**	**4630**	**2210**	**405**	22.6 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.734**	**29**	**5.46**	**101**	**4.98**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**2.11**	**111**	**8.94**	**108**	**11.2**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**103**	**339**	**107**	**160**	**19.6**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**690**	**919**	**935**	**127**	**11**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	0.068 U	0.083 U	**0.212 J**	**3.46**	0.042 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.102 U	**0.231 J**	**0.267 J**	**4.64 J**	**0.08 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	0.105 U	0.093 U	**0.208 J**	**2.12**	0.054 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.76**	**2.55**	**1.1**	**11.1 J**	0.042 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.24**	**2.04**	**0.688 J**	**3.43**	0.041 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**1.51**	**2.16**	**0.77 J**	**0.703 J**	0.048 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**3**	**4.78**	**1.22**	**1.94 J**	0.043 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**167**	**236**	**46**	**35**	**0.333 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**6.99**	**10.1**	**1.97**	**1.18 J**	0.07 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**261**	**393**	**90.7**	**26.6**	0.23 U
Total Tetrachlorodibenzofuran (TCDF)	--	**0.369**	**3.46**	**3.51**	**57.4**	**0.607**
Total Pentachlorodibenzofuran (PeCDF)	--	**7.53**	**21.9**	**6.19**	**31.5**	**0.268**
Total Hexachlorodibenzofuran (HxCDF)	--	**198**	**292**	**58.7**	**37.5**	**0.195**
Total Heptachlorodibenzofuran (HpCDF)	--	**597**	**835**	**166**	**58.2**	**0.562**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12	**12**	**18 J**	**6.95 J**	**9.3 J**	**0.093 J**

Table 1
2017 Supplemental RI/FS Dioxin/Furan Results

	Task Location ID Sample ID Sample Date Depth Sample Type Matrix X Y
	MTCA Method B Unrestricted
Conventional Parameters (pct)	
Total organic carbon	--
Total solids	--
Dioxin Furans (ng/kg)	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--
Total Tetrachlorodibenzofuran (TCDF)	--
Total Pentachlorodibenzofuran (PeCDF)	--
Total Hexachlorodibenzofuran (HxCDF)	--
Total Heptachlorodibenzofuran (HpCDF)	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	12

Notes:

Horizontal coordinate datum is NAD 1983 State Plane Washington North FIPS 4601 (US Survey Feet).

Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.

Dioxin/furan TEQ values were calculated with 2005 World Health Organization (WHO) TEF values for mammals.

Detected concentration is greater than MTCA Method B Unrestricted screening level.

Bold: Detected result

FD: field duplicate sample

ft: feet

J: Estimated value

mg/kg: milligram per kilogram

N: normal environmental sample

ng/kg: nanograms per kilogram

pct: percent

SO: soil matrix

U: Compound analyzed, but not detected above detection limit

UJ: Compound analyzed, but not detected above estimated detection limit

Table 2
Mill Site Soil Cleanup Levels

Analyte	Unit	Direct Contact Exposure Protection Residential	Direct Contact Exposure Protection Open-space[g]	Terrestrial Ecological Evaluation	Natural Background[a]	Practical Quantitation Level	Site-Specific Soil Cleanup Level	Basis for Cleanup Level
Dioxin/Furan TEQ	ng/kg	12[b]	45	260[c]	NC	5	12	Direct Contact
Total cPAHs[d]	µg/kg	190	480	30,000	NC	5	190	Direct Contact
Lead	mg/kg	250[e]	NC	220[f]	17	0.1	220	TEE[f]

Notes:

a. PTI Environmental Services Draft Report, Sections 1-7 Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State. Prepared for Washington Department of Ecology. April 1989.

b. Washington State Department of Ecology (Ecology) Cleanup Levels and Risk Calculation (CLARC) II Tables for unrestricted site use (incl. drinking water); 10-6 cancer risk

c. Based on site-specific biota accumulation factor (BAF) and MTCA Wildlife Exposure Model for Site-Specific Evaluations (Table 749-4; WAC 173-340-900)

d. The total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) concentration for each sample was calculated using the Method B toxicity equivalency factor (TEF) methodology described in WAC 173-340-708(8)(e)(ii).

e. Model Toxic Control Act (MTCA) Method A – based on MTCA Method A Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340-900, Table 740-1)

f. Simplified Terrestrial Ecological Evaluation Soil Cleanup Levels for Unrestricted Land use Sites (WAC 173-340-900, Table 749-2)

g. Based on Ecology (2015), assuming 2 days per week of child exposure.

µg/kg: micrograms per kilogram
cPAH: carcinogenic polycyclic aromatic hydrocarbons
EQ: toxicity equivalency factor
mg/kg: milligrams per kilogram
NC: not calculated
ng/kg: nanograms per kilogram
PQL: Practical Quantitation Limit
TEE: Terrestrial Ecological Evaluation

Table 3
Mill Site Groundwater Cleanup Levels

Analyte	Unit	Drinking Water Protection	Marine Surface Water Chronic Criterion[a]	Natural Background	Practical Quantitation Level (PQL)	Site-Specific Groundwater Cleanup Level	Basis for Cleanup Level
Dioxin/Furan TEQ	pg/L	0.67[b]	--	NC	4.4	4.4	PQL
Total cPAHs[c]	ng/L	12	--	NC	20[d]	20	PQL
Arsenic	µg/L	5[e]	36	8[f]	0.22	8	Natural Background

Notes:

a. WA Surface Water Quality - Washington Marine Water Chronic Criteria; WAC 173-201A-040, based on protection of aquatic organisms

b. Washington State Department of Ecology (Ecology) Cleanup Levels and Risk Calculation (CLARC) II Tables for unrestricted site use (incl. drinking water); 10-6 cancer risk

c. The total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) concentration for each sample was calculated using the TEF methodology described in WAC 173-340-708(8)(e)(ii)

d. Based on ARI's MDL for benoz(a)pyrene

e. Model Toxics Control Act (MTCA) Method A – MTCA Method A Cleanup Levels for Groundwater (WAC 173-340-900, Table 720-1)

f. PTI Environmental Services Draft Report, Sections 1-7 Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State. Prepared for Washington Department of Ecology. April 1989.

µg/L: microgram per liter

MDL: method detection limit

MTCA: Model Toxics Control Act

NC: not calculated

ng/L: nanograms per liter

pg/L: picograms per liter

PQL: Practical Quantitation Limit; ten times the Analytical Resources, Inc. (ARI) and AXYS Analytical Services Ltd. (AXYS) method detection limit (MDL); below the PQL specified in the US Environmental Protection Agency (EPA) Method 1613B

TEQ: toxicity equivalency factor

Table 4
Steady-State Reible Model Array Worksheet

Inputs	Units	Value
Octanol-water partition coefficient, log K_{ow}		7.32
Water Diffusivity, D_w	cm^2/s	4.3E-06
Cap Decay Rate, l_1	yr^{-1}	0
Bioturbation Layer Decay Rate, l_2	yr^{-1}	0
Nearshore Soil TOC	%	1.48%
Colloidal Organic Carbon Concentration, r_{DOC}	mg/L	0
Darcy Velocity, *V (* positive is upwelling)	cm/yr	2,577
Depositional Velocity, V_{dep}	cm/yr	0
Bioturbation Layer Thickness, h_{bio}	cm	60.96
Pore Water Biodiffusion Coefficient, D_{bio}^{pw}	cm^2/yr	100
Particle Biodiffusion Coefficient, D_{bio}^{p}	cm^2/yr	1
Conventional Cap placed depth	in	24
Conventional Cap placed depth	cm	60.96
Cap Materials -Granular (G) or Consolidated (C)		G
Porosity, e		0.4
Particle Density, ρ_P	g/cm^3	2.60
Fraction organic carbon at depth of interest, $f_{oc}(z)$		0.02%
Estimates		
Organic Carbon Partition Coefficient, log K_{oc}	log L/kg	7.20
Colloidal Organic Carbon Partition Coefficient, log K_{DOC}	log L/kg	6.83
Boundary Layer Mass Transfer Coefficient, k_{bl}	cm/hr	2.00
Dispersivity Percent of Domain length	%	50%
Dispersivity, α	cm	30.48
Effective Cap Layer Diffusion/Dispersion Coeff., D_1	cm^2/yr	78,586
Bioturbation Layer Diffusion/Dispersion Coeff., D_2	cm^2/yr	83,631
Outputs		
γ = SQRT(Pe12/4+Da)		0.939
Sherwood Number at Interface, Sh		*12.8*
Containment Layer Retardation Factor, R1		*4,945*
Bioturbation Layer Retardation Factor, R2		*4,945*
Effective Advective Velocity, U	cm/yr	2,577
Characteristic Reaction Time-cap layer, t decay	yr	infinity

Table 5
Mill Site Dioxin/Furan Cleanup and Remediation Levels

Parameter	Value	Units	Notes
Soil			
Practical Quantitation Limit	5	ng/kg TEQ	Developed by Ecology in the Port Gamble Bay remedial investigation
Natural Background Level	--	ng/kg TEQ	Not yet calculated by Ecology
MTCA Method B Human Health Protection Calculation	12	ng/kg TEQ	Ecology CLARC II Tables for unrestricted site use (incl. residential); 10^{-6} cancer risk
MTCA Method B Ecological Protection Calculation	260	ng/kg TEQ	Incorporating site-specific biota accumulation factor into MTCA risk equations; 0 to 6 foot point of compliance remediation level
Soil Cleanup Remediation Level (open-space land use exposure scenario)	45	ng/kg TEQ	Method B human health risk calculation determines the MTCA soil cleanup level; point of compliance throughout Site
Soil Cleanup Level (residential land use exposure scenario)	**12**	**ng/kg TEQ**	**Method B human health risk calculation determines the MTCA soil cleanup level; point of compliance throughout Site**
Soil Remediation Level	530	ng/kg TEQ	Steady-state Reible model output based on sediment protection; point of compliance throughout Site
Groundwater			
Practical Quantitation Limit	4.4	pg/L TEQ	Ten times the ARI/AXYS MDL; below the PQL specified in EPA Method 1613B
Natural Background Level	--	pg/L TEQ	Not yet calculated by Ecology
Applicable State and/or Federal Law (ARAR)	30	pg/L TEQ	WA Drinking Water Maximum Contaminant Level
MTCA Method B Human Health Protection Calculation	0.67	pg/L TEQ	Ecology CLARC II Tables for unrestricted site use (incl. drinking water); 10^{-6} cancer risk
Groundwater Cleanup Level	**4.4**	**pg/L TEQ**	**PQL determines the MTCA groundwater cleanup level (also ensuring surface water protection; see below)**
Maximum Groundwater Concentration at Soil Remediation Level	2.2	pg/L TEQ	Calculated using Reible model assuming implementation of soil remediation level; to be confirmed with post-construction monitoring
Surface Water			
Practical Quantitation Limit	4.4	pg/L TEQ	Ten times the ARI/AXYS MDL; below the PQL specified in EPA Method 1613B
Natural Background Level	--	pg/L TEQ	Not yet calculated by Ecology
Applicable State and/or Federal Law (ARAR)	0.0051	pg/L TEQ	EPA human health surface water criterion applicable to Washington State (40 CFR 131.45); unadjusted for PQL
MTCA Method B Human Health Protection Calculation	0.010	pg/L TEQ	Ecology CLARC II Tables for unrestricted site use (incl. fish/shellfish consumption); 10^{-6} cancer risk
Surface Water Cleanup Level	**4.4**	**pg/L TEQ**	**PQL determines the MTCA surface water cleanup level**
Maximum Surface Water Concentration at Soil Remediation Level	0.33	pg/L TEQ	Calculated using Reible model assuming implementation of soil remediation level
Sediment			
Practical Quantitation Limit	5.0	ng/kg TEQ	Developed by Ecology in the Port Gamble Bay remedial investigation
Natural Background Level	4.4	ng/kg TEQ	Developed by Ecology in the Port Gamble Bay remedial investigation
Applicable State and/or Federal Law (ARAR)	--	ng/kg TEQ	No sediment ARARs available for dioxins/furans
MTCA Method B Human Health Protection Calculation	< 4.4	ng/kg TEQ	Approximated by Ecology in the Port Gamble Bay remedial investigation based on shellfish consumption pathway
Sediment Cleanup Level	**5.0**	**ng/kg TEQ**	**PQL determines the MTCA/SMS sediment cleanup level; developed by Ecology in the Port Gamble Bay Cleanup Action Plan**
Maximum Sediment Concentration at Soil Remediation Level	5.0	ng/kg TEQ	Calculated using Reible model assuming implementation of soil remediation level; to be confirmed with post-construction monitoring

Notes:

ARAR: Applicable or Relevant and Appropriate Requirement
ARI/AXYS: Analytical Resources, Inc./AXYS Analytical Services LTD
ATSDR: Agency for Toxic Substances and Disease Registry
Ecology: Washington State Department of Ecology
EPA: US Environmental Protection Agency
MDL: method detection limit
MTCA: Model Toxics Control Act
ng/kg: nanograms per kilogram
pg/L: picogram per liter
PQL: Practical Quantitation Limit
SMS: Sediment Management Standards
TEQ: toxics equivalents quotient

Table 6
Mill Site Upland Primary Disproportionate Cost Analysis Matrix

Criterion	Weighting	WAC Language	Considerations for Site-Specific Evaluation		Alternative 1: Complete Removal	Alternative 2A: Partial Removal	Alternative 2B: Partial Removal	Alternative 3: Focused Removal and Capping	Alternative 4: Capping	Alternative 5: Institutional Controls
					Removal of all soils exceeding the dioxin/furan cleanup level (12 ng/kg TEQ) and institutional controls	**Removal of all soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of surficial (top 2 feet) and nearshore (50-foot zone) soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), capping upland subsurface soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), and institutional controls**	**Removal of all soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of nearshore (50-foot zone) soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), capping upland subsurface soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), and institutional controls. Soils <260 ng/kg dioxin/furan TEQ would be capped on site outside of the 50-foot shoreline buffer.**	**Removal of all nearsurface (top 6 feet) soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of all soils deeper than 6 feet exceeding the surface water protection remediation level (530 ng/kg dioxin/furan TEQ), capping remaining soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), and institutional controls**	**Capping all soils exceeding the cleanup level (12 ng/kg dioxin/furan TEQ), and institutional controls**	**Completed interim actions and institutional controls**
Protectiveness	30%	*Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality.*	Protection of Human Health	Narrative	Achieves risk-based human health cleanup standards at the point of compliance throughout the Mill Site from the ground surface to 15 feet bgs immediately following completion of construction; 100% removal of Mill Site soils with dioxin/furan levels greater than 22 ng/kg TEQ	Capping and institutional controls eliminate the human exposure pathway; 100% removal of shoreline soils with dioxin/furan levels greater than 22 ng/kg TEQ; some increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg TEQ)	Capping and institutional controls eliminate the human exposure pathway; 100% removal of shoreline soils with dioxin/furan levels greater than 22 ng/kg TEQ; some increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg TEQ)	Capping and institutional controls eliminate the human exposure pathway; approximately 40% removal of shoreline soils with dioxin/furan levels greater than 22 ng/kg TEQ; therefore,this alternative was scored 40% lower than Alternative 2B	Capping and institutional controls eliminate the human exposure pathway; increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg TEQ)	Would not achieve human health-based cleanup standards; institutional controls alone may not fully eliminate the human exposure pathway
				Score	10.0	6.0	6.0	2.0	2.0	1.0
			Protection of the Environment	Narrative	Achieves risk-based ecological cleanup standards at the point of compliance (6 feet bgs) immediately following construction	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction	Would not achieve terrestrial ecological protection remediation levels	Would not achieve terrestrial ecological protection remediation levels
				Score	10.0	10.0	10.0	10.0	1.0	1.0
			Risks Resulting from Implementation	Narrative	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern	Capping is the lowest risk construction activity alternative	Non-construction alternative is low risk implementation
				Score	10.0	10.0	10.0	10.0	10.0	10.0
			Total	Score	10.0	8.7	8.7	7.3	4.3	4.0
Permanence	20%	*The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*	Certainty and Reliability	Narrative	Lowest potential for future exposure or releases due to removal of contaminated soil; climate change does not increase risk of future exposure or releases	Partial removal of contaminated soil and engineered cap provides low potential for future exposure or releases; only very limited climate change vulnerabilities were identified by climate-related risk analysis; additional protection from removal of shoreline soils	Partial removal of contaminated soil and engineered cap provides low potential for future exposure or releases; only very limited climate change vulnerabilities were identified by climate-related risk analysis; additional protection from removal of shoreline soils	Focused removal of contaminated soil and engineered cap provides low potential for future exposure or releases; only very limited climate change vulnerabilities were identified by climate-related risk analysis	Engineered cap provides low potential for future exposure or releases; risk of future exposure or releases due to climate change is mitigated by overall increase to site elevation; only very limited climate change vulnerabilities were identified by climate-related risk analysis	Reliance on institutional controls only has greatest potential for future exposure or releases
				Score	10.0	9.0	9.0	6.0	6.0	1.0
			Residual Risks	Narrative	Residual risks are very low; this alternative targets 99% dioxin/furan TEQ mass removal	Capping may require maintenance; this alternative targets 75% dioxin/furan TEQ mass removal; scored at 75% of Alternative 1 based on target mass removal	Capping may require maintenance; this alternative targets addiitonal dioxin/furan TEQ mass removal over Alternate 3	Capping may require maintenance; this alternative targets 50% dioxin/furan TEQ mass removal; scored at 50% of Alternative 1 based on targeted mass removal %)	Capping may require maintenance and does not provide reduced mass of dioxin/furan TEQ	Does not reduce toxicity, mobility, or volume of hazardous substances
				Score	10.0	7.5	6.0	5.0	1.0	1.0
			Total	Score	10.0	8.3	7.5	5.5	3.5	1.0
Long-Term Effectiveness	20%	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.*	MTCA Cleanup Action Components	Relative degree of long-term effectiveness	100% excavation	57% capping and 43% excavation	57% capping and 43% excavation	5% excavation 95% capping	100% capping	Institutional Controls Only
			On-site or off-site disposal in an engineered, lined and monitored facility	10						
			On-site isolation or containment with attendant engineering controls	5						
			Institutional controls and monitoring	1						
			Total	Score	10.0	7.8	7.8	5.2	5.0	1.0
Management of Short-Term Risk	10%	*The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.*	Risk to human health and safety during construction	Narrative	Large volume of excavation has slightly increased risk to public and worker safety during construction (approximately 8,500 trips through town)	Large volume of excavation has slightly increased risk to public and worker safety during construction (approximately 6,700 trips through town)	Large volume of excavation has slightly increased risk to public and worker safety during construction; on-site disposal of nearshore soils reduces truck trips through town(approximately 5,500 trips through town)	Excavation has additional risk to worker safety during construction; excavation of only soil above the 260 ng/kg dioxin/furan concentration reduces truck trips through town to 2,570	Capping is the lowest risk construction activity alternative with 1,880 truck trips though town	No risk to human health or the environment associated with this non-construction alternative
			Total	Score	5.0	6.1	6.8	8.5	8.9	10.0
Technical and Administrative Implementability	10%	*Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*	Technical Feasibility	Narrative	Few technical challenges	Few technical challenges	Few technical challenges	Few technical challenges	Technical challenge to demonstrate alternative meets cleanp requirements	Technical challenge to demonstrate alternative meets cleanp requirements
				Score	10	10	10	10	2	1
			Administrative Feasibility	Narrative	Few administrative challenges	Few administrative challenges	Few administrative challenges	Few administrative challenges	Administrative challenge to demonstrate alternative meets cleanp requirements	Administrative challenge to demonstrate alternative meets cleanp requirements
				Score	10	10	10	10	2	1
			Total	Score	10.0	10.0	10.0	10.0	2.0	1.0
Consideration of Public Concerns	10%	*Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*	Balance the Public Desire for Environmental Cleanup and Sustainable Local Economic Conditions	Narrative	Would satisfy public desire for removal, but impacts to local business may be more of a concern for the public; score was not reduced based on public concern	May satisfy public desire for removal, but impacts to local business may be a concern for the public; score was not reduced based on public concern	Balances public desire for removal and impacts to local business	May have some concern from public based on less removal, but has less impact to local business	Unlikely to satisfy public desire for active cleanup	Unlikely to satisfy public desire for active cleanup
			Total	Score	8.0	10.0	10.0	8.0	2.0	1.0
				Total Weighted Benefits	9.30	8.42	8.34	7.00	4.29	2.80
				Cost ($M)	$9.6	$7.9	$7.0	$2.7	$1.3	$0.2

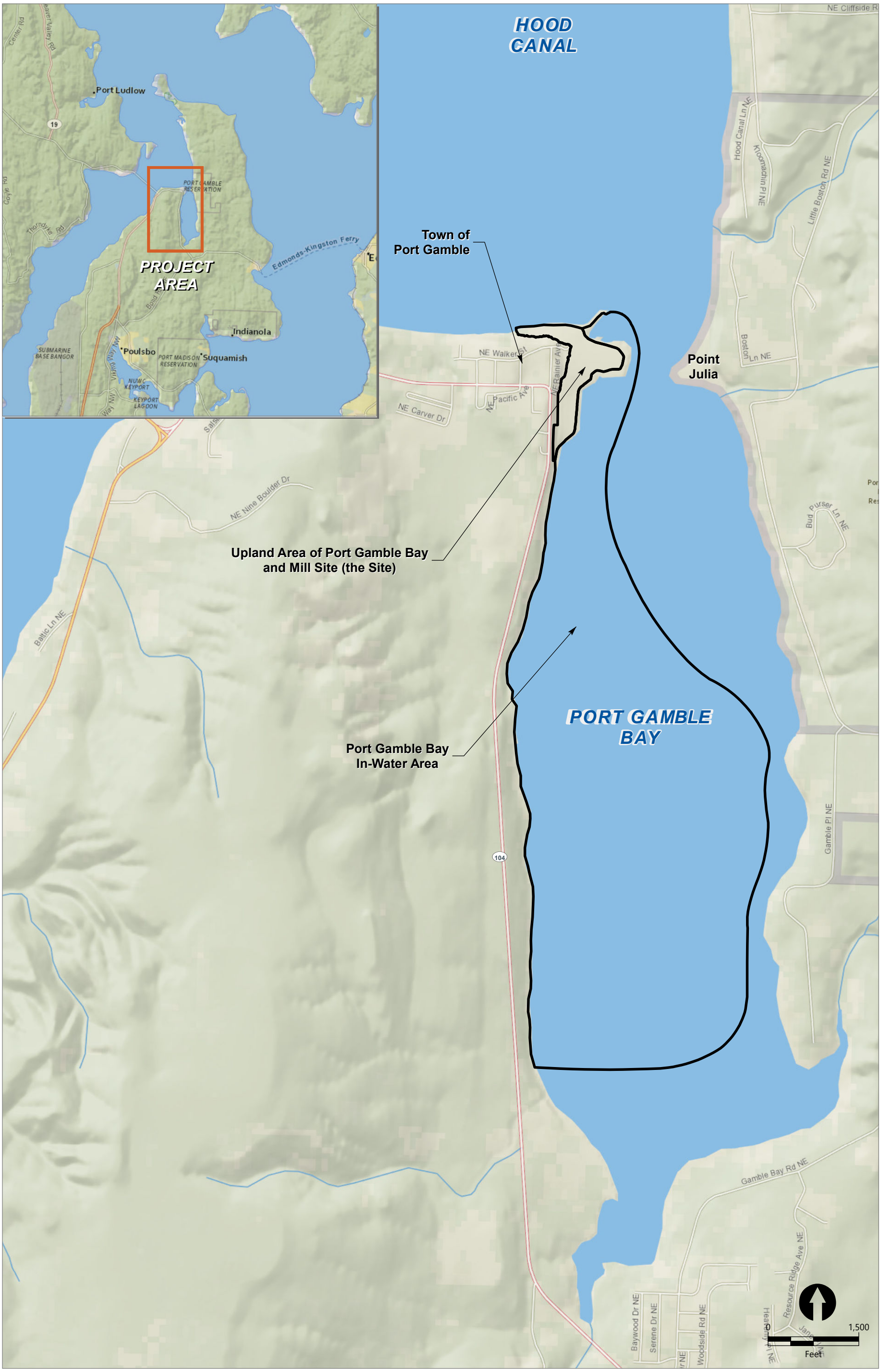
Notes:
bgs: below ground surface
ng/kg: nanograms per kilogram
TEQ: toxicity equivalency factor
WAC: Washington Administrative Code

Table 7
Mill Site Upland Secondary Disproportionate Cost Analysis Matrix

Criterion	Weighting	WAC Language	Considerations for Site-Specific Evaluation		Alternative 6: Complete Removal and Shoreline Restoration	Alternative 7A: Partial Removal and Shoreline Restoration	Alternative 7B: Partial Removal and Shoreline Restoration	Alternative 8: Focused Removal and Capping with Slope restoration	Alternative 9: Capping and Slope Restoration	Alternative 10: Institutional Controls
					Removal of all soils exceeding the dioxin/furan open space human health cleanup level (45 ng/kg TEQ) and institutional controls. Restore shoreline by excavating and backfilling/capping remediation areas to 10h:1v. Off-site commercial landfill disposal of excavated soils >45 ng/kg dioxin/furan TEQ.	Removal of all soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of surficial (top 2 feet) and near-shore (50-foot zone) soils exceeding the open-space cleanup level (45 ng/kg dioxin/furan TEQ), capping upland subsurface soils exceeding the cleanup level (45 ng/kg dioxin/furan TEQ), and institutional controls. Restore shoreline by excavating and backfilling/capping remediation areas to 10h:1v. Off-site commercial landfill disposal of excavated soils >45 ng/kg	Removal of all soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of surficial (top 2 feet) and near-shore (50-foot zone) soils exceeding the open-space cleanup level (45 ng/kg dioxin/furan TEQ), capping upland subsurface soils exceeding the cleanup level (45 ng/kg dioxin/furan TEQ), and institutional controls. Restore shoreline by excavating and backfilling/capping remediation areas to 10h:1v. Soils >45 and <260 ng/kg dioxin/furan TEQ would be capped on-site outside of the 50-foot shoreline buffer. Off-site commercial landfill disposal of excavated soils >260 ng/kg dioxin/furan TEQ.	Removal of all near-surface (top 6 feet) soils exceeding the terrestrial ecological protection remediation level (260 ng/kg dioxin/furan TEQ), removal of all soils deeper than 6 feet exceeding the surface water protection remediation level (530 ng/kg dioxin/furan TEQ), capping remaining soils exceeding the cleanup level (45 ng/kg dioxin/furan TEQ), and institutional controls. Restore shoreline by excavating remediation areas to 10h:1v and capping.	Capping all soils exceeding the open-space cleanup level (45 ng/kg dioxin/furan TEQ), and institutional controls. Restore shoreline by excavating remediation areas to 10h:1v and capping.	Completed interim actions and institutional controls
Protectiveness	30%	*Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality.*	Protection of Human Health	Narrative	Achieves risk-based human health cleanup standards at the point of compliance throughout the Mill Site from the ground surface to 15 feet bgs immediately following completion of construction. 100% of shoreline soils exceeding the 22 ng/kg dioxin/furan TEQ concentration protective of 0.014 pg/L EPA NTR surface water quality criterion.	Capping and institutional controls eliminate the human exposure pathway. 100% removal of shoreline soils exceeding the 22 ng/kg dioxin/furan TEQ concentration protective of 0.014 pg/L EPA NTR surface water quality criterion. Some increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg).	Capping and institutional controls eliminate the human exposure pathway. 100% removal of shoreline soils exceeding the 22 ng/kg dioxin/furan TEQ concentration protective of 0.014 pg/L EPA NTR surface water quality criterion. Some increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg).	Capping and institutional controls eliminate the human exposure pathway. Approximately 40% of shoreline soils marginaly exceed the 22 ng/kg dioxin/furan TEQ concentration protective of 0.014 pg/L EPA NTR surface water quality criterion and these soils not removed under this Alternative; therefore, this alternative was scored 40% lower than Alternative 2B.	Capping and institutional controls eliminate the human exposure pathway. Increased risk from capped material remaining on site above the human health direct contact concentration (12 ng/kg).	Would not achieve human health-based cleanup standards; institutional controls alone may not fully eliminate the human exposure pathway
				Score	10.0	6.0	6.0	2.0	2.0	1.0
			Protection of the Environment	Narrative	Achieves risk-based ecological cleanup standards at the point of compliance (6 feet bgs) immediately following construction.	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction. Additional protection resulting from shorline removal.	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction. Additional protection resulting from shorline removal.	Achieves terrestrial ecological protection remediation levels at the point of compliance (6 feet bgs) immediately following construction.	Achieves terrestrial ecological protection remediation levels at at a conditional point of compliance (2 feet bgs) immediately following construction. Scored 70% lower than Alternative 3 based on the need to demonstrate conditional point of compliance for	Would not achieve terrestrial ecological protection remediation levels
				Score	10.0	10.0	10.0	10.0	3.0	1.0
			Risks Resulting from Implementation	Narrative	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern.	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern.	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern.	Implements standard technologies with well established BMPs and saftey protocols, risk from implementation is not a significant concern.	Capping is the lowest risk construction activity alternative	Non-construction alternative is low risk implementation
				Score	10.0	10.0	10.0	10.0	10.0	10.0
			Total	Score	10.0	8.7	8.7	7.3	5.0	4.0
Permanence	20%	*The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*	Certainty and Reliability	Narrative	Lowest potential for future exposure or releases due to removal of contaminated soil; climate change does not increase risk of future exposure or releases.	Partial removal of contaminated soil and engineered cap provides low potential for future exposure or releases. Only very limited climate change vulnerabilities were identified by climate-related risk analysis. Additional protection from removal of shoreline soils.	Partial removal of contaminated soil and engineered cap provides low potential for future exposure or releases. Only very limited climate change vulnerabilities were identified by climate-related risk analysis. Additional protection from removal of shoreline soils.	Focused removal of contaminated soil and engineered cap provides low potential for future exposure or releases. Only very limited climate change vulnerabilities were identified by climate-related risk analysis. Some increased risk from shoreline soils remaining (40%)	Engineered cap provides low potential for future exposure or releases; risk of future exposure or releases due to climate change is mitigated by overall increase to site elevation. Only very limited climate change vulnerabilities were identified by climate-related risk analysis.Some increased risk from shoreline soils remaining (40%)	Reliance on institutional controls only has greatest potential for future exposure or releases
				Score	10.0	9.0	9.0	6.0	6.0	1.0
			Residual Risks	Narrative	Residual risks are very low; this alternative targets 99% dioxin/furan TEQ mass removal	Capping may require maintenance; this alternative targets 75% dioxin/furan TEQ mass removal. Scored at 75% of Alternative 1 based on target mass removal.	Capping may require maintenance; this alternative targets 75% dioxin/furan TEQ mass removal. Scored at 60% of Alternative 1 based on target mass removal with re-location of soils to on-site containment.	Capping may require maintenance; this alternative targets 50% dioxin/furan TEQ mass removal. Scored at 50% of Alternative 1 based on targeted mass removal %)	Capping may require maintenance and does not provide reduced mass of dioxin/furan TEQ	Does not reduce toxicity, mobility, or volume of hazardous substances
				Score	10.0	7.5	6.0	5.0	1.0	1.0
			Total	Score	10.0	8.3	7.5	5.5	3.5	1.0
Long-Term Effectiveness	20%	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.*	MTCA Cleanup Action Components	Relative degree of long-term effectiveness	100% excavation	75% capping and 25% excavation	75% capping and 25% excavation	10% excavation 90% capping	100% capping	Institutional Controls Only
			On-site or off-site disposal in an engineered, lined and monitored facility	10						
			On-site isolation or containment with attendant engineering controls	5						
			Institutional controls and monitoring	1						
			Total	Score	10.0	6.25	6.25	5.5	5.0	1.0
Management of Short-Term Risk	10%	*The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.*	Risk to human health and safety during construction	Narrative	Large volume of excavation has slightly increased risk to public and worker safety during construction (approximately 5,000 trips through town)	Large volume of excavation has slightly increased risk to public and worker safety during construction (approximately 2,700 trips through town)	Large volume of excavation has slightly increased risk to public and worker safety during construction. On site disposal of nearshore soils reduces truck trips through town(approximately 2,300 trips through town)	Excavation has additional risk to worker safety during construction. Approximately 1,900 truck trips through town.	Capping is the lowest risk construction activity alternative with 550 truck trips though town.	No risk to human health or the environment associated with this non-construction alternative
			Total	Score	5.0	7.3	7.7	8.1	9.5	10.0
Technical and Administrative Implementability	10%	*Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*	Technical Feasibility	Narrative	Few technical challenges	Few technical challenges	Few technical challenges	Few technical challenges	Technical challenge to demonstrate alternative meets cleanp requirements	Technical challenge to demonstrate alternative meets cleanp requirements
				Score	10	10	10	10	2	1
			Administrative Feasibility	Narrative	Few administrative challenges	Few administrative challenges	Few administrative challenges	Few administrative challenges	Administrative challenge to demonstrate alternative meets cleanp requirements	Administrative challenge to demonstrate alternative meets cleanp requirements
				Score	10	10	10	10	2	1
			Total	Score	10.0	10.0	10.0	10.0	2.0	1.0
Consideration of Public Concerns	10%	*Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*	Balance the Public Desire for Environmental Cleanup and Sustainable Local Economic Conditions	Narrative	Would satisfy public desire for removal, but impacts to local business may be more of a concern for the public. Score was not reduced based on public concern.	May satisfy public desire for removal, but impacts to local business may be a concern for the public. Score was not reduced based on public concern.	Balances public desire for removal and impacts to local business.	May have some concern from public based on less removal, but has less impact to local business.	Unlikely to satisfy public desire for active cleanup	Unlikely to satisfy public desire for active cleanup
			Total	Score	8.0	10.0	10.0	8.0	2.0	1.0
				Total Weighted Benefits	9.30	8.23	8.12	7.01	4.55	2.80
				Cost ($M)	$6.7	$6.1	$5.2	$2.9	$2.2	$0.2

Notes:
bgs: below ground surface
ng/kg: nanograms per kilogram
TEQ: toxicity equivalency factor
WAC: Washington Administrative Code

Figures



Publish Date: 2019/05/01, 1:20 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Site_Vicinity_RIFS.mxd

ANCHOR QEA

Figure 1
Site Vicinity Map
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

Publish Date: 2019/05/01, 1:20 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Potential_Mill_Site_Upland_Source_Areas_RIFS.mxd

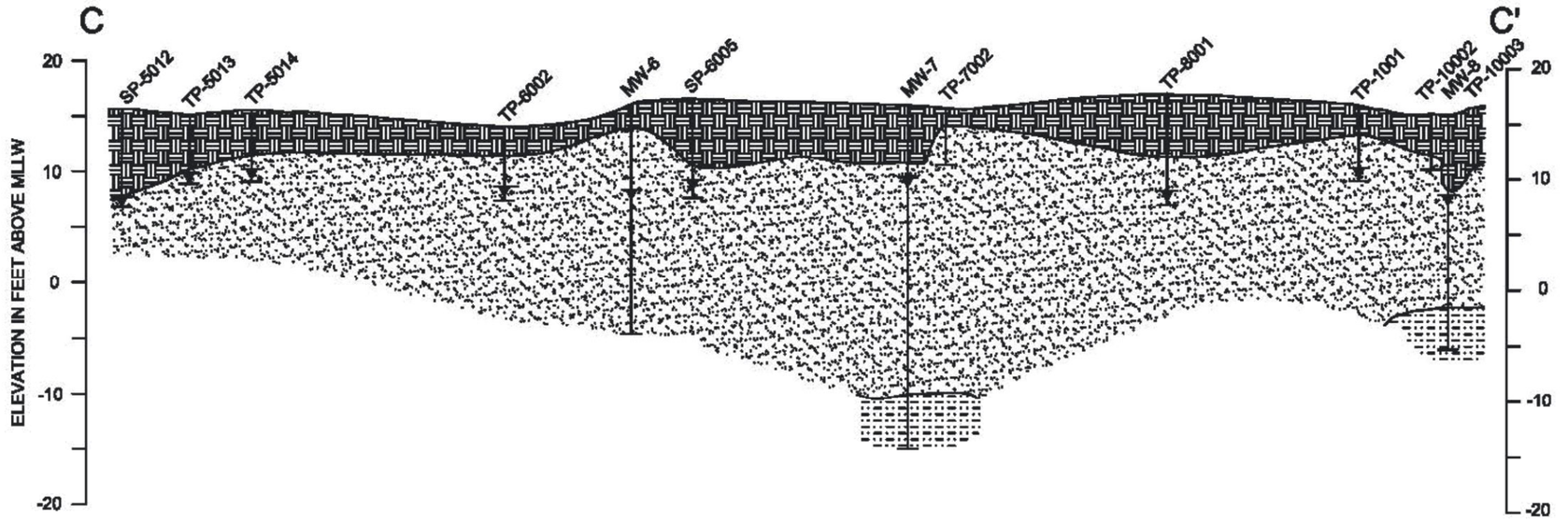
ANCHOR QEA

Figure 2
Potential Mill Site Upland Source Areas
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

Publish Date: 2019/05/01, 1:19 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_1999_2001_MillSiteSoilSampling_and_Xsections_RIFS.mxd

ANCHOR QEA

Figure 3
1999 to 2001 Mill Site Soil Sampling Locations and Cross-Sections
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



SOURCE: INTERIM REPORT NO.2 - POPE & TALBOT, INC. PORT GAMBLE MILL SITE, RESULTS OF PHASE I GROUNDWATER AND SURFACE WATER INVESTIGATION (OCTOBER 10, 1990; PARAMETRIX 1990d)

KEY:

- FILL
- SAND, NATIVE MATERIAL
- SILTY SAND OR CLAYEY SILT, NATIVE MATERIAL
- BOTTOM OF BORING
- WATER LEVEL AT TIME EXECUTION OR DRILLING

0 75 150
SCALE: 1" = 150'

NOTES:
-WATER LEVELS FOR TP-7002, TP-10002, AND TP-10003 ARE NOT RELIABLE
-BASE DRAWING BY PARAMETRIX
-SCALE: 10 HORIZONTAL EXAGGERATION

ENVIRONMENTAL PARTNERS INC
295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 3-5

CROSS SECTION C-C'

PROJECT	17008.2
PREPARED FOR	POPE RESOURCES
LOCATION	PORT GAMBLE MILL SITE PORT GAMBLE, WASHINGTON

SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	MMH	SLG	10/10/07

Publish Date: 2019/05/01, 1:42 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Representative Cross Section C-C'.mxd

Figure 4
Representative Cross Section C-C'
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

Publish Date: 2019/05/01, 1:19 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_2002_Interim_Remedial_Action_Removal_Areas.mxd

ANCHOR QEA

Figure 5
2002 Interim Remedial Action Removal Areas
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

2004/2005 Interim Remedial Action Removal Area

- Arsenic and TPH
- Mercury

0 200

Feet

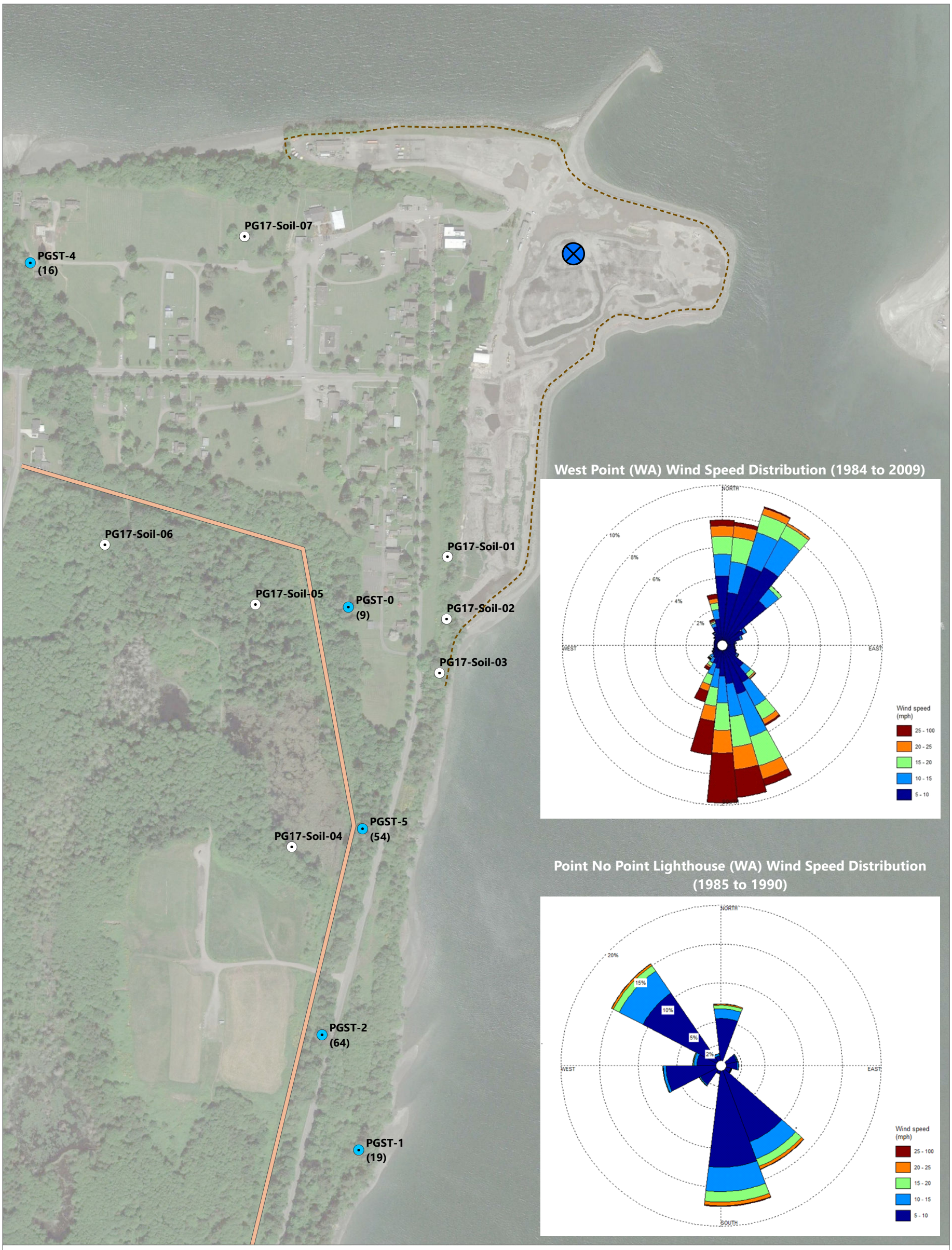
Publish Date: 2019/05/01, 1:19 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_2004_2005_Interim_Remedial_Action_Removal_Areas.mxd

ANCHOR QEA

Figure 6

2004/2005 Interim Remedial Action Removal Areas

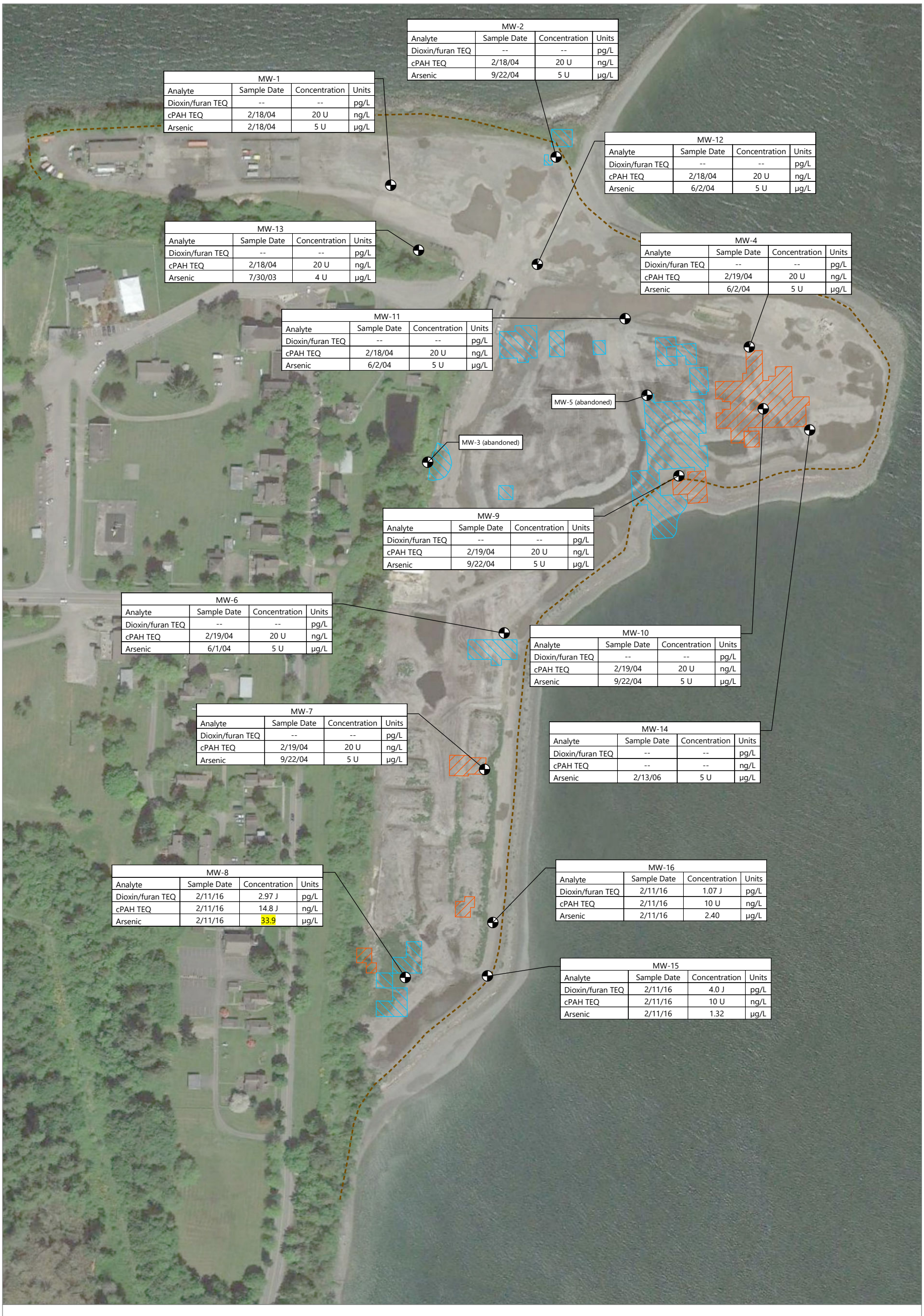
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



Publish Date: 2019/05/01, 1:21 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_2017_MillSite_Chr_and_WindRose_RIFS.mxd

ANCHOR QEA

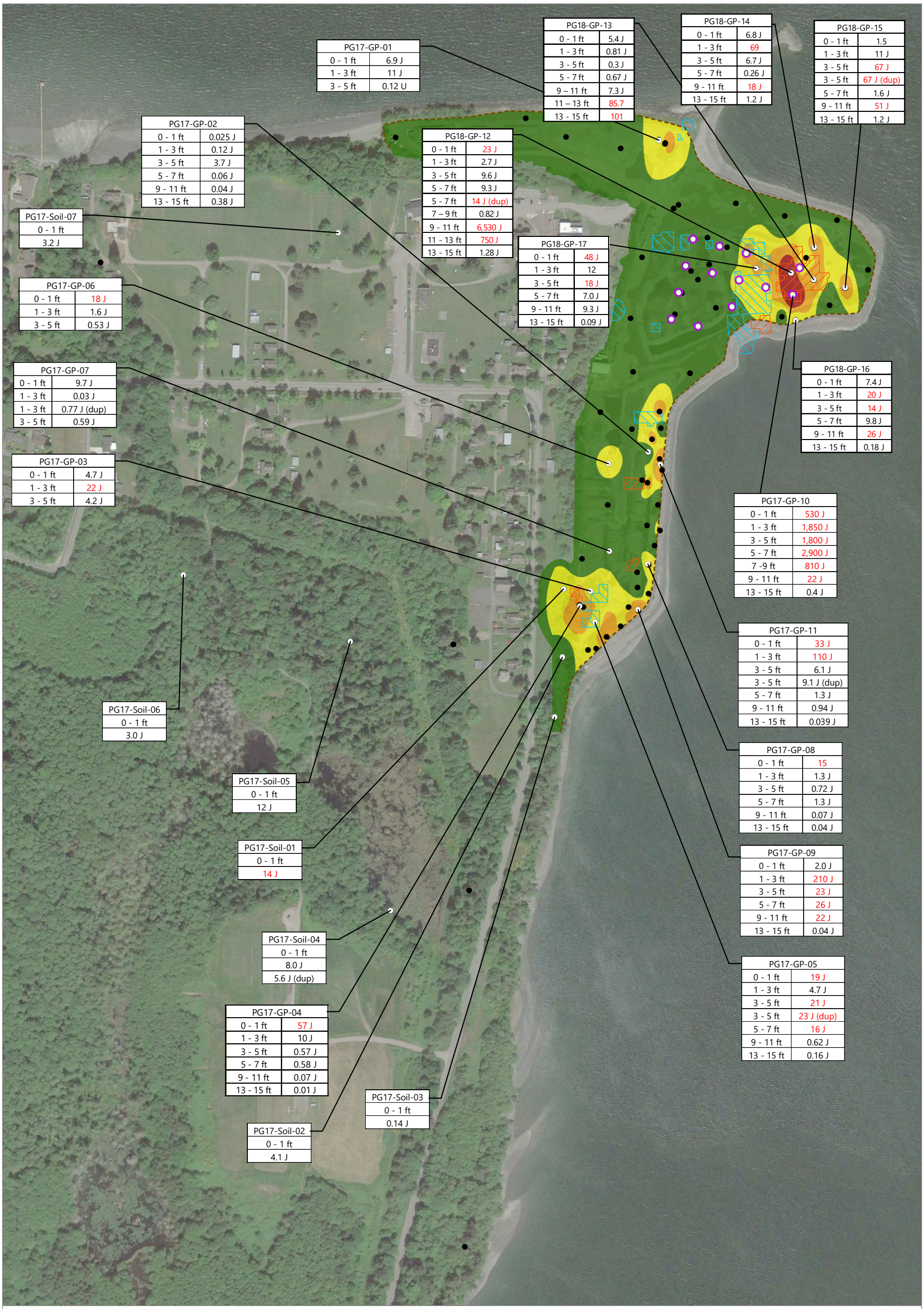
Figure 7
2017 Mill Site Boundary Characterization Sampling Stations and Prevailing Winds
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



Publish Date: 2019/05/01, 1:24 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_COPC_GW_RIFS.mxd

ANCHOR QEA

Figure 8
CoC Concentrations in Groundwater
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

- 2017 surface soil sampling station
- 2017 Post-Stockpile Sampling Location
- Existing surface soil sample location
- 18J Detected concentration is greater than MTCA Method B unrestricted land use soil screening criterion

Total Dioxin/Furan TEQ 2005 (ng/kg)

- < 12
- 12 - 45
- 45 - 260
- > 260

Remedial excavation area

- Mercury
- Other
- Approximate Recent Top of Bank

NOTE(S):

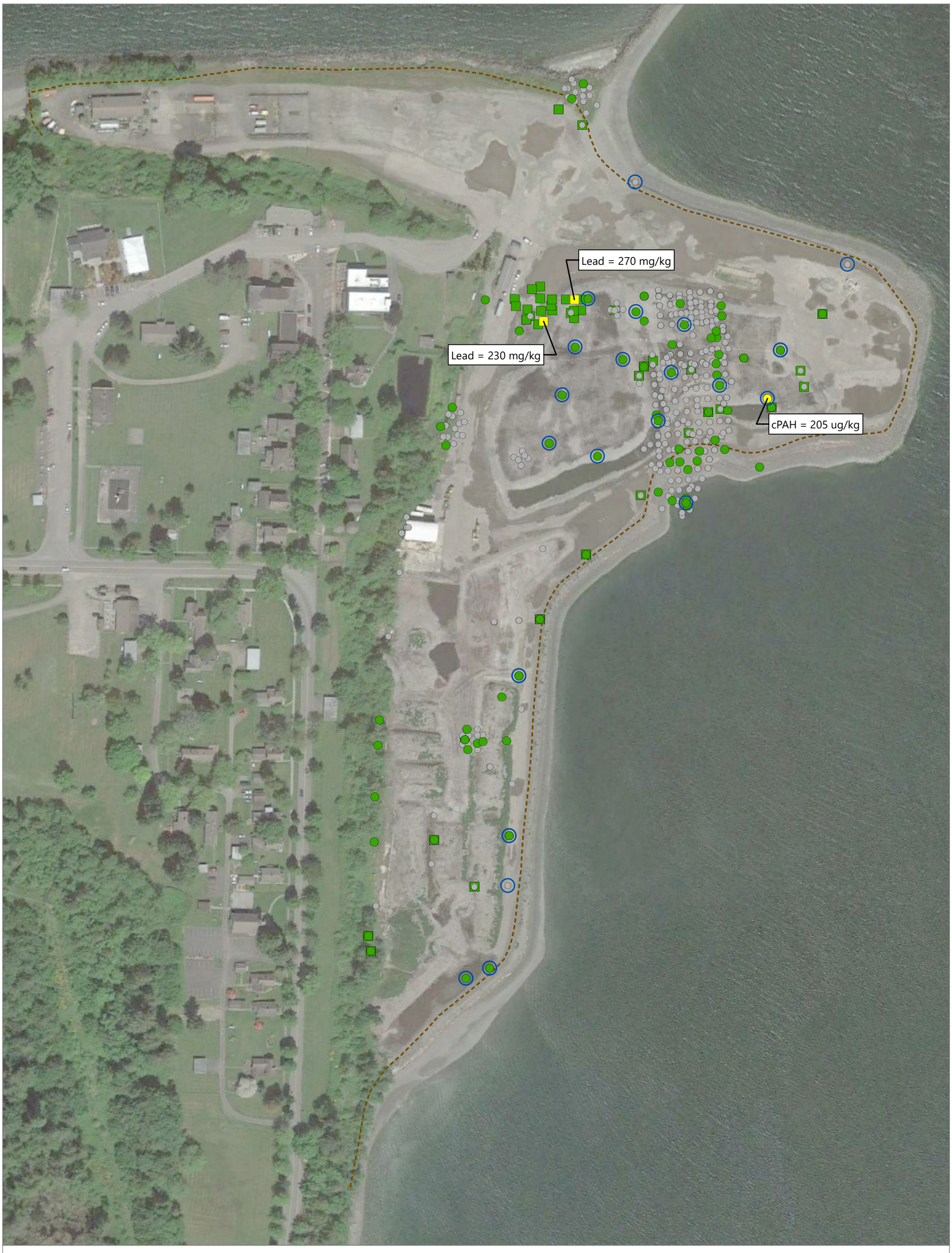
1. Total Dioxin/Furan TEQ reported in ng/kg. Surface-Weighted Average Concentration (SWAC) in the upland area shown is 31.3 ng/kg.
2. Data was log-normalized and interpolated using the inverse distance weighting technique taking the maximum value at all locations.

0 350
Feet

Publish Date: 2019/05/01, 1:24 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Soil_DFTEQ_RIFS.mxd

ANCHOR QEA

Figure 9
Dioxin/Furan TEQ Concentrations in Soil
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

cPAH (µg/kg)
- < 190
- > 190
- Composite
- Non-detect

Lead (mg/kg)
- < 220
- > 220

Approximate Recent Top of Bank

Analyte	Units	Cleanup Level
cPAH	µg/kg	190
Lead	mg/kg	220

0 200
Feet

Publish Date: 2019/05/01, 1:25 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Soil_cPAH_TEQ_and_Lead_RIFS.mxd

ANCHOR QEA

Figure 10
Lead and cPAH Concentrations in Soil
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

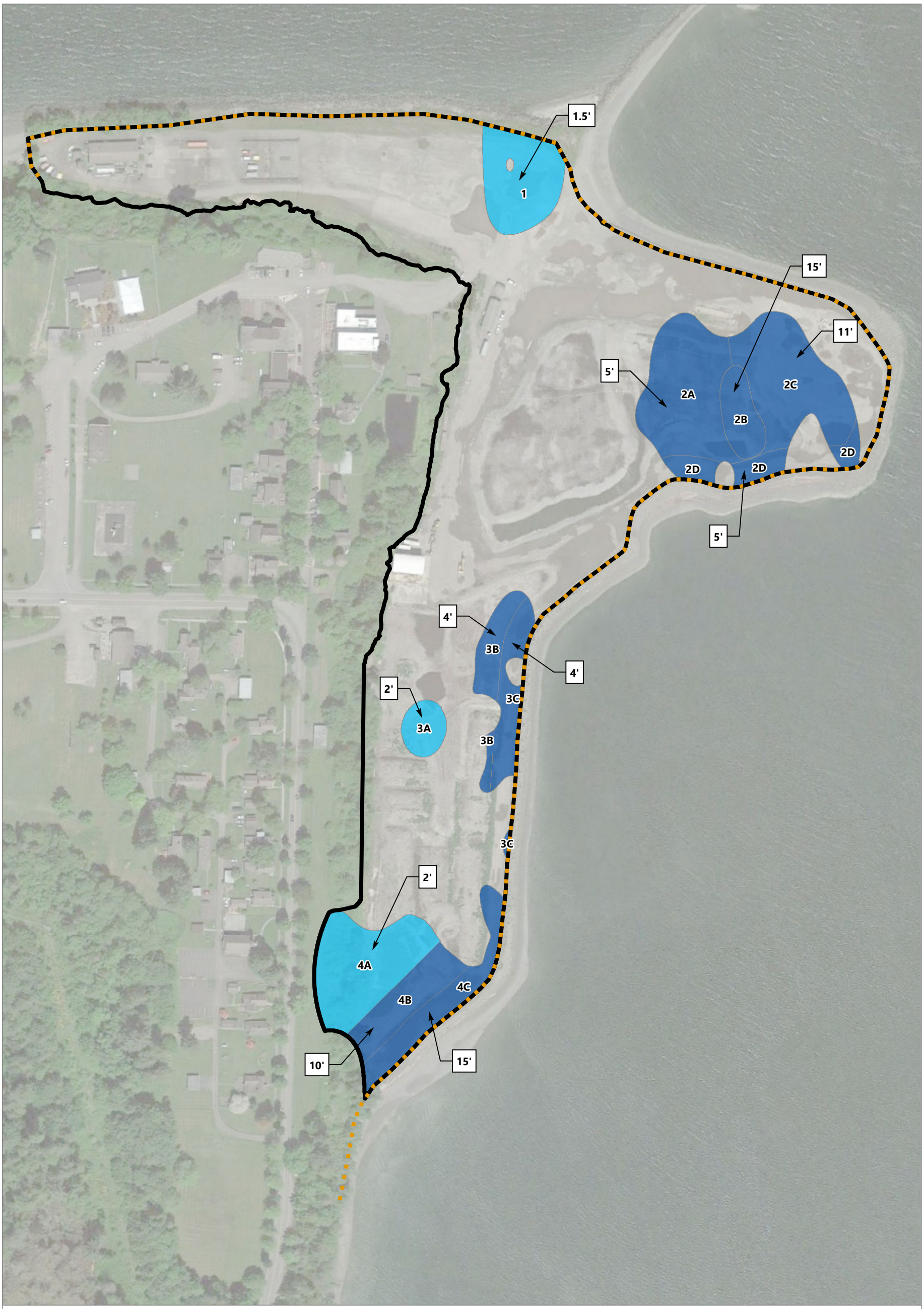
- Area Exceeding the MTCA Method B Unrestricted Soil Cleanup Level (12 ng/kg)
- Area Exceeding the Soil Remediation Level Protective of Ecological Receptors (260 ng/kg)
- Approximate Recent Top of Bank

0 200
Feet

Publish Date: 2019/05/01, 1:23 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Soil_DF_MgmtAreas_RIFS.mxd

ANCHOR QEA

Figure 11
Soil Management Areas
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

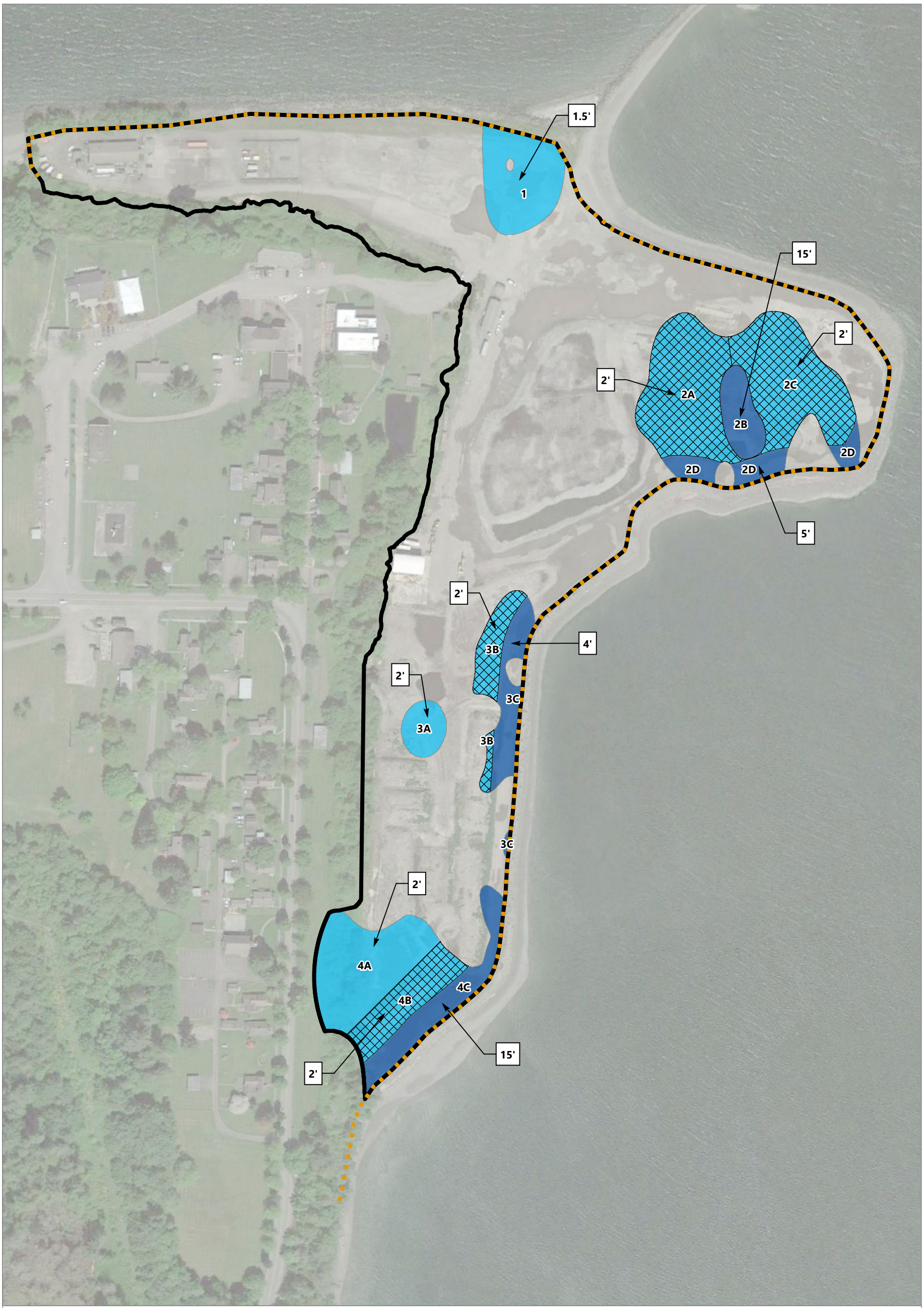
- Shallow Excavation
- Deeper Excavation
- 2A Area IDs
- 1.5' Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 12
Alternative 1: Complete Removal and Off-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

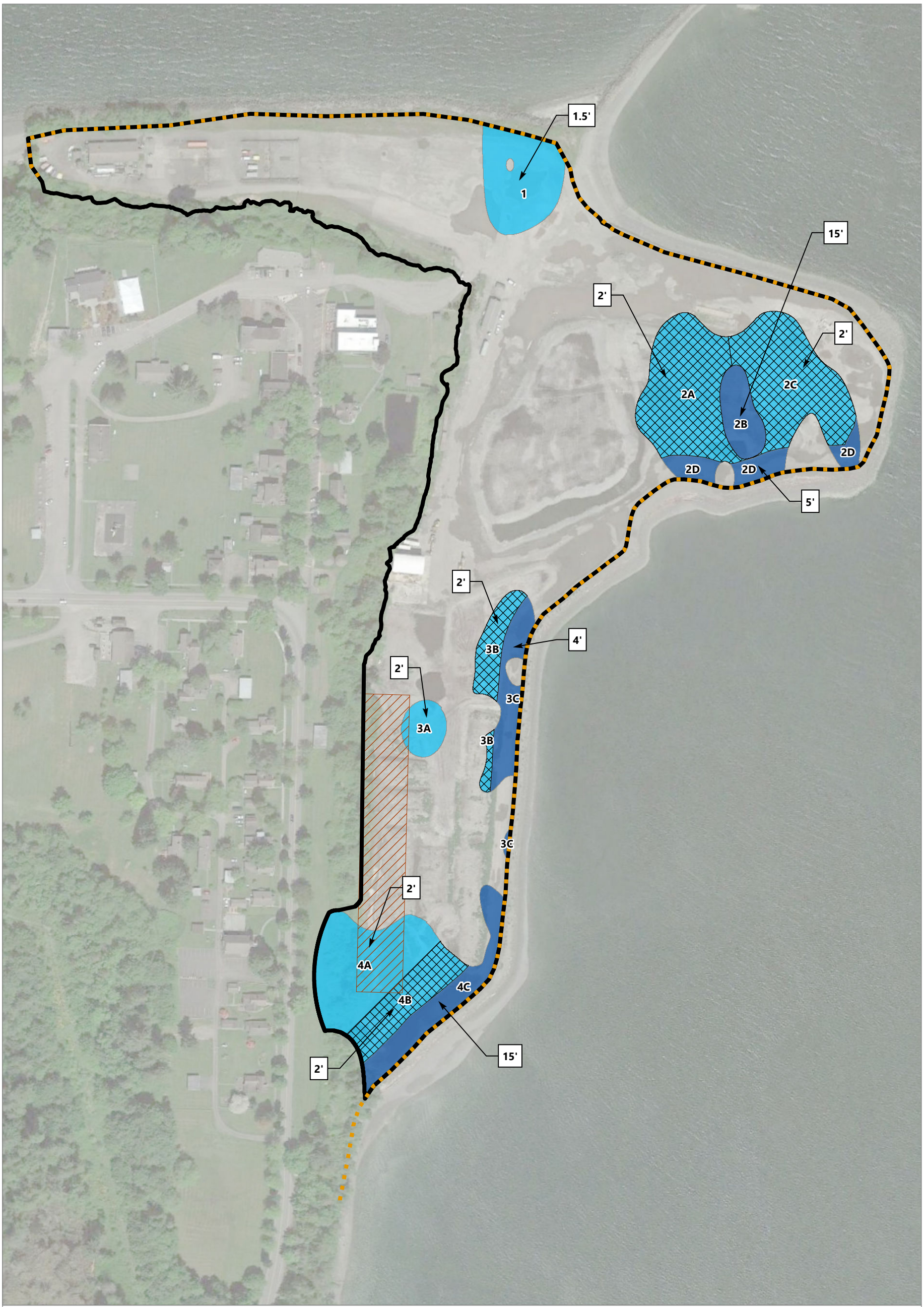
- Capping
- Shallow Excavation
- Deeper Excavation
- 2A Area IDs
- 1.5 Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 13A
Alternative 2A: Partial Removal and Capping and Off-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

- Capping
- Shallow Excavation
- Deeper Excavation
- Potential Placement Area
- 2A Area IDs
- 1.5 Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 13B
Alternative 2B: Partial Removal and Capping with On-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

- Capping
- Deeper Excavation
- 2A Area IDs
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200

Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 14

Alternative 3: Focused Removal and Capping

Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

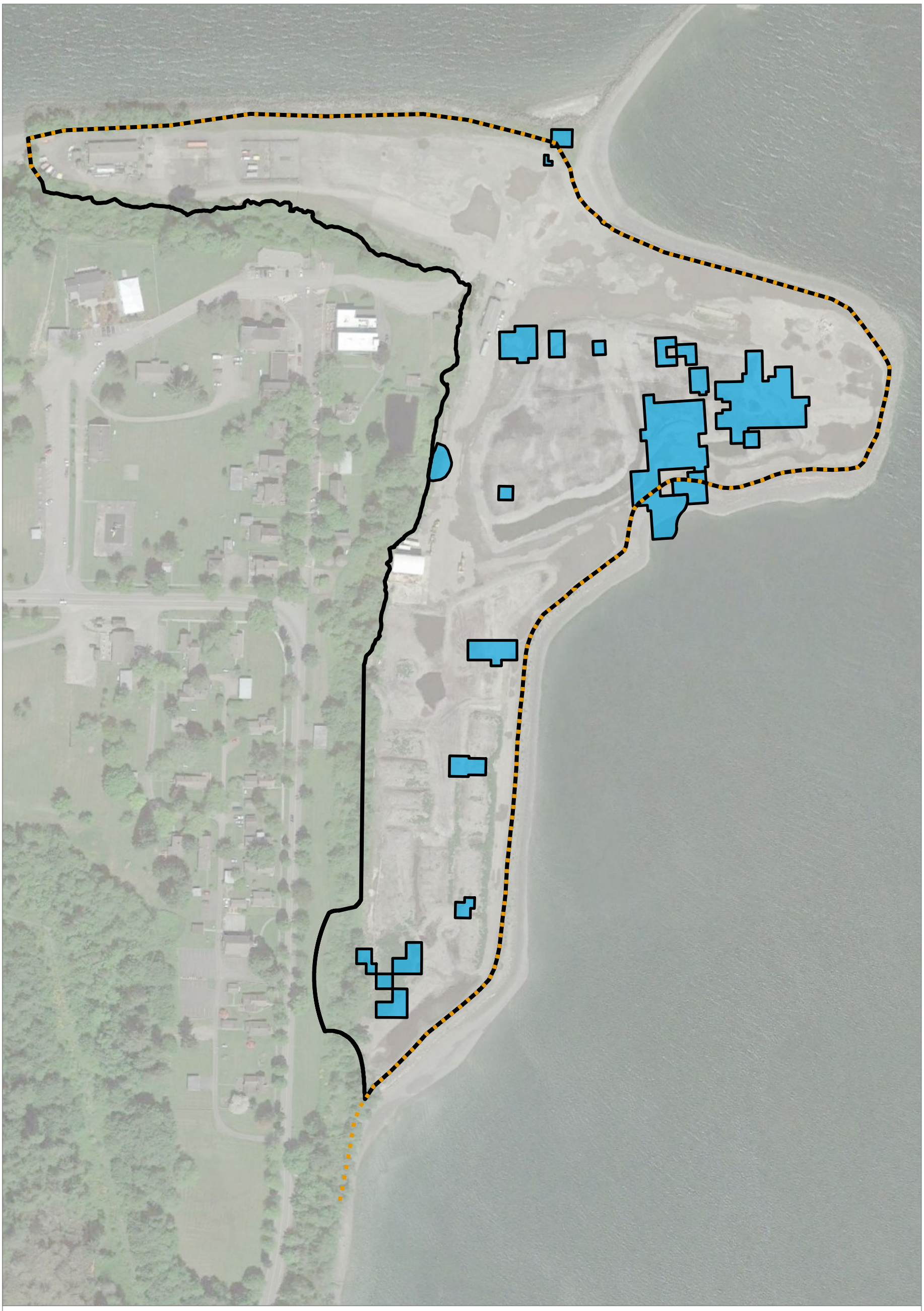
Capping
Approximate Recent Top of Bank
2A Area IDs
Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 15
Alternative 4: Capping
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

Previously Completed Remedial Action Removal Areas

Approximate Recent Top of Bank

Upland Area of Port Gamble Bay and Mill Site (the Site)

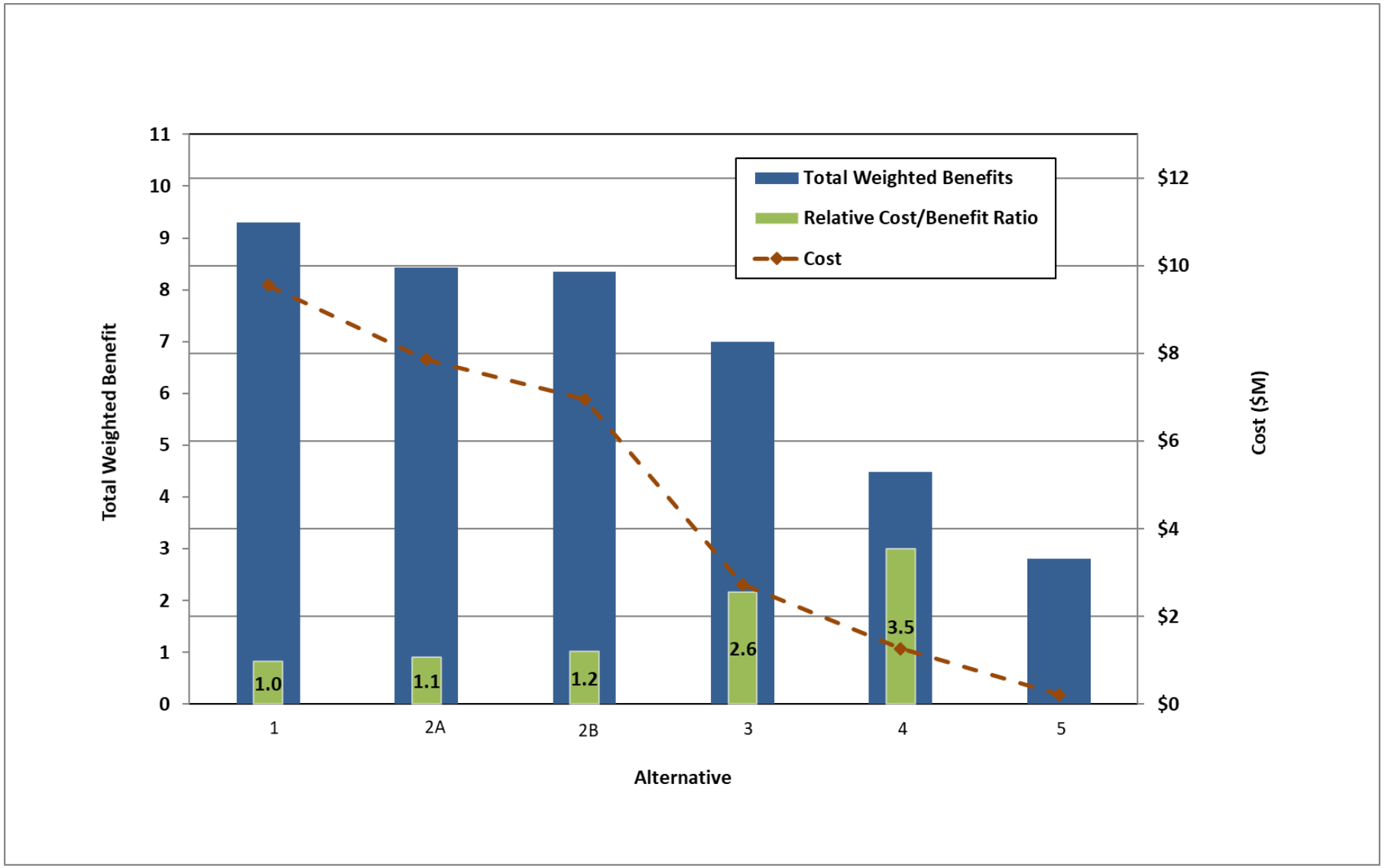
0 200

Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 16
Alternative 5: Completed Interim Actions and Institutional Controls
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



Filepath: \\FUJI\Anchor\Projects\Port Gamble\2017 - 2019 Upland RIFS\Public Review Draft\Figures\Individual Figures\Figure 17_Primary_DCA_05-01-19.docx

ANCHOR QEA

Figure 17
Mill Site Upland Primary Disproportionate Cost Analysis
Supplemental Remedial Investigation and Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 18
Alternative 6: Complete Removal with Shoreline Restoration and Off-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

- Capping
- Shallow Excavation
- Deeper Excavation
- Shoreline Restoration
- 2A Area IDs
- 1.5 Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 19A
Alternative 7A: Partial Removal and Capping with Shoreline Restoration and Off-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

- Capping
- Shallow Excavation
- Deeper Excavation
- Shoreline Restoration
- 2A Area IDs
- Potential Placement Area
- 1.5 Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 19B
Alternative 7B: Partial Removal and Capping with Shoreline Restoration and On-Site Disposal
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

- Capping
- Deeper Excavation
- Slope Restoration (10h : 1v)
- 2A Area IDs
- Potential Placement Area
- 1.5 Estimated Excavation Depth (feet)
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 20
Alternative 8: Focused Removal and Capping with Shoreline Restoration
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site

LEGEND:

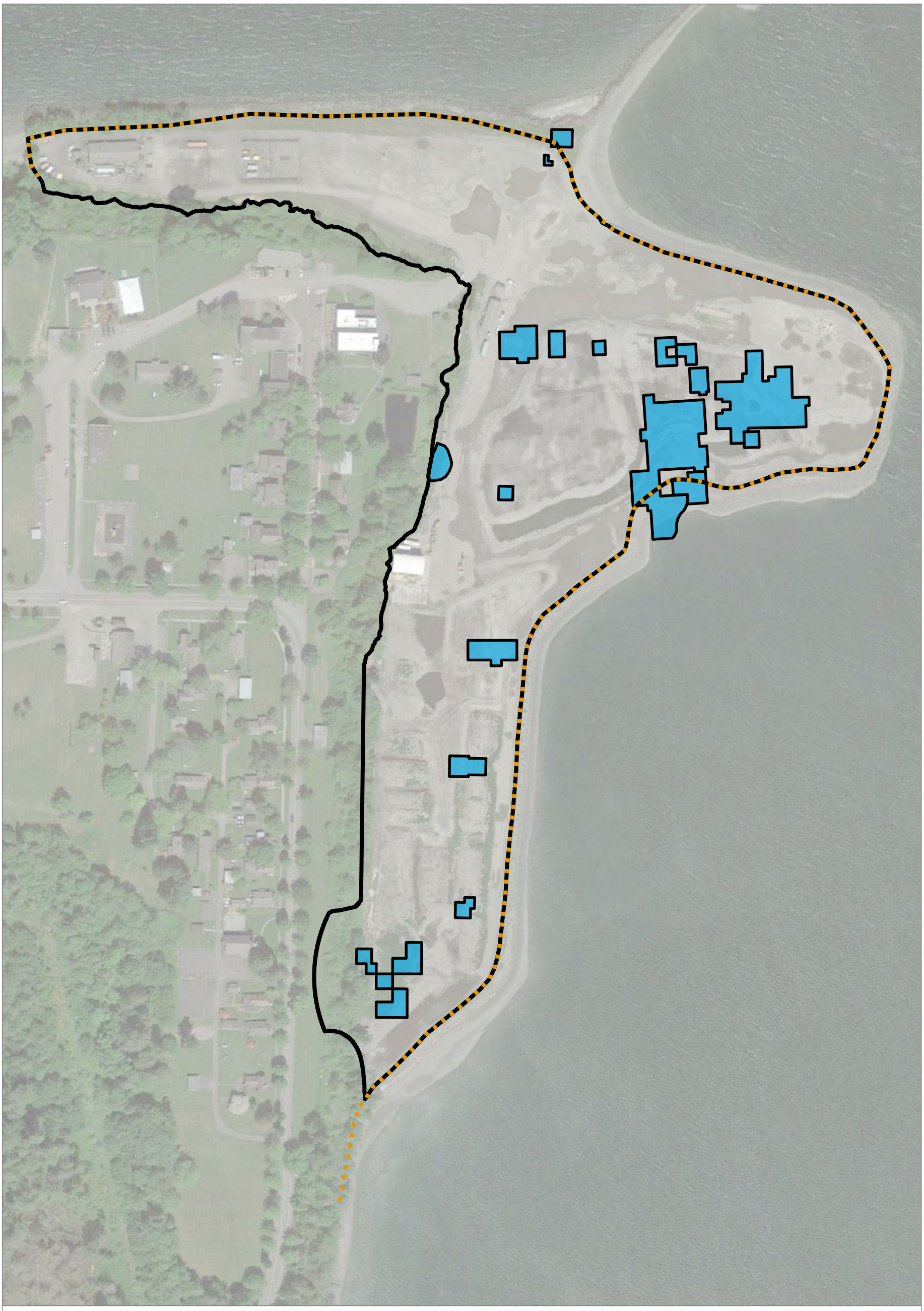
- Capping
- Slope Restoration (10h : 1v)
- 2A Area IDs
- Approximate Recent Top of Bank
- Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200
Feet

Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 21
Alternative 9: Capping with Shoreline Restoration
Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



LEGEND:

Previously Completed Remedial Action Removal Areas

Approximate Recent Top of Bank

Upland Area of Port Gamble Bay and Mill Site (the Site)

0 200

Feet

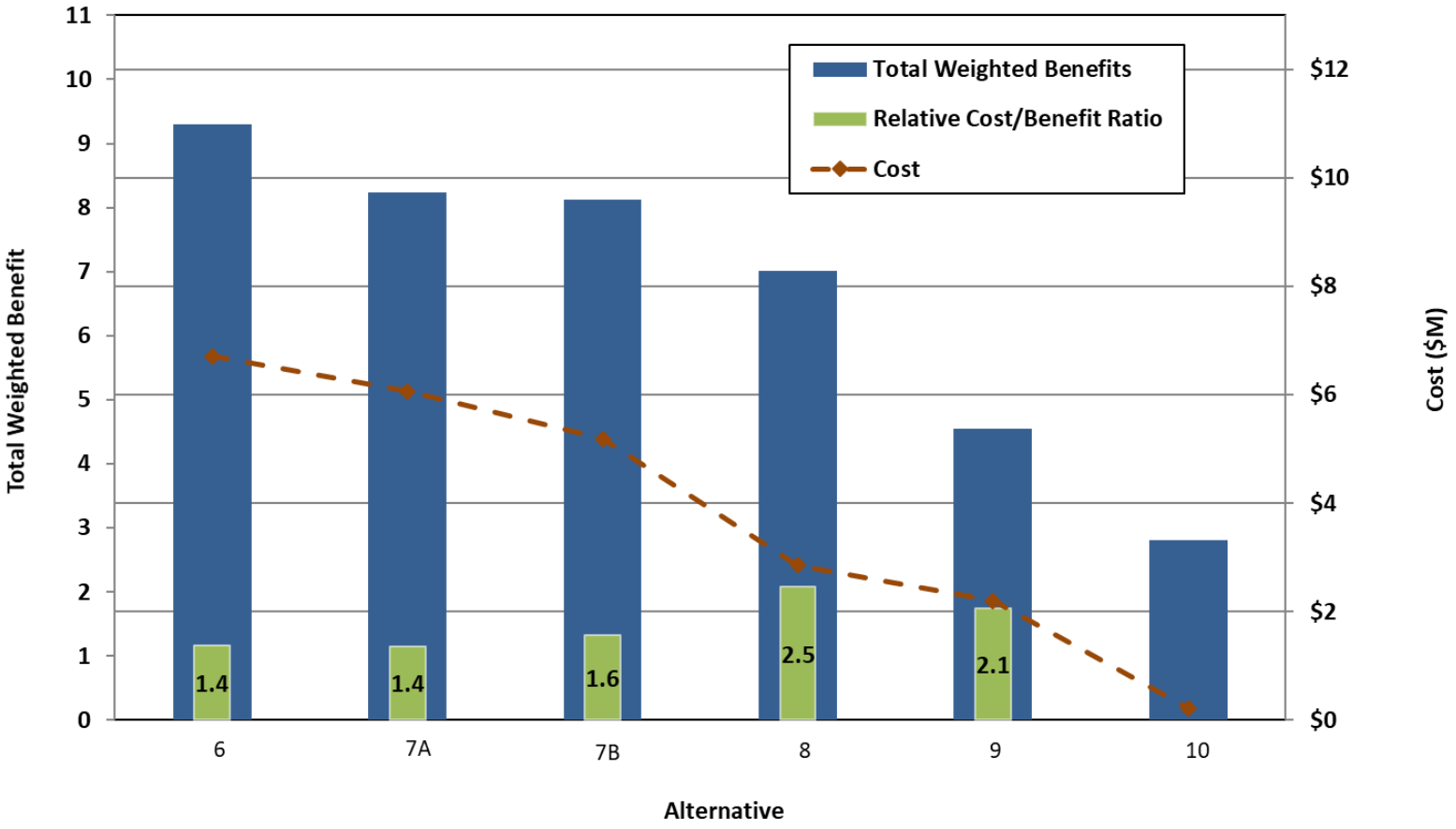
Publish Date: 2019/05/01, 1:45 PM | User: ckiblinger
Filepath: \\orcas\GIS\Jobs\PopeResources_0388\PortGamble\Maps\Reports\RIFS_Upland\AQ_PG_Alternatives_RIFS_DDP.mxd

ANCHOR QEA

Figure 22

Alternative 10: Completed Interim Actions and Institutional Controls

Supplemental Remedial Investigation/Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site



Filepath: \\FUJI\Anchor\Projects\Port Gamble\2017 - 2019 Upland RIFS\Public Review Draft\Figures\Individual Figures\Figure 23_Contingent_Land_Use_DCA_05-01-19.docx

ANCHOR QEA

Figure 23

Mill Site Upland Contingent Land Use Disproportionate Cost Analysis

Supplemental Remedial Investigation and Feasibility Study
Upland Area of the Port Gamble Bay and Mill Site