SITE HAZARD ASSESSMENT
Worksheet 1: Summary Score Sheet

SITE NAME: Blakely Harbor Park **Rank: 2**

Cleanup Site ID: 14770

Facility/Site ID: 60939

Completed on 8/14/2020 for inclusion on the August 2020 Hazardous Sites List.

LOCATION OF SITE

Blakely Avenue & 3-T Road

Bainbridge Island, Kitsap County, WA 98110

Tax Parcel ID: 022402-3-032-2000

Township 24N, Range 2E, Section 2

Latitude, Longitude: 47.59640, -122.51495

SITE DESCRIPTION

Within Currently Defined Site Boundaries

Based on currently available information, the Blakely Harbor Park site (Site) is located on the eastern part of the tax parcel listed above. The in-water portion of the Site extends off of this parcel and into Blakely Harbor (see Figure 1). The tax parcel listed above includes approximately 40 acres of land zoned for Incorporated City use, and is currently operated as a park by the Bainbridge Island Metropolitan Parks and Recreation District. The park is used for passive recreational activities, including picnicking, wildlife viewing, and kayaking, and includes the Blakely Harbor Park Trail. In addition to Blakely Harbor, surface water is present within the park in the forms of streams and wetlands.

Contamination of the property occurred during historical usage as a sawmill. The mill occupied an area of Blakely Harbor Park east of Country Club Road, south of Blakely Ave NE, and extended into Blakely Harbor to the east. Features of the mill are shown below in Figure 2. The mill operated between approximately 1864 and 1922. At the height of operations, it produced more than one million board feet of lumber a year, making it one of the largest mills on the Pacific coast. The mill experienced significant fires and rebuilding twice, in 1888 and 1907. The power house from the mill is still present on the Site. Areas of sediment within the Site are described by their usage during mill operations, including the log pond and wharf areas.

The Governor's Puget Sound Initiative has a goal of restoring health to Puget Sound. Identifying contaminated properties around the shoreline can reduce pollution reaching the Sound. Ecology's Toxics Cleanup Program has determined this is a Puget Sound Initiative site because it is within one-half mile of Puget Sound.

Historical Owners and Operators

From	To	Owner/Operator	Site Uses
1863	1923	Port Blakely Mill Company	Sawmill. Prior to incorporation of Company, was owned by William Renton. Operated for periods under lease to other companies.
1923	1984	Port Blakely Mill Company	Most of the mill structures removed in 1924. Limited development and natural recovery of the mill area.
1984	1999	The Port Blakely Company (general partner of Blakely Tree Farms Limited Partnership)	Continued natural recovery of the mill area and limited development. The limited partnership is currently known as Port Blakely Tree Farms (Limited Partnership).

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1999	Bainbridge Island Metropolitan Parks & Recreation District	Park. Portion of the park containing the Site was purchased in 1999. Additional acquisitions have expanded the park area since then.

Area Surrounding the Site

The Site is bordered by wooded areas to the north and east, and by Blakely Harbor to the west. Single family residences are present along the northern and southern edges of the Harbor.

The Bainbridge Island aquifer system is classified as a sole source aquifer by the EPA. The Site is located within the water service area of the Kitsap Public Utility District.

SITE CHARACTERIZATION AND/OR REMEDIATION

Investigations into site conditions began in the early 1990s. Between 1991 and 1992, Shannon and Wilson collected 9 soil, 7 sediment, and 3 groundwater samples. Analysis of these samples indicated areas of soil and sediment with metals above screening levels. Groundwater samples contained metals below screening levels. Test pit logs from soil sampling locations indicate the presence of buried wood waste in many locations, including sawdust, timbers, and pilings.

A 2008 investigation conducted by Anchor Environmental attempted to determine the extent of wood waste in the intertidal sediment areas of the Site. Buried wood waste is a concern in sediment areas not because the wood itself is considered toxic, but due to the chemicals produced under the anaerobic conditions created as the wood breaks down. These chemicals include phenol, methylphenols, ammonia, and sulfides.

Anchor's investigation included diver surveys and a combination of test pits, hand driven cores, and steel piston soundings to determine the extent of wood waste. Chemical analysis was done on sediment from selected locations. Water samples were also collected from 3 groundwater seeps, and analyzed for water quality parameters (pH, DO, ammonia, sulfides, etc.). The findings of this investigation were wood waste at depths up to 4-6 feet below the top of the sediment in the former log pond area and a layer of wood waste between 2 and 4 feet below the top of the sediment in the former wharf area. The estimated extent of wood waste is shown in Figure 3. Sediment samples contained lead, zinc, and copper above screening levels.

Two additional investigations were completed in 2019 by consultants working on behalf of Ecology. The first of these investigations, done by GeoEngineers, collected soil samples from 5 locations in the upland area of the Site and sediment samples from 6 nearshore locations (Figure 3). The second investigation, done by Leidos and New Fields, collected 40 surface sediment (0-10 cm deep) samples. MTCA Method A cleanup levels were used as screening levels to determine areas of potential soil contamination. Four of the 5 soil samples collected contained at least one chemical above screening levels. Chemicals present above screening levels include arsenic, lead, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and dioxins/furans. Dioxins/furans in soil and sediment and cPAHs in soil are evaluated using a toxic equivalency quotient, where the concentration of multiple contaminants are evaluated as a single TEQ value; references to cPAHs or dioxins/furans throughout this report refer to TEQ values. Sediment cleanup objective (SCO) and cleanup screening level (CSL) values, as established by the Sediment Management Standards, were used as screening levels for sediment. Chemicals present in sediment above screening values include lead, mercury, phenol, 3- and 4- methylphenol, and multiple polycyclic aromatic hydrocarbons (PAHs). Puget Sound background value for sediment was used as a screening level for dioxins/furans, and sediment samples did contain dioxins/furans above this screening level. Phenol and methylphenols were present above screening levels in the largest area (Figure 4), and were used to determine the area of contamination for ranking (see Worksheet 4).

Additional site characterization activities will be completed as part of the production of a Remedial Investigation report, per the scope of a draft Agreed Order between Ecology and Port Blakely Tree Farms. No remedial activities have been done at the Site to date.

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ADDITIONAL INFORMATION COLLECTED BY THE SITE HAZARD ASSESSOR

Information in this Site Hazard Assessment was taken from available site reports.

SPECIAL CONSIDERATIONS

Checked boxes indicate routes applicable for Washington Ranking Method (WARM) scoring

☑ **Surface Water**

Sediment is contaminated and in direct contact with surface water.

☐ **Air**

No volatile contaminants identified on Site.

☑ **Groundwater**

Soil is contaminated and contaminants may leach to groundwater.

The closest drinking water wells to the Site are located approximately 0.5 miles north at a higher elevation than the Site. Given the documented interconnection between Site groundwater and marine water in Blakely Harbor (salt water in groundwater samples, salt water measured in groundwater seeps in intertidal area), for scoring it was assumed that groundwater would be discharging into the Harbor before it could impact any wells.

ROUTE SCORES

Surface Water/ Human Health:	39.1	Surface Water/ Environment:	72.5
Air/ Human Health:		Air/ Environment:	
Groundwater/ Human Health:	33.8		

Overall Rank: 2

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REFERENCES

1 Anchor Environmental LLC. January 2009. Intertidal Sampling and Analysis Report, Blakely Harbor Park.

2 Ecology. January 2020. Blakely Harbor Park Agreed Order [DRAFT].

3 ESRI. Accessed 2020. World Annual Evapotranspiration Map. Accessed through https://www.esri.com/arcgis-blog/products/arcgis-online/mapping/world-average-annual-evapotranspiration-web-map-now-available/

4 GeoEngineers. August 2019. Surface Soil and Sediment Data Report, Former Port Blakely Mill Site, Bainbridge Island, Washington.

5 Kitsap County. Accessed 2020. Parcel Search. https://psearch.kitsapgov.com/psearch/index.html

6 Leidos and New Fields. October 2019. Blakely Harbor Park, Sediment Investigation, Final Data Report.

7 NOAA National Centers for Environmental Information. Accessed 2020. Global Summary of the Year 2009 - 2017 – Bremerton 1.8NE Station. Requested from https://www.ncdc.noaa.gov/cdo-web/

8 NOAA. Accessed 2020. Atlas 2: Precipitation Frequency Estimates. http://www.nws.noaa.gov/oh/hdsc/noaaatlas2.htm

9 Shannon & Wilson Inc. September 1992. Project Status Report II, Environmental Site Assessment, Old Port Blakely Mill, Bainbridge Island, Washington.

10 US EPA. Accessed 2020. Sole Source Aquifers map. https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b

11 WA Dept. of Ecology. Accessed 2020. Water Rights Tracking System (WRTS)

12 WA Dept. of Fish & Wildlife. Accessed 2020. Priority Habitats and Species (PHS on the Web). http://apps.wdfw.wa.gov/phsontheweb/

13 WA Dept. of Health Office of Drinking Water. Accessed 2020. Find Water System. https://fortress.wa.gov/doh/eh/portal/odw/si/FindWaterSystem.aspx

14 WA Dept. of Health Office of Drinking Water. Accessed 2020. Source Water Assessment Program (SWAP) Map. https://fortress.wa.gov/doh/swap/index.html

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SITE HAZARD ASSESSMENT
Worksheet 2: Route Documentation

SITE NAME: Blakely Harbor Park

Cleanup Site ID: 14770

Facility/Site ID: 60939

1. SURFACE WATER ROUTE

List those substances to be considered for scoring:

lead, mercury, phenol, TCDD (for dioxins/furans)

Explain the basis for choice of substances to be used in scoring:

Subset of substances above natural background (dioxins/furans) or screening levels (SCO or CSL, remaining contaminants). Maximum toxicity score is reached from this list of contaminants, so inclusion of additional substances would not affect ranking.

List those management units to be considered for scoring:

sediment

Explain basis for choice of unit to be used in scoring:

Sediment is confirmed to be contaminated, and is in closer contact with surface water than upland soil.

2. AIR ROUTE

List those substances to be considered for scoring:

Not scored.

Explain the basis for choice of substances to be used in scoring:

List those management units to be considered for scoring:

Explain basis for choice of unit to be used in scoring:

3. GROUNDWATER ROUTE

List those substances to be considered for scoring:

arsenic, lead, benzo(a)pyrene (for cPAHs), TCDD (for dioxins/furans)

Explain the basis for choice of substances to be used in scoring:

Substances present in surface soil samples above screening levels (Method A cleanup levels).

List those management units to be considered for scoring:

soil

Explain basis for choice of unit to be used in scoring:

Surface soil is confirmed to be contaminated in areas where precipitation may infiltrate and result in chemical leaching to groundwater.

Figure 1. General location and boundary of the Site. Figure from Ecology (2020) draft Agreed Order.

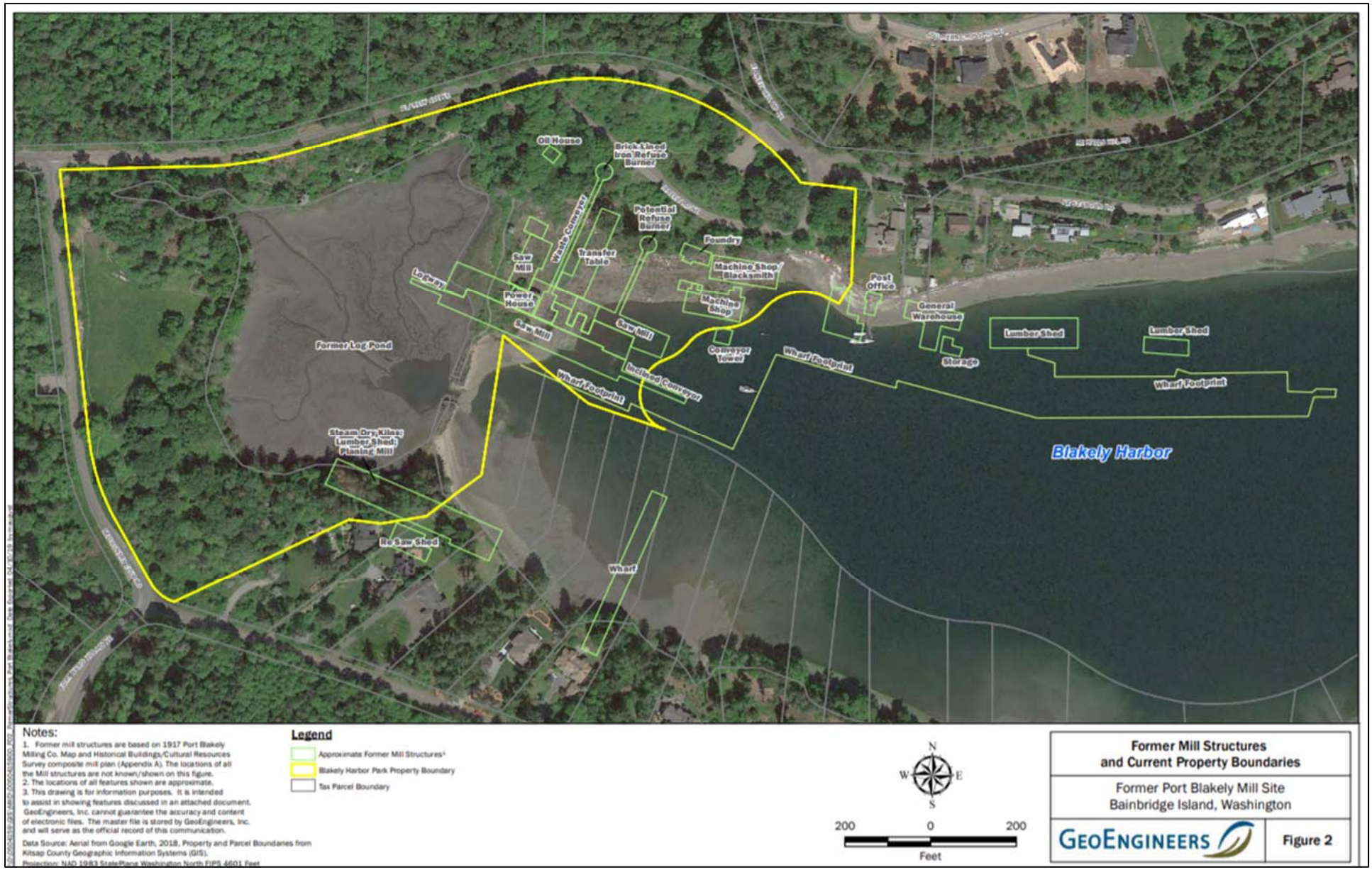

Figure 2. Approximate layout of mill structures. Figure from GeoEngineers (2019).

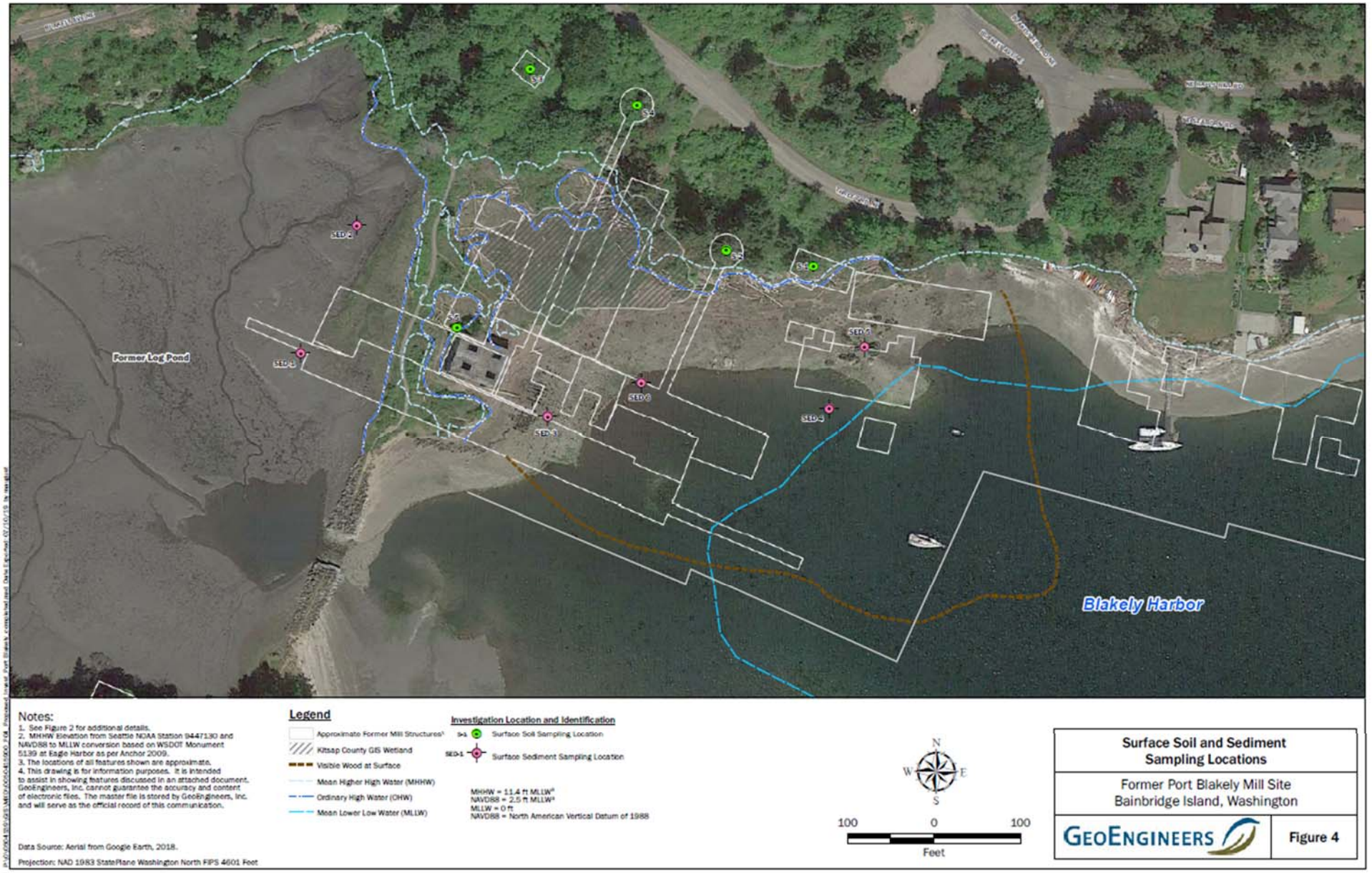

Figure 3. Locations of soil samples (green dots) and nearshore sediment samples (pink dots) collected in 2019. Area of wood waste designated by Anchor (2009) is indicated by the dashed brown line. Figure from GeoEngineers (2019).

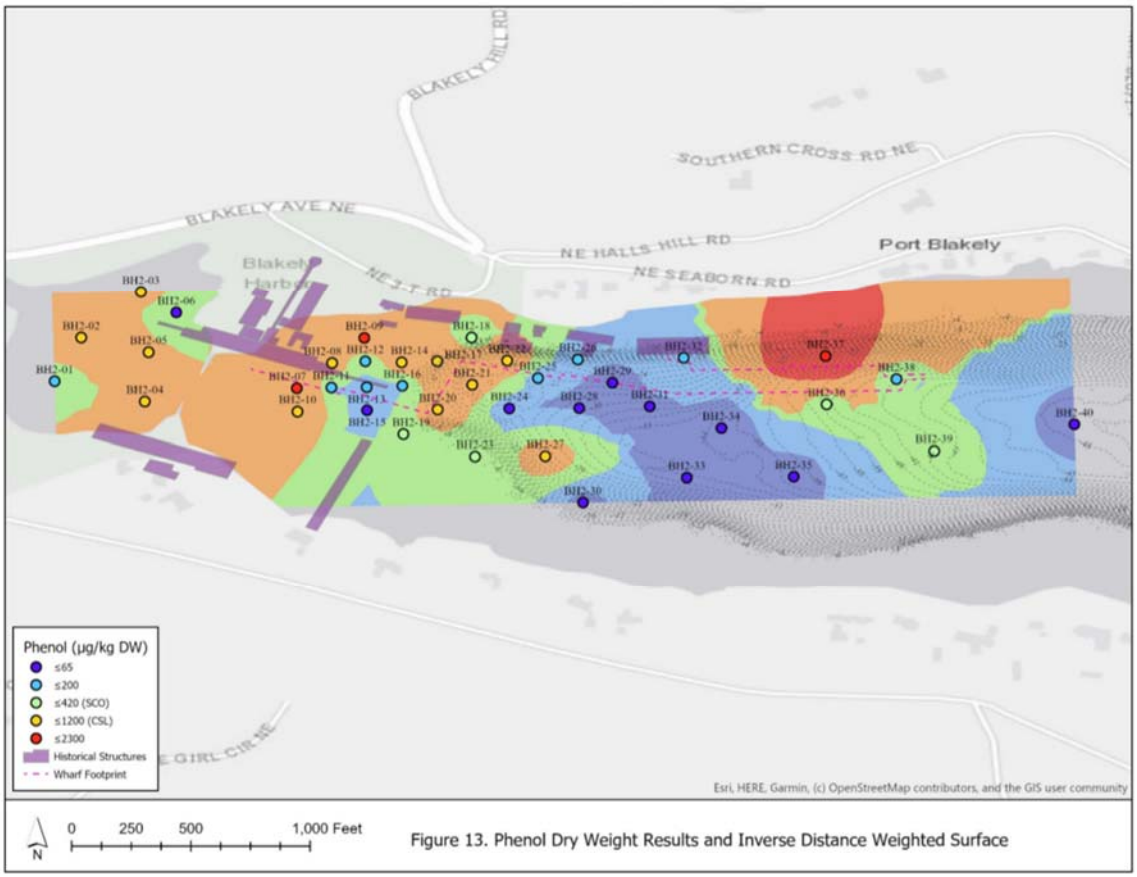

Figure 13. Phenol Dry Weight Results and Inverse Distance Weighted Surface

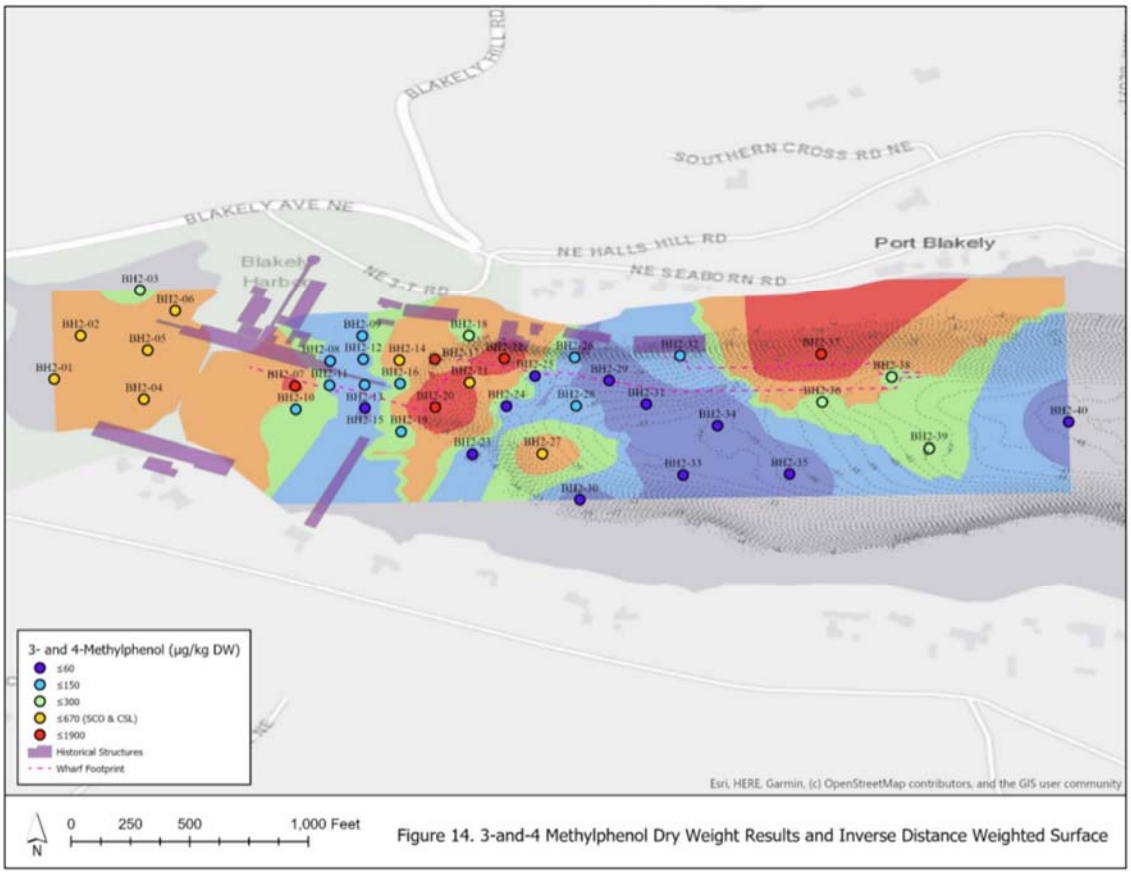

Figure 14. 3-and-4 Methylphenol Dry Weight Results and Inverse Distance Weighted Surface

Figure 4. Contaminants used to estimate area of contaminated sediment for scoring. Areas of green, orange, and red are above screening levels for phenol (top). Areas of orange and red are above screening levels for the methylphenols (bottom). Figures from Leidos and New Fields (2019).

Worksheet 4
Surface Water Route

CSID: 14770

Site: Blakely Harbor Park

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

	Drink. Wat. Stnd.		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
Substance	Value (ug/L)	Score	Value (mg/kg)	Score	Value (mg/kg/day)	Score	Adj. CPFo (risk/mg/kg-day)	Score
lead	1.5E+01	6	<0.001	10	--	X	--	X
mercury	2.0E+00	8	--	X	--	X	--	X
phenol	4.0E+03	2	1.0E+01	10	3.0E-01	1	--	X
TCDD (dioxin)	3.0E-05	10	--	X	7.0E-10	10	--	X

Maximum score: 10

Bonus points: 2 Human Toxicity Score: 12

Source: WARM Toxicity Database Range: 1-12

1.2 Environmental Toxicity

Freshwater:

Marine: X

Substance	Acute Water Quality Criterion Value (ug/L)	Score
lead	2.1E+02	4
mercury	1.8E+00	8
phenol	--	X
TCDD (dioxin)	--	X

Maximum score: 8 Environmental Toxicity Score: 8

Source: WARM Toxicity Database Range: 2-10

1.3 Substance Quantity

Amount: 1100000 ft^2

Basis: estimated area of contaminated sediment, from area with phenols above screening levels (other contaminants have smaller footprints that overlap with phenol)

Source: site reports Substance Quantity Score: 10

Range: 1-10

2.1 Containment

Description: contaminated sediment in contact with surface water

Source: site reports Containment Score: 10

Range: 0-10

SUBSTANCE PARAMETER CALCULATIONS

Human Health Pathway

SUBh (Human Toxicity + 3) x (Containment + 1) + Substance Quantity | 175.0

Environmental Pathway

SUBe (Environ. Toxicity + 3) x (Containment + 1) + Substance Quantity | 131.0

2.0 MIGRATION POTENTIAL

2.2 Surface Soil Permeability

Description:	contaminated sediment in contact with surface water		
Source:	site reports	Soil Permeability Score:	7
		Range: 1-7	

2.3 Total Annual Precipitation

Amount (in.):	46.7	Annual Precipitation Score:	3
Source:	NOAA NCEI	Range: 1-5	

2.4 Maximum Two-Year/24-Hour Precipitation

Amount (in.):	2.23	24-Hour Precipitation Score:	3
Source:	NOAA Atlas 2	Range: 1-5	

2.5 Flood Plain

Classification:	in 100 year flood plain	Floodplain Score:	2
Source:	Kitsap Parcel Viewer	Range: 0-2	

2.6 Terrain Slope

Degree of slope:	sediment in contact with surface water - max score		
Source:	site reports	Terrain Slope Score:	5
		Range: 1-5	

MIGRATION PARAMETER CALCULATION

MIG = Soil Permability + Annual Precip. + 24-Hour Precip. + Floodplain + Slope | 20.0

3.0 TARGETS

3.1 Distance to Surface Water

Name:	contaminated sediment in contact with surface water		
Distance (ft):	0	Distance to Surface Water Score:	10
Source:	site reports	Range: 0-10	

3.2 Population Served within 2 Miles

Population:	0 - water is marine	Population Served Score:	0
Source:	n/a	Range: 0-75	

3.3 Area Irrigated within 2 Miles

Basis:	water is marine		
Area (acres):	0	Area Irrigated Score:	0
Source:	n/a	Range: 0-30	

3.4 Distance to Nearest Fishery Resource

Name:	streams that drain into log pond		
Distance (ft):	on Site	Distance to Fishery Score:	12
Source:	PHS on the Web	Range: 0-12	

3.5 Distance to Nearest Sensitive Environment

Name:	Site is within a park		
Distance (ft):	0	Distance to Sensitive Environment Score:	12
Source:	site reports	Range: 0-12	

TARGET PARAMETER CALCULATIONS

Human Health Pathway

TARh: Dist. to Surface Water + Population Served + Area Irrigated | 10.0

Environmental Pathway

TARe Dist. to Surface Water + Dist. to Fishery + Dist. to Sensit. Environ. | 34.0

4.0 RELEASE

Evid. of release?	no concentration data available for surface water		
Source:	site reports	Release Score (REL):	0.0
		Range: 0 or 5	

SURFACE WATER ROUTE CALCULATIONS

Human Health Pathway

SWh = (SUBh x 40/175) x [(MIG x 25/24)) + REL + (TARh x 30/115)] / 24 | **39.1**

Environmental Pathway

SWe = (SUBe x 40/153) x {(MIG x 25/24)) + REL + (TARe x 30/34)} / 24 | **72.5**

Range: 0-100

Worksheet 5
Air Route

CSID: 14770

Site: Blakely Harbor Park

Not scored.

Worksheet 6
Groundwater Route

CSID: 14770

Site: Blakely Harbor Park

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human toxicity

	Drink. Wat. Stnd		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
Substance	Value (ug/L)	Score	Value (mg/kg)	Score	Value (mg/kg/day)	Score	Adj. CPFo (risk/mg/kg-day)	Score
arsenic	1.0E+01	8	7.6E+02	5	3.0E-04	5	1.5E+00	7
lead	1.5E+01	6	<0.001	10	--	X	--	X
benzo(a)pyrene	2.0E-01	10	5.0E+01	10	3.0E-04	5	8.0E-01	5
TCDD (dioxin)	3.0E-05	10	--	X	7.0E-10	10	--	X

Maximum score: 10
Bonus points: 2
Human Toxicity Score: 12
Source: WARM Toxicity Database
Range: 1-12

1.2 Mobility

Substance	Solubility Value (mg/L)	Score
arsenic	K >1	3
lead	0.1 < K < 1	2
benzo(a)pyrene	1.6E-03	0
TCDD (dioxin)	2.0E-04	0

Maximum value: 3
Mobility Score: 3
Source: WARM Toxicity Database
Range: 1-3

1.3 Substance quantity

Quantity: 8500 yd^3
Basis: approx. area of contaminated soil x assumed depth of 1 yd
Source: site reports
Substance Quantity Score: 5
Range: 1-10

2.1 Containment

Description: contaminated soil
Source: site reports
Containment Score: 10
Range: 0-10

SUBSTANCE PARAMETER CALCULATION

SUB = (Human Toxicity + Mobility + 3) x (Containment + 1) + Substance Quantity | 203.0

2.0 MIGRATION POTENTIAL

2.2 Net precipitation

Amount (in.):	26	Net Precipitation Score:	3
Source:	NOAA NCEI, ESRI	Range: 0-5	

2.3 Subsurface Hydraulic Conductivity

Description:	silt and sand		
Source:	site reports	Hydraulic Conductivity Score:	3
		Range: 1-4	

2.4 Vertical Depth to Aquifer

Depth (ft):	approx. 8	Depth to Aquifer Score:	8
Source:	site reports	Range: 1-8	

MIGRATION PARAMETER CALCULATION

MIG = Depth to Aquifer + Net Precipitation + Hydraulic Conductivity | 14.0

3.0 TARGETS

3.1 Aquifer Usage

Description:	brackish		
Source:	site reports	Aquifer Use Score:	1
		Range: 1-10	

3.2 Distance to Nearest Drinking Water Well

Distance (ft):	n/a	Well Distance Score:	0
Source:	see Special Considerations above	Range: 0-5	

3.3 Population Served by Drinking Water Wells within Two Miles — Population Served Score: 0.0

No. of people:	0	Range: 0-100	
Source:	see Special Considerations above		

3.4 Area Irrigated by Wells within Two Miles — Area Irrigated Score: 0.0

Area (acres):	0	Range: 0-50	
Source:	see Special Considerations above		

TARGET PARAMETER CALCULATION

1.0

TAR = Aquifer Use + Well Distance + Population Served + Area Irrigated

4.0 RELEASE

Evid. of release? contamination above screening levels not confirmed in groundwater Release Score (REL): 0.0

Source: site reports Range: 0 or 5

GROUND WATER ROUTE CALCULATION

33.8

GW = (SUB x 40/208) x {(MIG x 25/17) + REL + (TAR x 30/165)} / 24

Range: 0-100

Washington Ranking Method
Route Scoring Summary and Ranking Calculation

CSID: **14770**

Site: **Blakely Harbor Park**

Human Health Route Scores

Pathway	Score	Quintile
Surface water	39.1	5
Air	0.0	
Groundwater	33.8	3

Quintile	Value
High (H)	5
Middle (M)	3
Low (L)	

Human Health Pathway Quintiles - based off February 2020 HSL

Quintile	Surface Water		Air		Groundwater	
1	<=	7.3	<=	8.6	<=	24.1
2	7.4	14.7	8.7	16.3	24.2	33.1
3	14.8	21.1	16.4	25.6	33.2	40.4
4	21.2	29.5	25.7	40.1	40.5	49.6
5	>=	29.6	>=	40.2	>=	49.7

$(H^2 + 2M + L) / 8$

Human Health Priority Bin Score: 3.9

Environmental Route Scores

Pathway	Score	Quintile
Surface water	72.5	5
Air	0.0	

Quintile	Value
High (H)	5
Low (L)	

Environmental Pathway Quintiles - based off February 2020 HSL

Quintile	Surface Water		Air	
1	<=	11.3	<=	1.2
2	11.4	24.1	1.3	1.5
3	24.2	32.4	1.6	13.8
4	32.5	49.6	13.9	27.3
5	>=	49.7	>=	27.4

$(H^2 + 2L) / 7$

Environmental Priority Bin Score: 3.6

FINAL MATRIX RANKING

Human Health Priority	Environmental Priority 5	4	3	2	1	n/a
5	1	1	1	1	1	1
4	1	2	2	2	3	2
3	1	2	3	4	4	3
2	2	3	4	4	5	3
1	2	3	4	5	5	5
n/a	3	4	5	5	5	NFA

n/a - not applicable

NFA - no further action

Site Rank: 2