



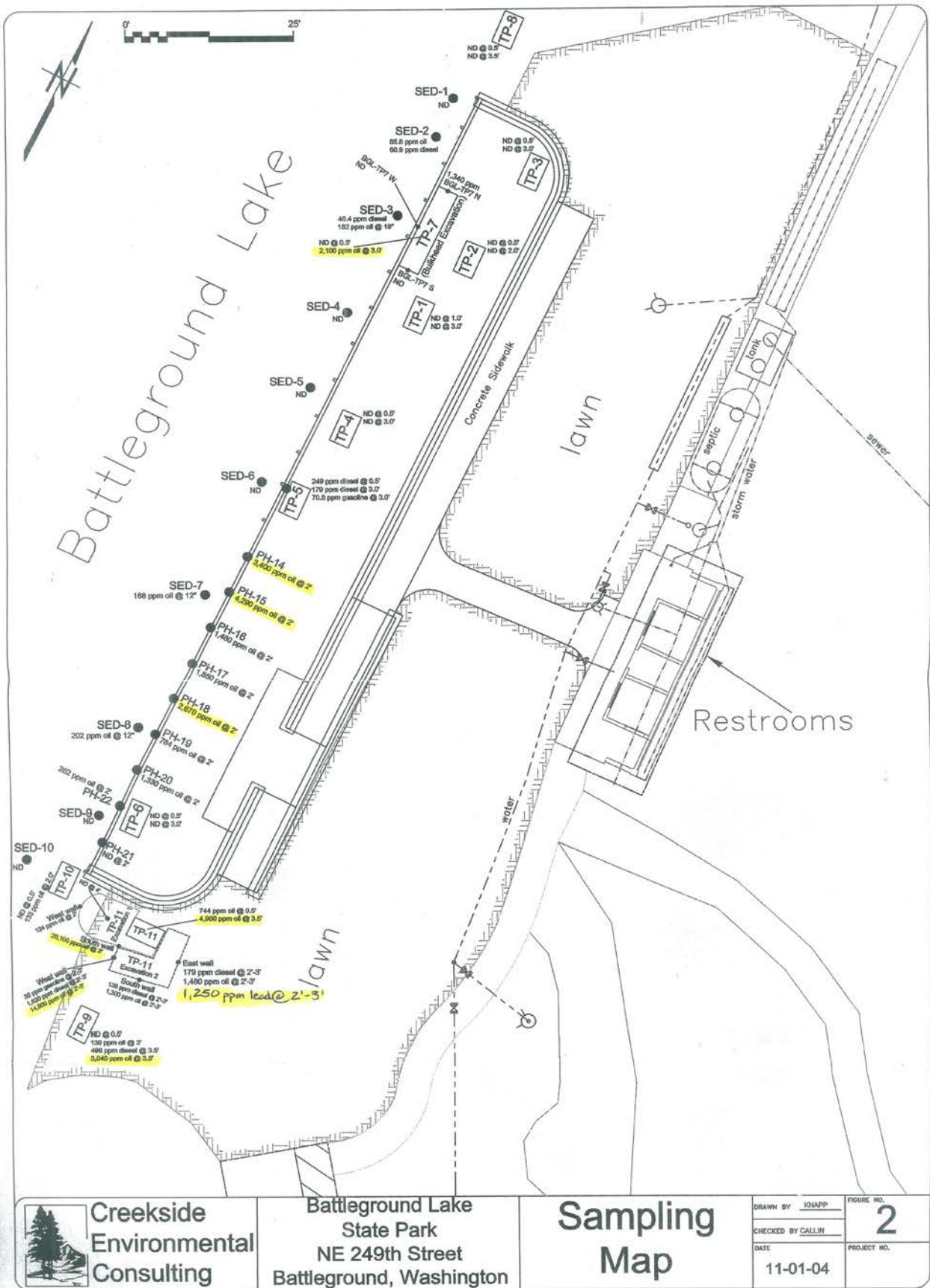


Washington State Parks hired Creekside Environmental Consulting, LLC to investigate and remediate the on-site soil contamination discovered in the bulkhead area. From October 14<sup>th</sup> - November 17<sup>th</sup>, 2004, a total of 11 test pits were dug and evaluated in the designated beach area and just south of it. Numerous subsurface soil samples were collected and 10 sediment samples were also collected from approximately 1-2' below the lake bottom. No underground fuel tanks were found during the investigation. Sampling locations are shown in Figure 1.

“Creekside attempted to assess the extent of the contaminated fill zone by completing several small, shallow, excavations south and southeast of TP-11 and TP-9. When it is determined that the contaminated fill layer extends more than 20 or 30-feet south and east from TP-11, the decision is made to (1) stop all soil removal, and backfill the remaining excavations with compacted top soil, and (2) collect three samples of the contaminated fill for laboratory analysis of an expanded range of contaminants. The sample collection and analysis was intended to provide information on the nature of the contaminated material being left in place.”<sup>9</sup>

“The extent of the contaminated layer of organic rich fill material identified at the south end of the beach has not been determined. Based on laboratory analytical results, diesel and heavy oil appear to be the principle contaminants in this fill.”<sup>9</sup>

**Figure 1: Sampling Map**



 Creekside Environmental Consulting

Battleground Lake State Park  
NE 249th Street  
Battleground, Washington

**Sampling Map**

DRAWN BY JOUAPP	FIGURE NO. <b>2</b>
CHECKED BY CALLIN	PROJECT NO.
DATE 11-01-04	

Note: All sample results exceeding their respective MTCA Method A Cleanup Levels have been highlighted. Creekside Environmental Consulting, did not include the total lead results in the sampling map. Therefore, the total lead sample that exceeded 250 mg/kg was handwritten in the sampling map by Clark County Public Health.

**Table 1: Soil Sample Results above MTCA Method A/B Cleanup Levels**

Sample ID	Sample Depth	Analyte Found	Sample Results	MTCA Method A or B Cleanup Level
Post Hole #14	2'	TPH-Oil	<b>3,400</b> mg/kg	2,000 mg/kg
Post Hole #15	2'	TPH-Oil	<b>4,290</b> mg/kg	2,000 mg/kg
Post Hole #18	2'	TPH-Oil	<b>2,670</b> mg/kg	2,000 mg/kg
TP4	0.5'	TPH-Oil	<b>2,100</b> mg/kg	2,000 mg/kg
TP9	3.5'	TPH-Oil	<b>3,040</b> mg/kg	2,000 mg/kg
TP11	3'	TPH-Oil	<b>4,900</b> mg/kg	2,000 mg/kg
TP11 - West wall	2'-3'	TPH-Oil	<b>14,900</b> mg/kg	2,000 mg/kg
TP11 - South wall	3'	TPH-Oil	<b>26,100</b> mg/kg	2,000 mg/kg
TP11 - East wall	2'3'	Lead	<b>1,250</b> mg/kg	250 mg/kg

On May 18<sup>th</sup>, 2012, Bryan DeDoncker of Clark County Public Health (CCPH) conducted a site visit at Battle Ground Lake State Park to evaluate existing site conditions. Jessica Logan, Steve Brand, and Jim Presser of Washington State Parks met on site to discuss the Site Hazard Assessment (SHA) process. CCPH shared concern of potential lead exposure to the public (especially children playing in the sand) at the designated beach area. Total lead was only analyzed in three soil samples from TP-11 Excavation 2, which is just outside of the designated beach area. None of the soil samples in the designated beach area were analyzed for total lead. Therefore, there still exists some concern for potential lead exposure.

One drinking water source well that serves the park's Group A Public Water System exists only 37 feet from the lake's shoreline. Therefore, to evaluate potential drinking water impact, a groundwater sample was collected from the well and analyzed for TPH-HCID, VOCs, and Total Metals. A distribution system valve was closed to ensure that the water sampled came directly from the well rather than the holding tank/reservoir. All sample results came back non-detect (ND). Therefore, sample analyses did not indicate that the public water system had been directly impacted by the lakeshore soil contamination.

As a result of this SHA, this site is scored and ranked due to the documented presence of lead and heavy oil range hydrocarbons in on-site subsurface soils exceeding their respective MTCA Method A cleanup levels. Although shallow groundwater data was not collected as part of this Site Hazard Assessment, groundwater contamination is suspected due to the unknown extent of subsurface contamination. If the discovered contamination found in and around the bulkhead installation area of the designated beach is a result of historical recreation activities, other areas of the lakeshore might also be impacted and need further assessment. Furthermore, BTEX analysis was not conducted on subsurface soils as required under the "Required Testing for Petroleum Releases" listed in Table 830-1 of the Model Toxics Control Act Statute and Regulation of Washington State. Therefore, it may be necessary to further evaluate the subsurface soils, and extent of contamination, to fully assess the full environmental and human health impacts of this site.

**SPECIAL CONSIDERATIONS (include limitations in site file data or data which cannot be accommodated in the model, but which are important in evaluating the risk associated with the site, or any other factor(s) over-riding a decision of no further action for the site):**

Due to the contamination documented on-site being primarily subsurface, the surface water and air routes are not applicable for WARM scoring for this site. Thus, only the groundwater route will be scored.

**ROUTE SCORES:**

Surface Water/Human Health:	<u>NS</u>	Surface Water/Environmental.:	<u>NS</u>
Air/Human Health:	<u>NS</u>	Air/Environmental:	<u>NS</u>
Groundwater/Human Health:	<u>58.6</u>		

**OVERALL RANK: 2**

WORKSHEET 2  
Route Documentation

1. **SURFACE WATER ROUTE** – *Not Scored*

- a. List those substances to be considered for scoring: Source: \_\_
  
- b. Explain basis for choice of substance(s) to be used in scoring.
  
- c. List those management units to be considered for scoring: Source: \_\_
  
- d. Explain basis for choice of unit to be used in scoring:

2. **AIR ROUTE** – *Not Scored*

- a. List those substances to be considered for scoring: Source: \_\_
  
- b. Explain basis for choice of substance(s) to be used in scoring:
  
- c. List those management units to be considered for scoring: Source: \_\_
  
- d. Explain basis for choice of unit to be used in scoring:

3. **GROUNDWATER ROUTE**

- a. List those substances to be considered for scoring: Source: 1, 2, 8, 9  
Lead, diesel & heavy oil range hydrocarbons.
  
- b. Explain basis for choice of substance(s) to be used in scoring:  
These substances were detected in subsurface soil samples at concentrations exceeding their respective MTCA Method cleanup levels.
  
- c. List those management units to be considered for scoring: Source: 1, 2, 8, 9  
Subsurface soil.
  
- d. Explain basis for choice of unit to be used in scoring:  
The contaminating substances were detected in subsurface soil at concentrations exceeding their respective MTCA Method A cleanup levels.

WORKSHEET 6  
Groundwater Route

**1.0 SUBSTANCE CHARACTERISTICS**

<b>1.1 Human Toxicity</b>										
Substance	Drinking Water Standard (µg/L)	Value	Acute Toxicity (mg/ kg-bw)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity		Value	
							WOE	PF*		
1	Lead	5	8	-	ND	-	ND	B2	-	ND
2	Heavy Oil (Diesel)	160	4	490 (rat)	5	0.004	3	-	-	ND

\* Potency Factor

Source: 1, 2, 4, 8, 9

**Highest Value: 8**

(Max = 10)

**Plus 2 Bonus Points? 2**

**Final Toxicity Value: 10**

(Max = 12)

<b>1.2 Mobility (use numbers to refer to above listed substances)</b>	
Cations/Anions	OR Solubility (mg/L)
1= 2	1=
2=	2= $3.0 \times 10^1$

Source: 1, 2, 4, 8, 9

**Value: 2**

(Max = 3)

<b>1.3 Substance Quantity:</b>	
Explain basis: Unknown, use default = 1	Source: <u>1, 2, 4, 9</u> <b>Value: <u>1</u></b> (Max=10)

**2.0 MIGRATION POTENTIAL**

		Source	Value
2.1	Containment (explain basis): Contaminated soil = 10.	1, 2, 5	<b><u>10</u></b> (Max = 10)
2.2	Net precipitation: 28.14" – 5.7" = 22.44"	5	<b><u>3</u></b> (Max = 5)
2.3	Subsurface hydraulic conductivity: sandy clayey loam	2, 4	<b><u>3</u></b> (Max = 4)
2.4	Vertical depth to groundwater: 0-3'	1, 4, 8, 9	<b><u>8</u></b> (Max = 8)

### 3.0 TARGETS

		Source	Value
3.1	<b>Groundwater usage:</b> public supply, but alternate sources available with minimum hookup requirements	4, 6	<u>4</u> (Max = 10)
3.2	<b>Distance to nearest drinking water well:</b> <600	4, 6	<u>5</u> (Max = 5)
3.3	<b>Population served within 2 miles:</b> $\sqrt{\text{pop.}} = >10,000$	4, 6	<u>100</u> (Max = 100)
3.4	<b>Area irrigated by (groundwater) wells within 2 miles:</b> 696 $(0.75)*\sqrt{\text{\# acres}} = 19.78$	7	<u>20</u> (Max = 50)

### 4.0 RELEASE

	Source	Value
<b>Explain basis for scoring a release to groundwater:</b> Confirmed subsurface soil contamination by laboratory analysis, only.	1, 8	<u>0</u> (Max = 5)

### SOURCES USED IN SCORING

1. Initial Investigation by Clark County Public Health, December 22, 2004.
2. Soil Survey of Clark County, Washington, November 1972.
3. Washington State Department of Ecology, Toxicology Database for Use in Washington Ranking Method Scoring, January 1992.
4. Washington State Department of Ecology, WARM Scoring Manual, April 1992.
5. Washington Climate – Net Rainfall Table.
6. Arial Photo, GIS Clark County MapsOnline.
7. Washington State Department of Ecology, Water Rights Application System (WRATS) printout for two-mile radius of site.
8. Preliminary Environmental Investigation Report, by Creekside Environmental Consulting, LLC, November 2004.
9. Project Summary Report: Remediation, Sampling & Analysis for Battle Ground Lake State Park, by Creekside Environmental Consulting, LLC, December 2004.
10. Battle Ground...In and Around - A pictorial drama of early Northwest pioneer life, Louise M. Allworth, 1976.