Site Hazard Assessment
Worksheet 1
Summary Score Sheet

Reserve Silica

Address:	28131 Ravensdale-Black Diamond Road, Ravensdale, WA 98051		
County:	King	Tax Parcels:	0121069002, 3622069065, 3522069018, 3522069046
Cleanup Site ID:	4728	Latitude:	47.342
Facility Site ID:	2041	Longitude:	-121.993

This site was assessed for the February 2016 update of the Hazardous Sites List.

Property Description

The Reserve Silica Ravensdale operations occur on the following four parcels:

- Parcel 0121069002 is 10,714,453 square feet (246 acres) and is owned by Reserve Silica of Albuquerque, New Mexico.
- Parcel 3622069065 is 4,518,043 square feet (104 acres), contains a 120 square foot shed, and is owned by Reserve Silica.
- Parcel 3522069018 is 2,290,385 square feet (53 acres) and is owned by Reserve Silica.
- Parcel 3522069046 is 599,821 square feet (14 acres), contains a one-story building of undocumented size, and is owned by Baja Properties of Enumclaw, Washington. Portions of the infiltration ponds used by Reserve Silica occur on this parcel.

The total lot size owned by Reserve Silica is 403 acres. The following two areas of interest, totaling 13 acres, contain cement kiln dust (CKD):

- The lower disposal area (LDA), which is 7 acres, is located in the northwestern portion of the property
- The Dale strip pit (DSP), which is 6 acres, is located in the southeastern portion of the property.

The LDA, DSP, and surrounding areas are covered by bare dirt, vegetated covers, and dirt roads largely surrounded by undeveloped forest and grassland.

Water is provided to the property by the Covington Water District, which obtains its water primarily from the Green River with supplementation from ground water.

Property History

The Reserve Silica property was used for sand and coal mining until 2007. Currently, the property is in the reclamation phase, being backfilled with materials from construction sites in the Puget Sound area.

The LDA was an open pit sand mine reclaimed by placing CKD and other material into the excavation between June 1979 and October 1982. An estimated 175,000 tons of CKD were placed in the excavation. A clay cap up to 7 feet thick was placed over the CKD.

A coal seam below the DSP was mined via tunnels until 1946, when the DSP was constructed as an open pit coal mine. The DSP was reclaimed in the 1970s and 1980s with approximately 250,000 cubic yards of material including CKD, borrow, and other materials pursuant to a permit from Public Health – Seattle and King County. One third (over 83,000 cubic yards) of the fill is estimated to be CKD.

Additional sand-mining pits, the north pit and the tan sand pit, which were filled with unknown materials not expected to be CKD, are located on other portions of the property.

In September and October 2007, the soil cover on the LDA was upgraded to meet industry standards and to reduce infiltration thought to contribute to high-pH seepage on the west side of the area. The cover was re-graded to provide positive surface water runoff and the thickness was increased to a minimum of 2 feet at all locations. A surface water diversion ditch was constructed around the up-slope boundary of the cover. When these measures failed to reduce the volume of seepage, it was concluded that the primary cause of seepage was groundwater in-flow.

Between September 2008 and February 2013, a trench system was installed to collect the seepage from the west side of the LDA and direct it to the infiltration ponds on the north side of the property.

Current Site Conditions

Assuming 13 acres of CKD fill at a minimum of 2 feet depth and a specific gravity of 2.6 to 2.8 in powder form, the total, estimated volume of CKD in the LDA and the DSP combined is 163,000 cubic yards. Although CKD might be present in other locations, the additional volume would not change the scoring.

Surface water and ground water samples have been analyzed for dissolved metals, general chemistry, and field parameters. The results for pH, arsenic, lead, and manganese at each sampling location in May 2015 (February 2015 for wells sampled semiannually) are summarized below. In many cases, older samples produced higher results.

Surface and Ground Water Concentrations of pH, Arsenic, Lead, and Manganese in 2015

Location	pH	Arsenic (µg/L)	Lead (µg/L)	Manganese (µg/L)
Surface Water in LDA				
Still Well	13.02	54.60	0.22 J	< 2.0
Infiltration Pond #1	12.53	35.30	7.40	1.4 J
Weir	9.38	43.30	11.30	170.0
South Pond	10.42	154.00	30.80	58.0
Shallow Ground Water in LDA				
MW-1A	7.26	1.70	< 1.0	10.0
MW-2A	7.36	1.40	< 0.10	0.4 J
MW-3A	7.12	9.30	< 0.10	1,880.0
MW-4A	6.29	0.20	< 0.10	79.0
MW-5A	9.74	42.30	0.50	13.0
MW-6A	10.14	41.60	0.50	7.0
Bedrock Ground Water in LDA				
MWB-1LDA	7.70	11.70	< 0.10	48.0
MWB-2LDA	7.73	4.80	< 0.10	20.0
MWB-3LDA	7.43	10.90	< 0.10	124.00
Bedrock Ground Water in DSP				
MWB-1SDSP	7.00	13.00	< 0.10	na
MWB-1DDSP	7.48	2.90	< 0.10	na
MWB-5DSP	7.13	5.90	< 0.10	na
MWB-6DSP	7.32	1.40	< 0.10	na
Portal	7.26	2.80	0.07 J	na
Maximum surface water	13.02	154.0	30.80	170.0
Maximum shallow ground water	10.14	42.30	0.50	1,880.0
Maximum bedrock ground water	7.73	13.00	0.07 J	124.00
MTCA Method A or B Ground Water CUL	--	5	15	2,240

na – not analyzed

The maximum concentrations of arsenic in surface water (154 µg/L in the south pond), shallow ground water (42.30 µg/L in MW-5A), and bedrock ground water (13.00 µg/L in MWB-1SDSP) exceed the MTCA Method A cleanup level (CUL) of 5 µg/L. The maximum concentration of lead in surface water (30.80 µg/L in the south pond) exceeds the Method A CUL of 15 µg/L, but the maximum concentrations in shallow ground water (0.50 µg/L in MW-5A and -6A) and bedrock ground water (0.07 J µg/L at the portal) do not. The maximum concentrations of manganese in surface water (170.0 µg/L at the weir), shallow ground water (1,880.0 µg/L in MW-3A), and bedrock ground water (124.00 µg/L in MWB-3LDA) do not exceed the Method B CUL of 2,240 µg/L. Concentrations of manganese in MW-3A have exceeded the Method B CUL in the past, but the last time there was a manganese exceedance in this well was September 2011 (2,700.0 µg/L).

Geology

The property is underlain by glacial drift, including glacial outwash and till, and Puget Group bedrock. The glacial outwash is composed of stratified gravel, sand, silt, and clay. The till consists of unsorted clay, sand, cobbles, and boulders. The Puget Group is typically composed of sandstone and siltstone with numerous carbonaceous shale and coal beds and minor amounts of claystone and conglomerate. Most of the rocks are silty sandstone or sandy siltstone. There are numerous faults throughout the area.

Contents of Disposal Areas

The following three types of fill were encountered in borings in the disposal areas, beginning with the surficial layer and moving deeper:

- Low permeability soil cover 2-7 feet thick, consisting of compact to dense silty fine to medium sand and silt with pockets of fine-grained coal fragments
- Mine spoils ranging in thickness between 4.5 and 65 feet and consisting of loose to very dense sand, silt, gravel, and coal fragments with scattered cobbles and boulder fragments
- Hetergeneous mixture of CKD, with scattered pockets of mine spoils and coal fragments, of unknown thickness.

Ground Water

Ground water occurs in two aquifers beneath the property, a shallow unconsolidated aquifer and a deeper bedrock aquifer. Ground water in the bedrock aquifer flows generally northwest beneath the property. A vertical upgradient at the south end of the LDA brings ground water in the bedrock up into the shallow unconsolidated ground water zone where it flows northward through the fill. A vertical downgradient along the middle and northern ends of the LDA causes ground water in the shallow zone to discharge into the bedrock aquifer system. Ground water in the LDA also discharges to the surface, as discussed in the Surface Water section.

Ground water beneath the DSP occurs in the bedrock. It drains through the abandoned mine tunnels to the collapsed mine portal on the north side of the property, where a pipe drains it to the surface. The ground water beneath the DSP does not rise into the CKD as it does in the LDA.

The property is within the South King County ground water management area and is considered to have “low susceptibility” to ground water contamination. It is in neither a critical aquifer recharge area nor a sole source aquifer area.

The Department of Ecology well log viewer lists 21 wells within an approximate two-mile radius of the property. Completion depths for these wells range 36 to 360 feet. Six well logs indicate that the wells are used for irrigation. One of these wells is associated with a 3.6-acre property. The other five wells are associated with a housing development that covers approximately 155 acres. For scoring purposes, it was assumed that a total of 159 acres is irrigated with well water obtained within 2 miles of the property.

The Department of Health's source water assessment program mapping application shows the following water systems within approximately two miles of the property.

Name	Location	Group A/B	No. of Connections
Sawyerwood Estates	9,600 feet west	A	22
New Arcadia	9,400 feet north	A	14
Ravensdale Mobile Home Park	4,500 feet northeast	A	17
Lake Retreat Firs #2	8,300 feet east	A	16
Sugarloaf	10,300 feet east	A	92
Total connections			161

Assuming 3 people per connection, the total population served by ground water within two miles is 483.

Surface Water

Seepage with a high pH surfaces along the western slope of the LDA, primarily along the northern portion. The leachate drains through low-lying, marshy areas and commingles with stormwater before flowing to three infiltration ponds south of Ravensdale-Black Diamond Road.

Ground water from the DSP drains out a pipe at the portal north of the LDA on the east side of the main haul road. The water exiting the mine portal, combined with surface runoff and ground water intercepted upgradient of the LDA, flows through a culvert under the main haul road to a wetland area east of the infiltration ponds.

The infiltration ponds cover approximately one tenth acre in the northwestern portion of the property. Additional, smaller bodies of water, some of them designated as wetlands, are scattered across the property. The southwest portion of the property is covered by wetlands.

Ravensdale Lake, which is approximately 25 acres, is 83 feet north of the property across Black Diamond-Ravensdale Road. Sonia Lake, which is approximately 2 acres, is 88 feet south of the property. The property is not located within a flood plain.

Surrounding Area

The Reserve Silica property is bordered on the north side by railroad tracks, with Ravensdale Lake and woods beyond the tracks. Black Diamond-Ravensdale Road cuts through the northwest corner of the property. Undeveloped land containing woods, clear cuts, and open fields surrounds the property to the east and south sides of the property and south half of the west side. A logging operation neighbors the property on the north half of the west side. The Black Diamond Natural Area, which is owned and managed by King County Parks and Recreation, is adjacent to the south half of

the west side of the property. During a site visit on August 8, 2015, deer tracks were observed near the infiltration ponds.

The closest residence is 1,200 feet north of the property, across Ravensdale Lake. The Missouri Census Data Center (MCDC) lists 0 people living within 0.5 miles of the center of the property. Given the size of the property, however, it was deemed appropriate to include a 1 mile radius of the center. The MCDC lists 1,350 people living within a 1 mile radius of the center of the property. Most of the residences are in the small town of Ravensdale northeast of the property and the Maple Ridge development north of the property.

Special Considerations for Scoring

Surface Water

The infiltration ponds and the south pond are collection points for surface water. These locations have sampling data indicating exceedances of CULs.

Air

Truck traffic on the main haul road raises a substantial quantity of dust. However, this route was not scored because the CKD fill is covered and the airborne dust is not expected to contain CKD.

Groundwater

Domestic wells around the site are typically screened in the bedrock aquifer, which has the lowest concentrations of arsenic (1.4 to 13 μg/L). Given the variability of arsenic concentrations in ground water across the state, it is possible that concentrations in the bedrock aquifer are consistent with background in this area. Nevertheless, because of uncertainty about background concentrations and because arsenic concentrations in the shallow aquifer range higher (up to 42.3 μg/L), the ground water route was scored for arsenic.

Route Score Summary

Route	Human Health	Environment
Surface Water	35.3	50.4
Air	--	--
Groundwater	54.9	

Overall Rank: 1

Worksheet 2
Route Documentation

Site Name: Reserve Silica, Ravensdale, WA
CSID: 4728
FSID: 2041

1. Surface Water Route

Substances Used for Scoring
Arsenic and lead
Basis for Selection of Substances
Surface water concentrations exceeding Method A
Management Units for Scoring
Infiltration ponds and south pond
Basis for Selection of Management Units
Data showing exceedances

2. Air Route

Substances Used for Scoring
Not scored
Basis for Selection of Substances

Management Units for Scoring

Basis for Selection of Management Units

3. Ground Water Route

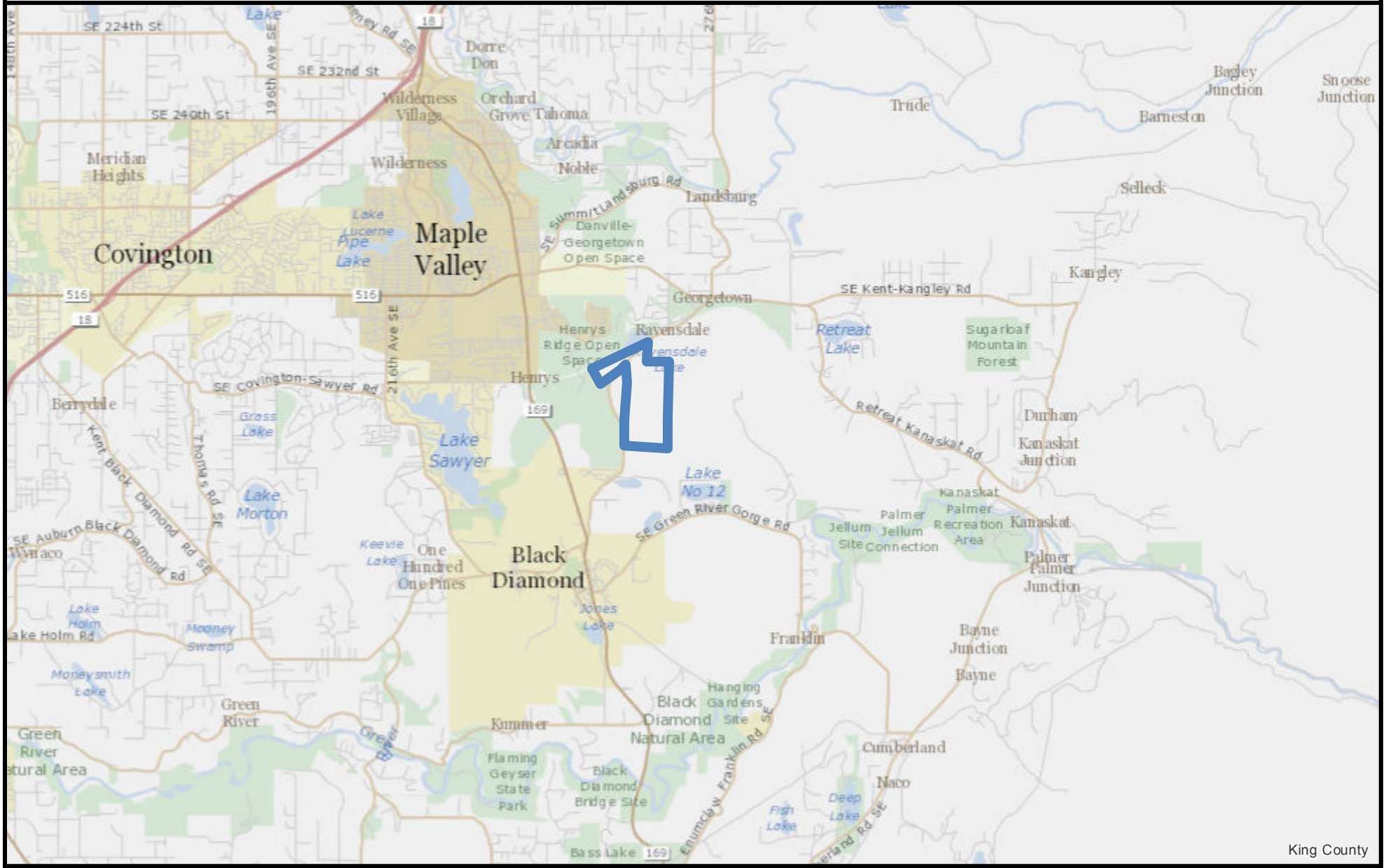
Substances Used for Scoring
Arsenic
Basis for Selection of Substances
Ground water concentrations exceeding Method A
Management Units for Scoring
Ground water
Basis for Selection of Management Units
Data showing exceedances

References

WARM Database	Ecology. 1992. Toxicology database for use in Washington ranking method scoring. Prepared by: Science Applications International Corporation, Olympia, WA. Prepared for: Washington State Department of Ecology, Olympia, WA. Publ. no. 92-37. Updated July 2015.
WARM Scoring Manual	Ecology. 1992. Washington ranking method, scoring manual. Washington State Department of Ecology, Olympia, WA. Publ. No. 90-14. Revised April 1992.
iMap	King County i-map. Available at: http://gismaps.kingcounty.gov/iMap/.
Well Log Viewer	Washington State well log viewer. Available at: https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx. Washington State Department of Ecology, Olympia, WA.
Drinking Water System Data	Drinking water system data. Available at: http://www.doh.wa.gov/DataandStatisticalReports/EnvironmentalHealth/DrinkingWaterSystemData. Washington State Department of Health, Olympia, WA.
NOAA Climate Data	NOAA Climate Data Online Search. National Centers for Environmental Information, National Oceanic and Atmospheric Administration. Available at: http://www.ncdc.noaa.gov/cdo-web/search.
NOAA Atlas 2	NOAA Atlas 2 precipitation frequency estimates in GIS compatible formats. Available at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm.
King County Precip Map	King County precipitation map. November 2011.
WA Interactive Geologic Map	Washington interactive geologic map. Available at: http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/geology_portal.aspx.
Priority Habitat and Species	Priority habitat and species map. Available at: http://apps.wdfw.wa.gov/phsontheweb/. Washington Department of Fish and Wildlife, Olympia, WA.
MO CDC	Missouri Census Data Center. Circular Area Profiles (CAPS). Available at: http://mcdc2.missouri.edu/websas/caps.html. Missouri State Library.
LDA Hydrogeo Investigations	Lower disposal area hydrogeological investigations, Ravensdale Site. Prepared by Golder Associates, Redmond, WA, for Holcim (US) Inc., Colorado Springs, CO. June 11, 2013.
Cover Inspection Report	Ravensdale 2014 LDA and DSP cover inspection report. Letter from J. Keller, IO Environmental and Infrastructure, Inc., to J. Bolduc, Holcim (US) inc., Colorado Springs, CO. September 30, 2014.
2015 Second Quarter Monitoring	Quarterly monitoring report, second quarter 2015, Ravensdale Site. Prepared by Golder Associates, Inc., Redmond, WA, for Holcim (US) Inc., Colorado Springs, CO. June 10, 2015.

Figures

Reserve Silica Location

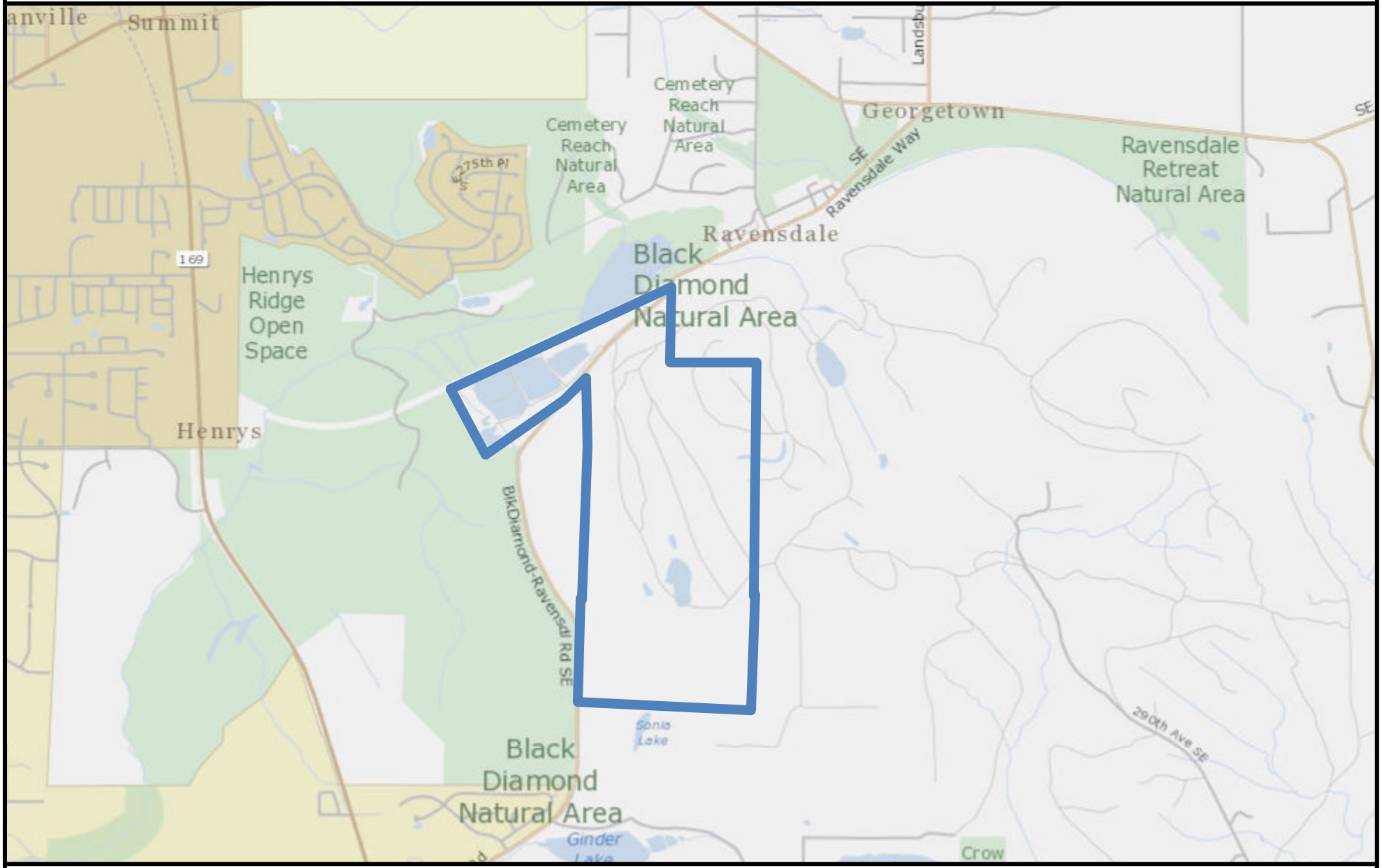


Date: 7/31/2015 Notes:

N

King County GIS Center

Reserve Silica Vicinity



Date: 7/31/2015 Notes:

King County
GIS Center

Reserve Silica Aerial View

Date: 7/31/2015 Notes:

N

King County
GIS Center

NOTES

1. BASE TOPOGRAPHY OUTSIDE OF LDA FOOTPRINT PREPARED BY AERO-METRIC, INC., SEATTLE, WA FROM AERIAL PHOTOS FLOWN ON FEBRUARY 10, 2007.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 5 FT

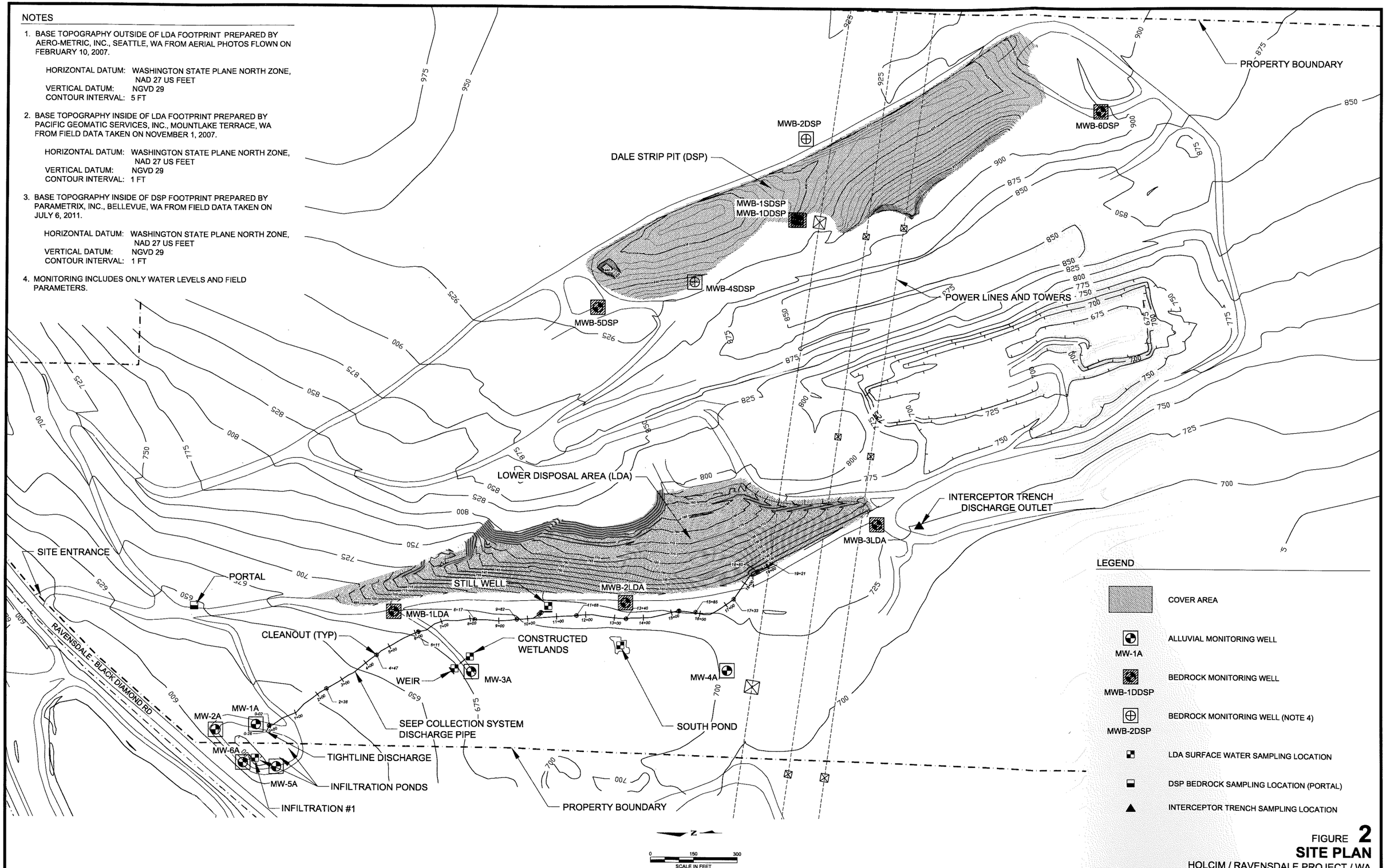
2. BASE TOPOGRAPHY INSIDE OF LDA FOOTPRINT PREPARED BY PACIFIC GEOMATIC SERVICES, INC., MOUNTLAKE TERRACE, WA FROM FIELD DATA TAKEN ON NOVEMBER 1, 2007.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 1 FT

3. BASE TOPOGRAPHY INSIDE OF DSP FOOTPRINT PREPARED BY PARAMETRIX, INC., BELLEVUE, WA FROM FIELD DATA TAKEN ON JULY 6, 2011.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 1 FT

4. MONITORING INCLUDES ONLY WATER LEVELS AND FIELD PARAMETERS.



LEGEND

- COVER AREA
- MW-1A — ALLUVIAL MONITORING WELL
- MWB-1DDSP — BEDROCK MONITORING WELL
- MWB-2DSP — BEDROCK MONITORING WELL (NOTE 4)
- LDA SURFACE WATER SAMPLING LOCATION
- DSP BEDROCK SAMPLING LOCATION (PORTAL)
- INTERCEPTOR TRENCH SAMPLING LOCATION

FIGURE **2**
SITE PLAN
HOLCIM / RAVENSDALE PROJECT / WA

K:\CAD\Projects\2007\07393074\x01\001\073_93074_01_001_F02_R4.dwg | F02 | Mod: 02/27/2015, 09:40 | Plotted: 02/27/2015, 09:40 | TRybar

Golder Associates

Figures 5-7: Site Photos

Figure 5. Storm water holding pond (pH 10.3): collects surface runoff, ground water exiting the mine portal, and ground water intercepted upgradient of the LDA

Figure 6. Intercept ditch downgradient of LDA (pH 12.8)

Figure 7. Looking south from the upper portion of the LDA (pH 12.2)

Worksheet 4
Surface Water Route

CSID: **4728**

Site: **Reserve Silica, Ravensdale**

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

	Drink. Wat. Stnd.		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
Substance	Value (ug/L)	Score	Value (ug/L)	Score	Value (ug/L)	Score	Adjusted CPFo (risk per mg/kg-day)	Score
Arsenic	10	8	763	5	3.00E-04	5	1.50E+00	7
Lead	15	6	<0.001	10	--	X	--	X

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

1.2 Environmental Toxicity

Freshwater: X
Marine:

Substance	Acute Water Quality Criterion Value (ug/L)	Score
Arsenic	340	4
Lead	65	6

Maximum score: 6 — Environmental Toxicity Score: 6
Source: WARM Database — Range: 2-10

1.3 Substance Quantity

Amount: 13 acres
Basis: Combined acreage of LDA and DSP
Source: Cover Inspection Report — Substance Quantity Score: 10
Range: 1-10

2.1 Containment

Description: Landfill with engineered cover but direct contact with ground water

Source: LDA Hydrogeological Investigations 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 | 109.0

Worksheet 4 (cont.)
Surface Water Route

CSID: **4728**
Site: **Reserve Silica, Ravensdale**

2.0 MIGRATION POTENTIAL

2.2 Surface Soil Permeability

Description:	Silty fine to medium sand		
Source:	LDA Hydrogeological Investigations	Soil Permeability Score:	3
		Range: 1-7	

2.3 Total Annual Precipitation

Amount (in.):	55	Annual Precipitation Score:	4
Source:	King County Precip Map	Range: 1-5	

2.4 Maximum Two-Year/24-Hour Precipitation

Amount (in.):	2.28	24-Hour Precipitation Score:	3
Source:	NOAA Atlas 2	Range: 1-5	

2.5 Flood Plain

Classification:	No	Floodplain Score:	0
Source:	iMap	Range: 0-2	

2.6 Terrain Slope

Degree of slope:	Ground water from LDA is piped to infiltration ponds		
Source:	iMap	Terrain Slope Score:	3
		Range: 1-5	

MIGRATION PARAMETER CALCULATION

MIG = Soil Permability + Annual Precip. + 24-Hour Precip. + Floodplain + Slope **13.0**

Worksheet 4 (cont.)
Surface Water Route

CSID: **4728**
Site: **Reserve Silica, Ravensdale**

3.0 TARGETS

3.1 Distance to Surface Water

Name:	Ravensdale Lake		
Distance (ft):	83 feet	Distance to Surface Water Score:	10
Source:	iMap	Range: 0-10	

3.2 Population Served within 2 Miles

Population:	0	Population Served Score:	0
Source:	Drinking Water System Data	Range: 0-75	

3.3 Area Irrigated within 2 Miles

Basis:	Unknown		
Area (acres):		Area Irrigated Score:	0
Source:		Range: 0-30	

3.4 Distance to Nearest Fishery Resource

Name:	Ravensdale Lake		
Distance (ft):	83	Distance to Fishery Score:	12
Source:	iMap	Range: 0-12	

3.5 Distance to Nearest Sensitive Environment

Name:	Black Diamond Natural Area		
Distance (ft):	0	Distance to Sensitive Environment Score:	12
Source:	iMap	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**

Worksheet 4 (cont.)
Surface Water Route

CSID: **4728**

Site: **Reserve Silica, Ravensdale**

4.0 RELEASE

Evid. of release? Yes; concentrations above cleanup levels in surface water samples

Source: 2015 Second Quarter Monitoring

Release Score (REL): 5

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 **35.3**

Environmental Pathway

SWe = (SUBe x 40/175) x {(MIG x 25/24)) + REL + (TARe x 30/115)} / 24 **50.4**

Range: 0-100

Worksheet 5
Air Route

CSID: **4728**

Site: **Reserve Silica, Ravensdale**

Not scored.

Worksheet 6
Groundwater Route

CSID: 4728

Site: Reserve Silica, Ravensdale

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human toxicity

	Drink. Wat. Stnd		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
Substance	Value (ug/L)	Score	Value (ug/L)	Score	Value (ug/L)	Score	Adjusted CPFo (risk per mg/kg-day)	Score
Arsenic	10	8	763	5	3.00E-04	5	1.50E+00	7

Maximum score:	8		
Bonus points:	2	Human Toxicity Score:	10
Source:	WARM Database	Range: 1-12	

1.2 Mobility

	Solubility	
Substance	Value (ug/L)	Score
Arsenic	K >1	3

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

1.3 Substance quantity

Quantity:	163,000		
Units:	cubic yards		
Basis:	13 acres with a minimum of 2 feet thickness		
Source:	LDA Hydrogeological Investigations	Substance Quantity Score:	10
		Range: 1-10	

2.1 Containment

Description:	Ground water in direct contact with CKD fill		
Source:	LDA Hydrogeological Investigations	Containment Score:	10
	2015 Second Quarter Monitoring	Range:	0-10

SUBSTANCE PARAMETER CALCULATION

SUB = (Human Toxicity + Mobility + 3) x (Containment + 1) + Substance Quantity 186.0

Worksheet 6 (cont.)
Groundwater Route

CSID: 4728

Site: Reserve Silica, Ravensdale

2.0 MIGRATION POTENTIAL

2.2 Net precipitation

Amount (in.):	55	Net Precipitation Score:	5
Source:	King County Precip Map	Range: 0-5	

2.3 Subsurface Hydraulic Conductivity

Description:	Sand and gravel, fractures in bedrock		
Source:	LDA Hydrogeological Investigations	Hydraulic Conductivity Score:	4
		Range: 1-4	

2.4 Vertical Depth to Aquifer

Depth (ft):	0 (CKD in ground water)	Depth to Aquifer Score:	8
Source:	LDA Hydrogeological Investigations	Range: 1-8	
	2015 Second Quarter Monitoring		

MIGRATION PARAMETER CALCULATION

MIG = Depth to Aquifer + Net Precipitation + Hydraulic Conductivity **17.0**

Worksheet 6 (cont.)
Groundwater Route

CSID: 4728

Site: Reserve Silica, Ravensdale

3.0 TARGETS

3.1 Aquifer Usage

Description:	Private supply but alternative source available with minimal hook-up		
Source:	Drinking Water System Data	Aquifer Use Score:	4
		Range: 1-10	

3.2 Distance to Nearest Drinking Water Well

Distance (ft):	4,500	Well Distance Score:	2
Source:	iMap	Range: 0-5	
	Drinking Water System Data		

3.3 Population Served by Drinking Water Wells within Two Miles

No. of people:	483	Population Served Score:	22
Source:	Drinking Water System Data	Range: 0-100	

3.4 Area Irrigated by Wells within Two Miles

Area (acres):	159	Area Irrigated Score:	9
Source:	iMap	Range: 0-50	
	Well Log Viewer		

TARGET PARAMETER CALCULATION

37.4

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

Worksheet 6 (cont.)
Groundwater Route

CSID: 4728

Site: Reserve Silica, Ravensdale

4.0 RELEASE

Evid. of release? Yes; concentrations above cleanup levels in groundwater samples

Source: 2015 Second Quarter Monitoring

Release Score (REL): 5

Range: 0 or 5

GROUND WATER ROUTE CALCULATION

54.9

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

Site Name: **Reserve Silica, Ravensdale**
Site Address: **123 Main Street, Bellevue**
CSID: **4728**
FSID: **1292568**

Human Health Route Scores

Pathway	Score	Quintile
Surface water	35.3	5
Air	--	
Ground water	54.9	5

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

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

Human Health Pathway Quintiles - February 2015

Quintile	Surface Water		Air		Ground Water	
1	<=	6.9	<=	8.4	<=	23.4
2	7.0	14.0	8.5	15.4	23.5	33.1
3	14.1	23.0	15.5	23.7	33.2	40.8
4	23.1	30.6	23.8	37.5	40.9	51.5
5	>=	30.7	>=	37.6	>=	51.6

Human Health Priority Bin Score: 4.4

Environmental Route Scores

Pathway	Score	Quintile
Surface water	50.4	4
Air	--	

Quintile	Value
High (H)	4
Low (L)	

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

Environmental Pathway Quintiles - February 2015

Quintile	Surface Water		Air	
1	<=	10.9	<=	1.5
2	11.0	23.5	1.6	13.9
3	23.6	31.1	14.0	22.4
4	31.2	50.8	22.5	29.8
5	>=	50.9	>=	29.9

Environmental Priority Bin Score: 2.3

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: 1