Work Plan
Remedial Investigation/Feasibility Study

Ione Petroleum Contamination Project
Ione, Washington

for
Washington State Department of Ecology

November 22, 2011

GeoEngineers
Earth Science + Technology

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File No. 0504-058-02

November 22, 2011

Prepared for:

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Toxics Cleanup Program
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1.0 INTRODUCTION

This Work Plan is submitted pursuant to the Scope of Work and Fee Estimate submitted to Washington State Department of Ecology (Ecology) by GeoEngineers, Inc. (GeoEngineers) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Ione Petroleum Contamination Site near Ione, Washington. The properties collectively referred to as the "Site", include: 1) the Airport Kwik Stop; 2) the Cabin Grill property; and 3) the vacant properties north, south and east of the Cabin Grill. The location of the Site is shown with respect to surrounding physical features on the Vicinity Map, Figure 1.

Previous site characterization activities have been completed at the Site, the results of which are presented in reports prepared by GeoEngineers and referenced in the following **Section 2.4** of this Work Plan. The activities described in this Work Plan will be conducted to obtain additional information to further characterize the nature and extent of petroleum contamination of soil and groundwater at the Site in order to conduct an RI/FS. This Work Plan was prepared in general accordance with the requirements defined by the Model Toxics Control Act (MTCA) Regulation (Washington Administrative Code [WAC] 173-340-350), and provides details for describing the proposed field investigation, data analysis program, anticipated schedule, and reporting. The project Sampling and Analysis Plan (SAP) is presented as Appendix A of this Work Plan. The project Quality Assurance Project Plan (QAPP) is presented as Appendix B of this Work Plan. GeoEngineers' site-specific Health and Safety Plan (HASP) for the project is presented as Appendix C of this Work Plan.

2.0 BACKGROUND INFORMATION

This section presents background information for the Site, including soil and groundwater conditions; historical and current Site uses; previous environmental investigations; and contaminants of potential concern (COPCs).

2.1. Property Descriptions

2.1.1. Airport Kwik Stop

The Airport Kwik Stop is located northwest of the intersection of State Route 31 and Greenhouse Road (Geographic ID 433707449008, Property ID 6477). The property is bounded on the east by State Route 31, on the south by Greenhouse Road, and on the west and north by residential, commercial and undeveloped property. The ground surface is relatively level. The Kwik Stop building is located near the southeast portion of the property, fronting State Route 31 and Greenhouse Road. The fuel dispensers are located in the range of about 50 to 75 feet northwest of the above intersection. Three former underground storage tanks (USTs) were located on the north side of the building (about 100 to 120 feet from the intersection). Two of the tanks were removed in 1994. According to Ecology records, it is likely that the third tank was closed in place. Currently, aboveground storage tanks (ASTs) are located behind (west) of the building, about 200 feet from the above intersection.

2.1.2. Cabin Grill

The Cabin Grill property is located southeast of the intersection of State Route 31 and Dewitt Road (Geographic ID 433718519001, Property ID 6714). The property is bounded on the north by Dewitt Road, on the west by State Route 31, and on the east and south by residential and undeveloped property. The property generally is level, with a slight topographic high point near the Cabin Grill building. Most of the ground surface is covered with field grass and stands of pine trees. A gravel parking area surrounds the Cabin Grill building. A domestic water well is located near the south side of the building, approximately 200 feet from the southeast corner of the above intersection. The Pend Oreille River is located approximately ¼ mile to the east of the Cabin Grill property. The Cabin Grill is an operating restaurant and the existing water well is utilized for restaurant operations. This well is contaminated with petroleum hydrocarbons; water is treated through carbon units before use.

2.1.3. Ione Airport

The Ione Airport is located southwest of the intersection of State Route 31 and Greenhouse Road (Geographic ID 433718000001, Property ID 6698). The site is bounded on the north by Greenhouse Road, on the east by State Route 31, and on the west by sparsely populated residential and undeveloped property. The airport extends approximately 4,000 feet to the south. The subject area of the airport is located generally north of the runway, near two former USTs which were removed in 2008. The ground surface near the former tank locations generally is level. Additional site improvements at the airport include a paved runway and several pre-fabricated metal airplane hangars.

2.1.4. Vacant Properties

2.1.4.1 DOYLE PROPERTIES

Mr. John Doyle owns vacant property located northeast of the intersection of State Route 31 and Dewitt Road (Geographic ID 433707449006, Property ID 6475; and Geographic ID 433707040004, Property ID 6422). The property is bounded on the south by Dewitt Road and on the west by State Route 31. The vacant property is generally level and extends about 850 feet north of Dewitt Road and 530 feet east of State Route 31. The property is undeveloped and most of the ground surface is covered with field grass. A hand dug well is located about 100 feet north of Dewitt Road and 60 feet east of State Route 31. The hand-dug well is about 8 feet in diameter and constructed of concrete. An approximate 3-foot-diameter concrete hatch provides access to the well. At the time of field activities, concrete blocks had been stacked on top of the access hatch and wire fences had been erected around the well.

In addition, Mr. Doyle owns property (Geographic ID 433717529009, Property ID 6611) located east and south of the Cabin Grill property.

2.1.4.2 DAWSON PROPERTY

Mr. Daniel Dawson owns a triangular-shaped piece of vacant property (Geographic ID 433718510002, Property ID 6713) located south of the Cabin Grill property. Mr. Dawson's property is bounded on the north by the Cabin Grill property, on the west by State Route 31, and on the east by the Doyle property and two other smaller properties.

2.2. Geologic and Soil Conditions

The Town of Ione is situated within the Pend Oreille River Valley in Pend Oreille County, Washington. Topography slopes gently downward to the north along the main axis of the river valley, and the valley is bounded by upland areas to the east and west.

Basement rocks near the subject site generally consist of a complex assemblage of variously metamorphosed and folded sedimentary and volcanic rocks. These include Pre-Cambrian-age (greater than about 570 million years old [MA]) metasedimentary and metavolcanics, Cambrian-age (about 570 to 510 MA) phyllite, and Ordovician-age (about 510 to 440 MA) metacarbonate rocks. These rocks were later intruded by Cretaceous granite, which outcrops in abundance on both sides of the river valley to the south of Ione.

During the Quaternary (as recently as 15,000 years ago), glacial ice flowed through the ancestral Pend Oreille River Valley and is thought to have extended as far south as Newport. Subsequently as the climate warmed, the ice melted in-place and deposited large quantities of poorly-sorted glacial till on the surrounding mountains. The voluminous melt waters reworked some of the till into outwash plains and carried abundant silt and clay to quiescent marginal lakes. These marginal lakes were ideal depositional sites for thick laminated silts and clays which are found in abundance within the Pend Oreille River Valley. Near Ione, glacial deposits are widely distributed and generally are mapped as glacial drift (found within upland areas and primarily consisting of till and outwash) and glaciolacustrine deposits (found on the valley floor and primarily consisting of silt and clay). Alluvial deposits associated with the Pend Oreille River and its tributaries occur in close proximity to surface water and floodplain areas.

Review of water well reports from near the project area indicates that subsurface conditions consist of an upper zone of silt, sand and gravel, which extends to depths in the range of about 40 to 60 feet. The upper silt, sand and gravel unit appears to be underlain by clay. The water well report for the domestic water well at the Cabin Grill indicates that sand and gravel extends to a depth of about 50 feet below the site. Reports for several water wells in the area indicate that the clay layer extends to depths of at least several hundred feet.

Results of previous explorations at the Site completed during site characterization activities in 2010 and 2011 generally confirm the published geologic conditions. Twenty-five direct-push borings (DP-1 through DP-25) and 5 hollow-stem auger borings (B-1 through B-5) were drilled and 15 monitoring wells (MW-1 through MW-15) were installed at the Site during previous site characterization activities in 2010 and 2011. Subsurface conditions encountered in the borings generally consisted of an upper layer of sand with variable silt content, which extended to depths in the range of about 17 to 50 feet below ground surface, underlain by low-permeability silt and clay.

2.3. Hydrogeologic Setting and Groundwater Conditions

The complex distribution and geometry of bedrock and unconsolidated formations within the Pend Oreille River valley has resulted in numerous locally-important aquifers of limited areal extent and storage capacity. Aquifer systems within the valley occur within basement rocks and unconsolidated glacial and alluvial deposits.

A hydrogeologic evaluation performed by Golder Associates (2002) for the Town of Ione identified three primary hydrogeologic units including: 1) an unconfined aquifer of relatively high permeability consisting of outwash and alluvial sand and gravel; (2) an aquitard consisting of glacial till and glaciolacustrine silt and clay; and 3) a confined aquifer of moderate permeability within Ordovician-age carbonate rocks. Over 60 percent of the area wells inventoried by Golder Associates were completed within the unconfined aquifer. The maximum specific capacity (well discharge per foot of drawdown) in wells completed in the unconfined aquifer was reported at about 80 gallons per minute per foot (gpm/foot), whereas maximum specific capacity was reported at less than 2 gpm/foot for wells completed within the confined aquifer.

During the five groundwater monitoring events conducted at the Site between August 2010 and August 2011, groundwater was encountered at depths ranging from 14.8 feet (MW-10 in August 2011) to 41.56 feet (MW-15 in August 2011) below ground surface (bgs). The water well report for the Cabin Grill well indicates the static water level was at a depth of 35 feet (located within the sand and gravel unit) at the time of well installation. Based on the soil conditions encountered at the locations of the borings, the shallow groundwater table underlying the site appears to be unconfined and situated above the low-permeability silt and clay unit.

Interpreted groundwater flow direction during the previous groundwater monitoring events generally was east-southeast; away from upland recharge areas to the west and towards the Pend Oreille River to the east. However, the local distribution in groundwater elevation, flow direction and gradient observed at the site was relatively complex. Within the west portion of the site (approximately between monitoring wells MW-1 and MW-8), hydraulic gradient was relatively steep, at about 1.6×10^{-2} feet per foot (about 85 feet per mile) and groundwater flowed east. Within the east portion of the site (approximately between monitoring wells MW-8 and MW-10), hydraulic gradient flattened significantly, averaging about 2.4×10^{-3} feet per foot (about 12.7 feet per mile) and groundwater flowed southeast. Variation in hydraulic gradient could be caused by soil permeability variation across the site (an increase in permeability to the east), the geometry of perching layers, and/or Pend Oreille River stage. Groundwater elevations measured in the Site monitoring wells and interpreted flow direction for the August 2011 monitoring event are shown in Groundwater Elevations and Flow Direction-August 2011, Figure 2. Results of groundwater elevation measurements from the quarterly groundwater monitoring events are summarized in Summary of Groundwater Level Measurements, Table 1.

2.4. Site Use History and Existing Data

2.4.1. General

Details regarding the site are presented in previous reports prepared by GeoEngineers for this site including:

- "Site Characterization Report, Ione Petroleum Contamination Site, Ione, Washington," dated October 14, 2010.
- "Supplemental Site Characterization Report, Ione Petroleum Contamination Site, Ione, Washington," dated January 3, 2011.
- "Groundwater Monitoring Report (Second Quarterly Event), Ione Petroleum Contamination Site, Ione, Washington," dated January 25, 2011.

- "Groundwater Monitoring Report (Third Quarterly Event), Ione Petroleum Contamination Site, Ione, Washington," dated May 5, 2011.
- "Groundwater Monitoring Report (Fourth Quarterly Event), Ione Petroleum Contamination Site, Ione, Washington," dated June 29, 2011.
- "Second Supplemental Site Characterization Report, Ione Petroleum Contamination Site, Ione, Washington," dated August 31, 2011.

The results of the previous site characterization and groundwater monitoring efforts indicate that a plume of petroleum-contaminated groundwater (gasoline) is present beneath the site, extending from the Airport Kwik Stop property, downgradient through the Cabin Grill property to undeveloped property (referred to as the Vacant Property) located south and east of the Cabin Grill property. Locations of the previous explorations, and explorations where soil samples contained gasoline-range petroleum hydrocarbons (GRPH) and/or benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds at concentrations greater then MTCA Method A cleanup levels for unrestricted land use are presented in GRPH and BTEX in Soil Samples, Figure 3. Locations where GRPH and BTEX compounds have been detected in groundwater samples at concentrations greater than MTCA Method A cleanup levels are presented in GRPH and BTEX in Groundwater Samples, Figure 4. Soil analytical data from initial site characterization activities in April and July 2010 also are summarized in Summary of Chemical Analytical Results - Site Characterization Soil Samples, Table 2 and Summary of Volatile Organic Compounds Analytical Results - Site Characterization Direct-Push Samples, Table 3. Soil analytical data from the supplemental site characterization in November 2010 are summarized in Summary of Chemical Analytical Results - Supplemental Exploration Phase Soil Samples, Table 4. Soil analytical data from the second supplemental site characterization in July 2011 are summarized in Summary of Chemical Analytical Results - Second Supplemental Exploration Phase Soil Samples, Table 5. Results of groundwater analytical data from groundwater samples obtained from direct-push borings during initial site characterization activities in April 2010 are summarized in Summary of Chemical analytical Results - Site Characterization Groundwater Samples Direct-Push Phase, Table 6. Groundwater analytical results from five quarterly groundwater monitoring events are summarized in Summary of Groundwater Chemical Analytical Results - Monitoring Well Samples, Table 7. A summary of field water quality parameters measured during the quarterly groundwater monitoring events also is presented in Summary of Field Quality Parameters, Table 8.

2.4.2. Airport Kwik Stop

The Airport Kwik Stop formerly was known as Crandall's Airport Grocery and Bob & Cindy's Airport Grocery. The site was registered with Ecology in 1987 with three underground storage tanks. The Airport Kwik Stop historically has sold regular and premium gasoline and diesel. As indicated previously, two of the tanks were removed in 1994 and the third tank was reportedly closed in place. ASTs located west of the building were subsequently utilized for fuel storage. In May 2008, a flex pipe connection beneath the premium gasoline dispenser was found spraying gasoline inside the dispenser. The flex pipe was repaired and subsequently, along with the attached supply line, passed a tightness test before returning to operation.

The site was not in operation between fall 2008 and sometime between May and August 2011. During the May 2011 monitoring event, repairs were being made to the building, and sometime between the May 2011 monitoring event and the August 2011 monitoring event, the Airport Kwik Stop become operational, including serving food and selling groceries. We understand that the Airport Kwik Stop is not currently selling or storing petroleum. The pumps at the dispenser island are covered and not accessible for distribution of petroleum products.

Analytical data from the 1994 tank removal was not available. Soil samples were obtained at the Airport Kwik Stop during previous site characterization activities in 2010 and 2011) and groundwater samples have been obtained at the Kwik Stop during five quarterly groundwater monitoring events conducted between August 2010 and August 2011. Soil analytical results are presented in Tables 2 and 3. Groundwater analytical results are presented in Tables 6 and 7. Results of previous site characterization activities indicated petroleum-contaminated soil near the fuel dispensers contained GRPH and BTEX compounds at concentrations greater than MTCA Method A cleanup levels for unrestricted land use, and contaminated soil extends from near the ground surface to the water table (about 36 to 38 feet bgs). Results also indicated that groundwater underlying the site near the fuel dispensers is contaminated with GRPH and BTEX compounds at concentrations greater than MTCA Method A cleanup levels. Petroleum hydrocarbons were not detected in analyzed soil and groundwater samples obtained from explorations upgradient of the fuel dispensers.

2.4.3. Cabin Grill

The Cabin Grill property was developed in 1985 as a realty office. Subsequent site use included a cabinet shop, a pottery business, Pend Oreille North Realty and, currently, the Cabin Grill. Ecology records indicate that the cabinet shop was used for display only, and not for manufacturing. While documentation has not been found in available records, based on anecdotal evidence and interviews with local residents, historic use of the property also included a storage yard for a construction business. Records indicate that the domestic water well at the Cabin Grill property was installed in 1986. Prior to the 2010/2011 site characterization activities, petroleum compounds had been detected in groundwater samples collected from the domestic well on at least two separate occasions. Ecology conducted an initial investigation in 1993 following notification by Pend Oreille North Realty of a strong petroleum odor emanating from the drinking water tap. A water sample was collected by the owner/representative and sent to North Creek Analytical in Spokane, Washington for analysis of GRPH and volatile organic compounds (VOCs). Ecology was notified in 2008 by the Cabin Grill owners of a strong petroleum odor emanating from the drinking water tap. A water sample was collected by Ecology and sent to TestAmerica (formerly North Creek Analytical) in Spokane, Washington for analysis of VOCs. The results from initial analytical testing are presented below in Table 9:

TABLE 9. ANALYTICAL RESULTS OF CABIN GRILL WELL WATER

Sample Date	Matrix	Sample ID	Gasoline-Range TPH (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
1993	Water	NA	1,100	460	140	16	190
2008	Water	NA	NT	2,200	6,200	370	1,900
MTCA Method A Cleanup Groundwater Levels			800[1]	5	1,000	700	1,000

1. Cleanup level for groundwater where benzene is present.

ppb = parts per billion

MTCA = Model Toxics Control Act

NA = not available

NT = not tested

TPH = total petroleum hydrocarbons

Soil and groundwater samples were obtained at the Cabin Grill property during the 2010/2011 site characterization activities (April and August 2010, November 2010, July 2011 and August 2011). Soil analytical data from these events are presented in Tables 2, 3 and 5. Groundwater analytical data from these events are presented in Tables 6 and 7. Results indicate that petroleum contaminated soil and groundwater with concentrations of GRPH and BTEX compounds greater than MTCA Method A cleanup levels are present beneath the Cabin Grill property.

2.4.4. Ione Airport

Two USTs at the Airport were installed around 1974/1975. Initially, the tanks contained aviation gasoline (Avgas). During the mid- to late-1980s, airplanes utilizing the airport were retrofitted to use unleaded gasoline. The tanks were removed and disposed in 2008. Soil contamination was discovered during removal of the westernmost tank which showed signs of structural failure. Analytical results from samples collected from the tank excavations are presented in Table 10:

TABLE 10. ANALYTICAL RESULTS OF IONE AIRPORT TANK REMOVAL

Sample ID	Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	MTBE (ppm)
1A-SAG-7 bottom	**13,300**	**216**	**1,340**	**283**	**1,790**	**10.1**
1A-SAG-8 west side wall	29.9	**0.349**	1.12	0.208	2.75	ND
1A-SAG-9 east side wall	**2,010**	**12.4**	**73.9**	**18.4**	**197**	**0.808**
MTCA Method A Cleanup Level for soil	100; 30 if benzene is present	0.03	7	6	9	0.1

Notes:

MTBE = methyl tert-butyl ether

MTCA = Model Toxics Control Act

ND = not detected

ppm – parts per million

Soil samples were obtained at the Ione Airport during the 2010/2011 site characterization activities (April and August 2010). Groundwater samples also have been obtained at the Ione Airport during five quarterly groundwater monitoring events conducted between August 2010 and August 2011. Soil analytical data from these events is presented in Tables 2 and 3, and groundwater analytical data from these events are presented in Tables 6 and 7. Petroleum-contaminated soil and groundwater were not detected, or were detected at concentrations below MTCA Method A cleanup levels in samples analyzed during the 2010/2011 site characterization activities.

2.4.5. Vacant Properties

Records currently are not available regarding previous site history on the Doyle properties. Based on verbal information provided by local residents, the Cabin Grill property previously was used as a storage yard for construction equipment. It is not currently known if the Dawson property was also used for storage of construction equipment.

Soil samples were obtained from the Vacant Properties during the Site Characterization (April and August 2010), Supplemental Site Characterization (November 2010), and Second Supplemental Site Characterization (July and August 2011). Groundwater samples have been obtained at the Vacant Properties during five quarterly groundwater monitoring events conducted between August 2010 and August 2011. Soil analytical data from these events are presented in Tables 4 and 5, and groundwater analytical data from these events are presented in Table 7. Results of the 2010/2011 site characterization activities indicate that petroleum-contaminated soil and groundwater with concentrations of GRPH and BTEX compounds greater than MTCA Method A cleanup levels are present below the properties owned by Mr. Doyle. Explorations have not been completed on the property owned by Mr. Dawson.

2.5. Site Contaminants of Potential Concern

COPCs for Site soil and groundwater include contaminants previously detected at levels exceeding MTCA Method A cleanup levels and contaminants associated with historic storage and distribution of petroleum products. COPCs for the Site include the following constituents:

- GRPH;
- VOCs including BTEX compounds, ethylene dibromide (EDB), 1,2 dichlorethane (EDC), MTBE and naphthalene;
- Diesel-range petroleum hydrocarbons (DRPH);
- Oil-range petroleum hydrocarbons (ORPH);
- If ORPH are encountered during investigation activities or detected in analyses samples, samples will also be analyzed for polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and lead, as appropriate.

3.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed to help direct the RI exploration program. The CSM consists of three components: 1) the sources of COPCs at the Site; 2) the subsequent potential migration of those hazardous substances in environmental media; and 3) complete exposure pathways.

Contamination sources and exposure mechanisms are shown in Conceptual Site Model, Figure 5. Contaminant sources include the vadose zone contamination at the Airport Kwik Stop property and the contaminated groundwater plume (both in liquid and dissolved phase) underlying the Site. While the area of known shallow vadose zone contamination currently is covered by pavement, direct contact exposure with petroleum contaminated soil is possible if any underground construction or utility work were to occur on the Kwik Stop property. Based on groundwater analytical results, contaminants have been leached and transported downward toward the water table and have been detected in at least one drinking water well. The downgradient extent of the contaminated groundwater plume has not been defined. Contaminated groundwater could potentially impact downgradient domestic wells, surface water, and associated ecological receptors.

A complete exposure pathway consists of: 1) an identified contaminant source; 2) a transport pathway to locations (exposure points) where potential receptors might come in contact with COPCs; and 3) an exposure route (e.g., soil ingestion) through which potential receptors might be exposed to COPCs. Exposure pathways deemed to be incomplete were not considered further in this RI/FS Work Plan.

Potential exposure pathways and receptors include:

- Ecological
  - Direct contact with contaminated soil - small burrowing mammals, soil biota, plants.
  - Ingestion of contaminated soil – small mammals.
  - Ingestion of plants or fauna that have ingested or absorbed contaminants from the site – predatory small mammals, birds.
  - Possible ingestion of contaminated surface water – aquatic and terrestrial food chain.
- Human
  - Ingestion of contaminated groundwater from onsite wells - residents and patrons of the Cabin Grill and possibly downgradient domestic wells.
  - Dermal contact with contaminated groundwater removed from onsite wells – residents and restaurant patrons of the Cabin Grill and possibly downgradient domestic wells.
  - Inhalation of contaminated vapors – residents and patrons of the Kwik Stop and Cabin Grill.
  - Dermal contact with contaminated soil during excavation work – onsite workers at the Kwik Stop.
  - Possible direct contact and ingestion of contaminated surface water.

4.0 REMEDIAL INVESTIGATION

The purpose of the RI will be to further delineate the nature and extent of soil and groundwater contamination beneath the Site. RI field activities will be conducted to support contaminant delineation at the Site, as follows:

4.1.1. Historical Research

Research historical documents regarding the Airport Kwik Stop and Cabin Grill properties and the vacant property south of the Cabin Grill, if available. We will contact the town of Ione and Pend Oreille County as part of our research. Additional resources also might be utilized, as appropriate.

4.1.2. Sample Domestic Wells

Obtain water samples from downgradient privately-owned domestic wells, (provided permission is obtained from the property owners). Ecology will coordinate access to the domestic wells. Water samples from domestic wells will be collected from existing faucets or taps, preferably upstream of any existing water treatment components. Wells located on the following properties will be sampled: 1) Geographic ID 433717539017, Property ID 6654 owned by Mr. Dennis Braun; and 2) Geographic ID 433717530018, Property ID 6628 owned by Mr. Max Koch.

Submit the water samples to a qualified local analytical laboratory for analysis of GRPH using Ecology Northwest Method NWTPH-Gx, VOCs using Environmental Protection Agency (EPA) 8260 methods, DRPH and ORPH using Ecology Northwest Method NWTPH-Dx..

4.1.3. Geophysical Survey

Subcontract a geophysical consultant to perform a survey of the Airport Kwik Stop and Cabin Grill properties, and the vacant property south of Cabin Grill if access agreements can be obtained by Ecology, to evaluate the sites for the presence of potential USTs as alternative sources of petroleum contamination. The sites will be evaluated using magnetic field mapping. Ground penetrating radar (GPR) equipment will be utilized to further evaluate areas identified as potential USTs by the initial magnetic field mapping. At the Kwik Stop, the area surrounding the existing building, and areas to the north, south and east of the building will be the focus of the survey. At the Cabin Grill and vacant properties, areas which are currently bare/void of trees or that appear to have been disturbed in the past will be the focus of the survey. Heavily wooded areas will not be surveyed unless results of historical research or surface reconnaissance indicate such areas should be investigated.

4.1.4. Direct-push Borings

Use direct-push (e.g. Geoprobe®) techniques using a subcontracted licensed driller. Direct-push borings will be advanced to depths in the range of about 20 to 50 feet below current site grades. We estimate that about 12 to 16 borings will be completed. If results of the geophysical survey indicate the presence of buried sources of contamination (i.e., USTs), those areas might be explored using an excavator. The purpose of the direct-push borings will be to:

- Further delineate the extent of vadose zone contamination near the Airport Kwik Stop fuel dispensers. Approximately 8 to 10 borings will be advanced near the fuel dispensers. A right-of-way permit will be obtained from the Washington State Department of Transportation (WSDOT) for borings drilled within the right-of-way of State Route 31.

- Investigate any areas identified during the geophysical survey where USTs might be located (using an excavator if deemed appropriate). If USTs are encountered, they will be removed and assessed in accordance with 173-360 WAC.
- Investigate areas downgradient of existing monitoring well MW-15 in an effort to delineate the downgradient extent of the petroleum plume. About three to five borings will be advanced downgradient of well MW-15. Soil samples will be collected continuously from each direct-push boring. Samples of soil recovered from the borings will be field screened using water sheen and headspace vapor measurements to assess possible presence of petroleum-related contaminants. If possible, samples of groundwater might be obtained from direct-push borings, particularly direct-push borings drilled downgradient of well MW-15 for a qualitative assessment of groundwater contamination. Boreholes will be backfilled in accordance with applicable state regulations.

The approximate location of the proposed direct-push borings are presented in the Proposed Exploration Locations, Figure 6. Soil, and groundwater samples if collected, will be submitted to a qualified local analytical laboratory for analysis of GRPH using NWTPH-Gx methods and VOCs using EPA 8260 methods. Samples submitted for analytical testing from borings drilled downgradient of well MW-15 also will be analyzed for DRPH and ORPH using NWTPH-Dx methods. About 24 soil samples will be submitted for analysis of GRPH and VOCs. About five samples will be submitted for analysis of DRPH and ORPH. Samples of soil collected from excavations to remove USTs also will be sampled for DRPH and ORPH using NWTPH-Dx methods. If results of analytical testing indicate the presence of heavy oils. Samples also will be analyzed for PCBs, PAHs and lead.

4.1.5. New Groundwater Monitoring Wells and Pilot Test Wells

Subcontract a licensed driller to drill borings using hollow-stem auger drilling techniques. Soil samples will be obtained using standard penetration test (SPT) samplers. Soil samples will only be obtained near the groundwater table (approximately two to four samples per boring), except borings installed in areas of known or suspected vadose zone contamination. Drill cuttings will be placed into labeled drums, which will be stored in a secure location approved by Ecology. Ten borings will be drilled at the following locations:

- Three borings drilled to depths of about 45 feet bgs, located downgradient and crossgradient of the petroleum plume near well MW-15 .
- Three borings drilled to depths of about 20 to 40 feet bgs located near the Airport Kwik Stop fuel dispensers.
- Two borings drilled to depths of about 40 to 50 feet bgs located near the Cabin Grill.
- Two borings drilled to depths of about 40 to 45 feet bgs located near existing well MW-9.

The approximate locations of the proposed monitoring wells and pilot test wells are shown on Figure 6. The final locations of the monitoring wells and pilot test wells will be selected in coordination with Ecology after completion of the direct-push borings. Install and develop three (3) 2-inch-diameter groundwater monitoring wells in the three borings located downgradient and crossgradient of the plume.

Install and develop four (4) 4-inch-diameter soil vapor extraction (SVE) wells to be utilized to conduct pilot tests. The SVE wells will be installed in the three borings located at the Kwik Stop and one of the borings drilled near the Cabin Grill.

Install and develop one (1) 2-inch-diameter air sparge well in one of the borings drilled near the Cabin Grill to be utilized to conduct pilot tests. The wells will be constructed with a short (2- to 3-foot long) screened interval placed in the bottom of the boring and fully beneath the static groundwater level.

Install and develop one (1) 4-inch-diameter well in one of the borings drilled near MW-9 to be used as a pilot test well during a pumping test. This well will be utilized to better understand shallow aquifer characteristics and will be located at an appropriate distance from the petroleum plume to minimize the potential for capturing, and therefore having to treat, contaminated groundwater.

Install and develop one (1) 2-inch-diameter groundwater monitoring well in one of the borings drilled near MW-9 to be used as an observation well during the pumping test.

Submit soil samples from the borings to a qualified local analytical laboratory for analysis of GRPH using NWTHP-Gx methods and VOCs using EPA 2860 methods. Six soil samples will be submitted for analysis (two samples from each of the borings drilled at the Kwik Stop).

Subcontract a licensed surveyor to record elevations and locations of the borings and wells.

Subcontract a licensed contractor to remove and dispose of drill cuttings at a suitable disposal facility such as the Waste Management Graham Road facility in Spokane County (local alternative disposal options will be assessed).

Purchase and install dedicated bladder pumps in selected wells; approximately 12 dedicated pumps will be installed.

4.1.6. Pilot Testing

- Conduct SVE tests at the Airport Kwik Stop. Two-hour stepped vacuum tests will be conducted at each of the three SVE wells using a regenerative blower; each test will begin with partial dilution and the last hour of each test will be conducted with the dilution valve closed. Applied vacuum will be measured at the test well; induced vacuum and water level measurements (if applicable) will be measured at adjacent monitoring wells, which will include the other two SVE wells and wells MW-7 and MW-8. Effluent air from the test well will be monitored for air flow, oxygen and carbon dioxide content, and VOCs. Work will be done in coordination with the Ecology Air Quality Program.
- Conduct an air sparge test using the dedicated air sparge well. The 6-hour test will be stepped such that air flow into the well will be increased during the first hour of the test, then stabilized for the remainder of the test. Air flow and air pressure will be measured at the test well. Air pressure, oxygen and carbon dioxide content, VOCs and groundwater levels will be measured at nearby observation wells, which include an SVE well, MW-5 and possibly MW-3 and/or MW-4. During the final two hours of the test, a vacuum will be applied to the SVE well, and

monitoring procedures listed above will be followed for the duration of the test. Work will be done in coordination with the Ecology Air Quality Program.

- Conduct pumping tests using the installed test well. Testing will consist of approximate 4-hour step-rate and 24-hour constant-rate tests, as well as associated recovery periods. During testing and recovery, water levels within the test well and up to three monitoring/observation wells (including MW-9 and the proposed 2-inch-diameter located near MW-9) will be monitored at logarithmic intervals using pressure transducers and dataloggers. Water levels within other nearby monitoring wells also will be monitored during the test to evaluate the effect of the pump tests on the aquifer. Well discharge will be measured by a calibrated in-line flowmeter or manometer. We assume that the test well will be located outside of the contaminant plume and water generated during testing can be disposed of to ground downgradient of the test well. The duration and pumping rate of the tests will be adjusted if results of monitoring during the test indicate the potential to draw the plume to currently uncontaminated areas. Testing will be done in coordination with Ecology Water Resources and Water Quality Programs.
- Evaluate the apparent effectiveness of SVE and air sparging with SVE.
- Analyze pumping test data for well parameters including specific capacity and aquifer parameters including transmissivity, hydraulic conductivity, and storage properties. Using these estimated parameters, estimate preliminary capture zones, well spacings and pumping rates that would be required to intercept the contaminant plume with a conventional pump-and-treat remedial system.

4.1.7. Groundwater Monitoring

- Conduct quarterly groundwater monitoring through June 2012. Groundwater elevations at each well (monitoring, test, air sparge as well as the Cabin Grill Well) will be measured using a water level indicator on a quarterly basis. Three on-site water level transducers also will be utilized. We anticipate that the transducers will be installed within wells near the proposed pump test well. Collect groundwater samples from select wells using standard low flow sampling techniques and a portable submersible pump. Based on consultation with Ecology, some of the site monitoring wells might be moved to annual sampling or decommissioned.
- Submit groundwater samples to a qualified local analytical laboratory for analysis of GRPH using NWTPH-Gx methods and VOCs using EPA 8260 methods (and possibly other COCs as necessary). About 19 samples will be submitted for each of three monitoring events between November 2011 and June 2012.
- Submit groundwater samples from existing monitoring wells MW-4, MW-6, MW-12, MW-13 and MW-15, and proposed wells downgradient of the Cabin Grill for analysis of DRPH and ORPH using Ecology NWTPH-Dx methods, for at least the first sampling event. If results of analytical testing do not indicate the presence of DRPH and/or ORPH in groundwater, sampling for DRPH and ORPH will be discontinued. If USTs are located during the geophysical survey, sampling for DRPH and ORPH will be reassessed.
- Submit groundwater samples to a qualified local analytical laboratory for analysis of geochemical indicators for assessing feasibility of natural attenuation including: dissolved iron and manganese using EPA 6000 series methods, nitrates and sulfates using EPA 300 methods, and alkalinity using SM 2320 methods. Samples for geochemical indicators will be

collected from five wells: one upgradient well (MW-7); one well within the source (to be determined); two wells near the plume center-line where concentrations of contaminants have been measured close to cleanup levels (MW-6 and MW-15); and one downgradient well (to be determined).

- Subcontract a licensed contractor to properly dispose of purge water generated during well installation and sampling.

5.0 PRELIMINARY CLEANUP LEVELS

In accordance with MTCA, development of preliminary cleanup levels includes identifying potential exposure pathways for human and environmental impacts based on the planned land use. Considering the proximity to residential neighborhoods and recreational facilities, unrestricted land use cleanup levels likely are appropriate.

5.1. Preliminary Soil Cleanup Levels

Access to the Kwik Stop and Cabin Grill properties currently is unrestricted. Therefore, preliminary soil cleanup levels will be based on unrestricted land use. Contaminants of concern are frequently encountered at many sites and cleanup levels for each contaminant of concern are listed in Table 740-1 in MTCA. Therefore, preliminary cleanup levels were developed using MTCA Method A Unrestricted Land Use cleanup levels.

5.2. Preliminary Groundwater Cleanup Levels

Preliminary groundwater cleanup levels were selected from MTCA Method A Cleanup Levels Groundwater WAC 173-340-720(3) and Chapter 173-340 WAC Table 720-1.

6.0 FEASIBILITY STUDY

The RI/FS will develop draft cleanup levels for the Site and evaluate hazardous substances in soil and groundwater by comparing analytical results to appropriate cleanup levels. Soil and groundwater cleanup criteria will be developed and used in accordance with MTCA. The FS will develop and evaluate cleanup action alternatives for contaminated media so that cleanup actions may be selected. The FS will:

- Develop cleanup levels, points of compliance and establish remediation levels;
- Delineate affected media where evaluation of remedial action is appropriate;
- Develop remedial action objectives;
- Screen and evaluate specific cleanup alternatives and recommend a preferred alternative; and
- Be presented in a written report along with the results of the RI (the RI/FS report).

The following sections provide the details of the FS process that will be completed, if necessary, for the Site.

6.1. Establishment of Cleanup Levels, Points of Compliance, and Remediation Levels

Cleanup standards, including cleanup levels and points of compliance, will be developed for soil and groundwater in accordance with MTCA requirements. Exposure pathways and receptors will be identified as part of cleanup level development. As needed, remediation levels might also be established for specific cleanup alternatives.

Cleanup levels for soil will be protective of human health, terrestrial ecological receptors and groundwater based on current and likely future uses of the property. The point of compliance for soil will also be established.

Cleanup levels for groundwater will be based on protection of the underlying aquifer which supplies drinking water to the site properties and most of the downgradient properties. Accordingly, a groundwater point of compliance will be developed.

6.2. Delineation of Media Requiring Remedial Action

The RI process will determine if soil and groundwater sample results exceed cleanup levels and, if so, identify the locations where analyses of soil and groundwater samples exceeded applicable MTCA cleanup levels. Based on exceedances and the established points of compliance, the FS will estimate the extent or volume of soil or groundwater that requires remedial action.

6.3. Development of Remedial Action Objectives

Remedial action objectives (RAOs) that define the goals of the cleanup that must be achieved to adequately protect human health and the environment will be developed for each medium and area identified as requiring remedial action. These RAOs will be action-specific and/or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on developed cleanup levels. The RAOs will specify the COPCs, the potential exposure pathways and receptors, and acceptable contaminant levels or range of levels for each exposure pathway, as appropriate.

6.4. Screening of Cleanup Alternatives

Cleanup alternatives will be developed for each medium of concern. Initially, general remediation technologies will be identified for the purpose of meeting RAOs for each medium. General remediation technologies consist of specific remedial action technologies and process options and will be considered and evaluated based on the media type and the properties of any contaminant(s). These might include institutional controls, containment or other engineering controls, and removal.

Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for the particular medium and COPCs. Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology expectations identified in WAC 173-340-370 using best professional judgment and guidance documents as appropriate.

During the development of cleanup alternatives, both the current and planned future land use will be considered.

If the RI identifies localized hot spots of contaminants in soil, active cleanup alternatives such as excavation or in situ treatment alternatives might be appropriate for those limited areas. If there are portions of the site with large volumes of materials with relatively low concentrations of petroleum contamination, cleanup alternatives including monitored natural attenuation will be developed following Ecology Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation (Publication No. 05-09-091, Version 1.0). Current and planned future property uses will be considered during development of cleanup.

6.5. Evaluation of Cleanup Alternatives

MTCA requires that cleanup alternatives be compared to a number of criteria as set forth in WAC 173-340-360 to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the developed cleanup alternatives. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with threshold requirements, permanence, and restoration timeframe, and a disproportionate cost analysis; the results of the evaluation will be documented in the RI/FS report.

7.0 SCHEDULE AND REPORTING

Following completion of the RI field activities and receipt of analytical data, reports will be prepared as follows:

- Prepare quarterly draft and final Groundwater Monitoring Reports containing groundwater level and elevation data as well as analytical data and trends. Three (3) quarterly reports will be prepared.
- Prepare draft and final RI/FS Reports containing applicable sections as outlined in Chapter 173-340-350 of the WAC.
- All sampling data will be submitted to Ecology in both printed and electronic formats in accordance with Ecology's Toxics Cleanup Program Policy 840.

In our preliminary opinion based on the soil and groundwater conditions and likely contaminants, the FS likely will lead toward a remedial approach that will aggressively address soil and groundwater contamination at the source area(s), groundwater remediation at locations near and upgradient of groundwater ingestion receptors (i.e., the Cabin Grill well and perhaps downgradient receptors, and monitored natural attenuation. Certainly other options will also be considered, but it currently appears removing an ongoing source and protecting drinking water sources are key goals.

The proposed schedule for the project milestones is shown in the table below. Current plans call for starting the field investigation in November 2011. Ecology review periods are assumed to be 30 days for draft documents and 15 days for final documents. Schedule durations are presented for planning purposes; final schedule will be determined by Ecology based on project progress and other factors. Documents become final upon written approval by Ecology.

PROJECT MILESTONES	SCHEDULE
Notice to Proceed	October 2011
CSM Development	October/November 2011

PROJECT MILESTONES	SCHEDULE
Draft RI Work Plan	October 2011
Final RI Work Plan	November 2011
RI Field Work – Background Research	November 2011
RI Field Work – Domestic Well Sampling	November 2011
RI Field Work – Geophysical Survey	November 2011
RI Field Work – Direct-push Borings	December 2011/January 2012
RI Field Work – New Well Installation	December 2011/January 2012
RI Field Work – Pilot Testing	February 2012
Groundwater monitoring	November 2011, February 2012 and May 2012
Quarterly Draft and Final Groundwater Monitoring Reports	December 2011, March 2012 and June 2012
Draft RI/FS Report	May 1, 2012
Final RI/FS Report (after Ecology review and 30-day public comment period)	June 30, 2012

8.0 ACRONYMS

ASTM - ASTM International
ASTs – aboveground storage tanks
Avgas – aviation gasoline
AWQC - Ambient Water Quality Criteria
bgs - below ground surface
BTEX – benzene, toluene, ethylbenzene and xylenes
CAS - Chemical Abstracts Service
COC – chain-of-custody
COPCs – contaminants of potential concern
CSM - conceptual site model
DRPH – diesel-range petroleum hydrocarbons
Ecology – Washington State Department of Ecology
EDB – ethylene dibromide
EDC – 1,2 dichloroethane
EDD - Electronic Data Deliverable
EIM - Environmental Information Management
EPA – Environmental Protection Agency
FID - flame-ionization detector
FS - Feasibility Study
GeoEngineers – GeoEngineers, Inc.
gpm/foot = gallons per minute per foot
GPR - ground penetrating radar
GPS - global positioning system
GRPH – gasoline-range petroleum hydrocarbons
HASP – Health and Safety Plan

HCID - hydrocarbon identification
HPLC - high performance liquid chromatography
IDL - instrument detection limit
IDW – investigation derived waste
LCS – laboratory control spike
LCSD – laboratory control spike duplicate
MA - million years old
MDL – method detection limit
MQO – measurement quality objectives
MS – matrix spike
MSD – matrix spike duplicate
MTBE = methyl tert-butyl ether
MTCA – Model Toxics Control Act
NA = not available
ND = not detected
NT = not tested
ORPH – oil-range petroleum hydrocarbons
PAHs – polycyclic aromatic hydrocarbons
PARCC - precision, accuracy, representativeness, completeness and comparability
PCBs – polychlorinated biphenyls
PE - professional engineer
PID – photo-ionization detector
PM - project manager
ppb – parts per billion
ppm – parts per million
PQL – practical quantitation limit
PVC – polyvinyl chloride
QA – quality assurance
QAPP – Quality Assurance Project Plan
QC – quality control
RAOs - remedial action objectives
RI - Remedial Investigation
RPD – relative percent difference
SAP – Sampling and Analysis Plan
Site – Cabin Grill, Airport Kwik Stop and City of Ione Airport
SOPs – standard operating procedures
SPT – standard penetration test
SVE - soil vapor extraction
SVOCs - semivolatile organic compounds
TPH – total petroleum hydrocarbons
TRL – target reporting limit
USTs – underground storage tanks
VOCs – volatile organic compounds
WAC – Washington Administrative Code
WSDOT - Washington State Department of Transportation

TABLES

GeoEngineers

Table 1

Summary of Groundwater Level Measurements

Ione Petroleum Contamination

Ione, Washington

Well Number	Date Measured	Top of Casing Elevation[1] (feet)	Depth to Water[2] (feet)	Groundwater Elevation (feet)
MW-1	08/05/10	2,106.45	29.41	2,077.04
	11/10/10	2,106.45	29.40	2,077.05
	02/09/11	2,106.45	29.76	2,076.69
	05/10/11	2,106.45	29.10	2,077.35
	08/02/11	2,106.45	28.12	2,078.33
MW-2	08/05/10	2,109.36	37.54	2,071.82
	11/10/10	2,109.36	37.53	2,071.83
	02/09/11	2,109.36	37.67	2,071.69
	05/10/11	2,109.36	37.02	2,072.34
	08/02/11	2,109.36	35.56	2,073.80
MW-3	08/05/10	2,110.17	38.66	2,071.51
	11/10/10	2,110.17	38.63	2,071.54
	02/09/11	2,110.17	38.73	2,071.44
	05/10/11	2,110.17	38.19	2,071.98
	08/02/11	2,110.17	36.90	2,073.27
MW-4	08/05/10	2,109.31	38.17	2,071.14
	11/10/10	2,109.31	38.14	2,071.17
	02/09/11	2,109.31	38.26	2,071.05
	05/10/11	2,109.31	37.69	2,071.62
	08/02/11	2,109.31	36.36	2,072.95
MW-5	08/05/10	2,109.28	38.57	2,070.71
	11/10/10	2,109.28	37.90/38.51[3]	2,071.23[4]
	02/09/11	2,109.28	37.97/38.72[3]	2,071.12[4]
	05/10/11	2,109.28	37.50/37.85[3]	2,071.69[4]
	08/02/11	2,109.28	36.07/36.94[3]	2072.99[4]
MW-6	08/05/10	2,110.34	39.72	2,070.62
	11/10/10	2,110.34	39.68	2,070.66
	02/09/11	2,110.34	39.80	2,070.54
	05/10/11	2,110.34	39.17	2,071.17
	08/02/11	2110.34	38.12	2,072.22
MW-7	08/05/10	2,109.31	36.27	2,073.04
	11/10/10	2,109.31	36.27	2,073.04
	02/09/11	2,109.31	36.38	2,072.93
	05/10/11	2,109.31	35.97	2,073.34
	08/02/11	2109.31	34.66	2,074.65
MW-8	08/05/10	2,109.72	37.93	2,071.79
	11/10/10	2,109.72	37.90	2,071.82

Well Number	Date Measured	Top of Casing Elevation[1] (feet)	Depth to Water[2] (feet)	Groundwater Elevation (feet)
MW-8 cont.	02/09/11	2,109.72	38.01	2,071.71
	05/10/11	2,109.72	37.45/37.70[3]	2,072.21[4]
	8/2/2011[5]	2,109.65	35.91	2,073.74
MW-9	11/10/10	2,109.43	38.43	2,071.00
	02/09/11	2,109.43	38.53	2,070.90
	05/10/11	2,109.43	37.95	2,071.48
	08/02/11	2109.43	37.00	2,072.43
MW-10	11/10/10	2,085.56	15.96	2,069.60
	02/09/11	2,085.56	16.05	2,069.51
	05/10/11	2,085.56	15.23	2,070.33
	08/02/11	2085.56	14.80	2,070.76
MW-11	11/10/10	2,093.44	23.33	2,070.11
	02/09/11	2,093.44	23.43	2,070.01
	05/10/11	2,093.44	22.66	2,070.78
	08/02/11	2093.44	22.00	2,071.44
MW-12	11/10/10	2,108.87	37.98	2,070.89
	02/09/11	2,108.87	38.11	2,070.76
	05/10/11	2,108.87	37.51	2,071.36
	08/02/11	2108.87	36.19	2,072.68
MW-13	08/02/11	2,109.09	36.77	2,072.32
MW-14	08/02/11	2,103.16	31.61	2,071.55
MW-15	08/02/11	2,112.90	41.56	2,071.34

Notes:

[1]Top of casing elevation survey performed by Thomas, Dean & Hoskins, Inc. (TD&H). Elevations are referenced to NAVD 88.

[2]Depth to water measurements referenced to the top of PVC casing.

[3]For MW-5, 37.50/37.85, and MW-8, 37.45/37.70 indicates depth to top of free product/depth to groundwater measured using an oil-water interface probe.

[4]Groundwater elevation at MW-5 for the November 2010 , February 2011, May 2011, and August 2011 monitoring events, and MW-8 for the May 2011 monitoring event, was calculated using the following equation:

GW = SG x T + IE; where GW = equivalent groundwater elevation, SG = specific gravity of free product (0.75 for gasoline),

T = thickness of product measured in water using oil/water interface probe , IE = elevation of water/product interface measured in the well.

[5]Top of well casing adjusted during repairs to well monument in June 2011. Top of well casing resurveyed by TD&H in August 2011.

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 1

Table 2

Summary of Chemical Analytical Results - Site Characterization Soil Samples[1]

Ione Petroleum Contamination

Ione, Washington

Sample Number	Exploration Number	Sample Depth (feet)	Date Sampled	Lead[2] (mg/kg)	DRPH[3] (mg/kg)	GRPH[4] (mg/kg)	ORPH[5] (mg/kg)	Benzene[8] (mg/kg)	Toluene[8] (mg/kg)	EthylBenzene[8] (mg/kg)	Total Xylenes[8] (mg/kg)	MTBE[8] (mg/kg)	Naphthalene[8] (mg/kg)
Ione Airport													
IADP01-31.5-32.1[6]	DP-1	31.5 to 32.1	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP03-18-18.7[7]	DP-3	18 to 8.7	04/27/10	5.32	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IADP03-30-31[6]	DP-3	30 to 31	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP05-17.5-18.5[7]	DP-5	17.5 to 18.5	04/26/10	7.52	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IADP06-25-26[6]	DP-6	25 to 26	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP05-32-33.3[6]	DP-5	32 to 33.3	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP07-32-33.3[6]	DP-7	32 to 33.3	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP07-25-26[6]	DP-7	25 to 26	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP08-31.5-32.5[6]	DP-8	31.5 to 32.5	04/26/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP09-32.5-33.5[6]	DP-9	32.5 to 33.5	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IADP10-33-34.5[6]	DP-10	33 to 34.5	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
MW-2-37.5[7]	MW-2	37.5	07/12/10	NA	NA	<2.62	NA	<0.0262	<0.0262	<0.0262	<0.0524	<0.0262	NA
B-4-33.5[7,9]	B-4	33.5	07/21/10	NA	NA	<5.37	NA	<0.03	<0.0537	<0.0537	<0.1074	<0.0537	NA
Airport Kwik Stop													
IKSDP11-2.5-3.5[6]	DP-11	2.5 to 3.5	04/27/10	NA	70	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP12-31-31.8[6]	DP-12	31 to 31.8	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP13-5-6[6]	DP-13	5 to 6	04/27/10	NA	110	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP14-17.5-18.5[6]	DP-14	17.5 to 18.5	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP15-10-11[6]	DP-15	10 to 11	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP16-10-11[6]	DP-16	10 to 11	04/27/10	NA	<50	<25	<100	NA	NA	NA	NA	NA	NA
IKSDP17-22-23[7]	DP-17	22-23	04/28/10	NA	<25	<5	<100	NA	NA	NA	NA	NA	NA
IKSDP17-34-35[7]	DP-17	34-35	04/28/10	6.38	<25	<5	<100	NA	NA	NA	NA	NA	NA
IKSDP17-40.5-41.5[7]	DP-17	40.5-41.5	04/28/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IKSDP18-18-19[7]	DP-18	18-19	04/28/10	9.62	1,740	11,500	<1,000	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IKSDP18-21-22[7]	DP-18	21-22	04/28/10	NA	1,780	11,400	<1,000	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IKSDP18-36.5-37.5[7]	DP-18	36.5-37.5	04/28/10	5.07	<25	23.2	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IKSDP19-26-27[7]	DP-19	26-27	04/28/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
IKSDP19-35.5-36.5[7]	DP-19	35.5-36.5	04/28/10	7.63	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
MW-7-38.5[7]	MW-7	38.5	07/23/10	NA	NA	<2.81	NA	<0.0281	<0.0281	<0.0281	<0.0562	<0.0281	NA

Sample Number	Exploration Number	Sample Depth (feet)	Date Sampled	Lead[2] (mg/kg)	DRPH[3] (mg/kg)	GRPH[4] (mg/kg)	ORPH[5] (mg/kg)	Benzene[8] (mg/kg)	Toluene[8] (mg/kg)	EthylBenzene[8] (mg/kg)	Total Xylenes[8] (mg/kg)	MTBE[8] (mg/kg)	Naphthalene[8] (mg/kg)
Vacant Lot													
B-1-40.0[7]	B-1	40	07/13/10	NA	NA	198	NA	1.31	13.6	3.78	20.5	<0.025	NA
MW-3-40.0[7,10]	MW-3	40	07/13/10	NA	NA	<5.95	NA	0.401	0.869	0.3	0.981	<0.0595	NA
Cabin Grill													
CGDP21-15-16[7]	DP-21	15-16	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP21-27-27.8[7]	DP-21	27 to 27.8	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP21-37-38[7]	DP-21	37 to 38	04/29/10	NA	188	768	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP21-41.5-42.5[7]	DP-21	41.5 to 42.5	04/29/10	4.25	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP21-42.5-43.5[7]	DP-21	42.5 to 43.5	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP22-16-17[7]	DP-22	16 to 17	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP22-32-33[7]	DP-22	32 to 33	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP22-40-41[7]	DP-22	40 to 41	04/29/10	5.46	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CDP23-41.5-42.3[7]	DP-23	41.5 to 42.3	04/29/10	5.35	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP24-27-28[7]	DP-24	27 to 28	04/29/10	NA	<25	<5	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP24-37.4-38[7]	DP-24	37.4 to 38	04/29/10	4.16	27.8	1,060	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
CGDP25-37-38[7]	DP-25	37 to 38	04/30/10	4.41	40.5	1,130	<100	--[12]	--[12]	--[12]	--[12]	--[12]	--[12]
MW-4-40.0[7,9]	MW-4	40	07/20/10	NA	NA	<5.53	NA	<0.03	0.0682	<0.0553	<0.1106	<0.0553	NA
MW-5-33.5[7]	MW-5	33.5	07/21/10	NA	NA	16.3	NA	<0.025	0.652	0.27	1.98	<0.025	NA
MW-5-38.5[7]	MW-5	38.5	07/21/10	NA	NA	2,670	NA	9.32	189	52.8	302	<0.571	7.14
MW-5-43.5[7]	MW-5	43.5	07/21/10	NA	NA	7.81	NA	<0.025	0.0601	<0.025	0.508	<0.025	NA
MW-6-43.5[7]	MW-6	43.5	07/22/10	NA	NA	9.48	NA	1.42	2.65	0.275	2.69	<0.0596	NA
MTCA[11] Method A Cleanup Levels				250	2000	100	2000	0.03	7	6	9	0.01	5

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. located in Spokane Washington.

[2]Lead analyzed using EPA Method 6020A.

[3]DRPH = Diesel-range petroleum hydrocarbons by either Northwest Ecology Method NWTPH-HCID or NWTPH-Dx, see notes next to individual samples for specific test method.

[4]GRPH = Gasoline-range petroleum hydrocarbons by either Ecology Northwest Method NWTPH-HCID or NWTPH-Gx, see note next to individual samples for specific test method.

[5]ORPH = Oil-range petroleum hydrocarbons analyzed using either Ecology Northwest Method NWTPH-HCID or NWTPH-Dx, see note next to individual samples for specific test method.

[6]GRPH, DRPH and ORPH analyzed using Ecology Northwest Method NWTPH-HCID.

[7]GRPH analyzed using Ecology Northwest Method NWTPH-Gx. DPRH and ORPH analyzed using NWTPH-Dx.

[8]Benzene, toluene, ethylbenzene, total xylenes, methyl-tert-butyl ether (MTBE) and naphthalene were analyzed using EPA Method 8021,with the exception of samples B-4-33.5 and MW-4-40.0.

[9]Benzene was analyzed using EPA Method 8260B.

[10]Sample labeled B-2-40.0 and sample labeled MW-3-40.0 are the same sample. (B-2 and MW-3 are the same exploration.)

[11]MTCA = Washington State, Model Toxics Control Act, Method A Cleanup levels

[12]See Table 4 for analytical results.

mg/kg = milligrams per kilogram; NA = not analyzed; - = results not presented in this table; Bold indicates detection limit exceeds cleanup level.

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 2

Table 3

Summary of Volatile Organic Compounds Analytical Results - Site Characterization Direct-Push Phase Soil Samples[1]

Ione Petroleum Contamination

Ione, Washington

Analyte	Units	MTCA Method A Cleanup Level	Sample Number Date Boring Number Depth (feet)	Ione Airport				Airport Kwik Stop				Cabin Grill		
				IADP03-18-18.7 04/27/10 DP-03 18-18.7	IADP05-17.5-18.5 04/26/10 DP-05 17.5 to 18.5	IKSDP17-22-23 04/28/10 DP-17 22 to 23	IKSDP17-34-35 04/28/10 DP-17 34 to 35	IKSDP17-40.5-41.5 04/28/10 DP-17 40.5 to 41.5	IKSDP18-18-19 04/28/10 DP-18 18 to 19	IKSDP-18-21-22 04/28/10 DP-18 21 to 22	IKSDP18-36.5-37.5 04/28/10 DP-18 36.5 to 37.5	IKSDP19-26-27 04/28/10 DP-19 26 to 27	IKSDP19-35.5-36.5 04/28/10 DP-19 35.5 to 36.5	CGDP21-15-16 04/29/10 DP-21 15 to 16
1,1,1,2-Tetrachloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1,1-Trichloroethane	mg/kg	2		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1,2,2-Tetrachloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1,2-Trichloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1-Dichloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1-Dichloroethene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,1-Dichloropropene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2,3-Trichlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2,3-Trichloropropane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2,4-Trichlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2,4-Trimethylbenzene	mg/kg	NE		0.0197	0.0147	<0.0125	<0.0125	<0.0125	596	633	0.943	0.0127	0.0618	<0.0125
1,2-Dibromo-3-chloropropane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2-Dibromoethane (EDB)	mg/kg	0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.096	<0.005	<0.005	<0.005	<0.005
1,2-Dichlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2-Dichloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,2-Dichloropropane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,3,5-Trimethylbenzene	mg/kg	NE		0.0194	0.0137	<0.0125	<0.0125	<0.0125	196	167	0.299	<0.125	<0.0125	<0.0125
1,3-Dichlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,3-Dichloropropane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
1,4-Dichlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
2,2-Dichloropropane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
2-Chlorotoluene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
2-Hexanone	mg/kg	NE		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<1.2	<0.0625	<0.0625	<0.0625	<0.0625
4-Chlorotoluene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Acetone	mg/kg	NE		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<1.2	<0.0625	<0.0625	<0.0625	<0.0625
Acrylontrile	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Benzene	mg/kg	0.03		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	12.8	1.1	0.132	<0.0125	<0.0125	<0.0125
Bromobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Bromochloromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Bromodichloromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Bromoform	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Bromomethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Carbon disulfide	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Carbon Tetrachloride	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Chlorobenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Chloroethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Chloroform	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Chloromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
cis-1,2-Dichloroethene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
cis-1,3-Dichloropropene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125

Analyte	Units	MTCA Method A Cleanup Level	Sample Number Date Boring Number Depth (feet)	Ione Airport				Airport Kwik Stop				Cabin Grill		
				IADP03-18-18.7 04/27/10 DP-03 18-18.7	IADP05-17.5-18.5 04/26/10 DP-05 17.5 to 18.5	IKSDP17-22-23 04/28/10 DP-17 22 to 23	IKSDP17-34-35 04/28/10 DP-17 34 to 35	IKSDP17-40.5-41.5 04/28/10 DP-17 40.5 to 41.5	IKSDP18-18-19 04/28/10 DP-18 18 to 19	IKSDP-18-21-22 04/28/10 DP-18 21 to 22	IKSDP18-36.5-37.5 04/28/10 DP-18 36.5 to 37.5	IKSDP19-26-27 04/28/10 DP-19 26 to 27	IKSDP19-35.5-36.5 04/28/10 DP-19 35.5 to 36.5	CGDP21-15-16 04/29/10 DP-21 15 to 16
Dibromochloromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Dibromomethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Dichlorodifluoromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Ethylbenzene	mg/kg	6		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	219	189	0.242	<0.0125	0.0139	<0.0125
Hexachlorobutadiene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.125	<0.0125	<0.0125	<0.0125
Isopropylbenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	16.6	19.1	0.0248	<0.0125	<0.0125	<0.0125
m,p-Xylene	mg/kg	9		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	970	942	1.13	<0.0125	0.0633	<0.0125
Methyl ethyl ketone (MEK)	mg/kg	NE		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<1.2	<0.625	<0.0625	<0.0625	<0.0625
Methyl isobutyl ketone (MIBK)	mg/kg	NE		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<1.2	<0.625	<0.0625	<0.0625	<0.0625
Methylene chloride	mg/kg	0.02		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<1.2	<0.625	<0.0625	<0.0625	<0.0625
Methylt buytl ether (MTBE)	mg/kg	0.1		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Naphthalene	mg/kg	5		0.0131	0.0182	<0.0125	<0.0125	<0.0125	0.9	87.4	0.242	<0.0125	<0.0125	<0.0125
n-Butylbenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	19.2	20.2	0.0408	<0.0125	<0.0125	<0.0125
n-Propylbenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	70.7	77	0.115	<0.0125	<0.0125	<0.0125
o-Xylene	mg/kg	9		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<1.25	389	0.618	<0.0125	0.034	<0.0125
p-Isopropyltoluene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	4.27	4.94	<0.0125	<0.0125	<0.0125	<0.0125
sec-Butylbenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Styrene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
tert-Butylbenzene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Tetrachloroethene	mg/kg	0.05		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Toluene	mg/kg	7		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	612	369	0.823	<0.0125	0.0441	<0.0125
trans-1,2-Dichloroethene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
trans-1,3-Dichloropropene	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Trichloroethene	mg/kg	0.03		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Trichlorofluoromethane	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125
Vinyl chloride	mg/kg	NE		<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.24	<0.0125	<0.0125	<0.0125	<0.0125

Analyte	Units	MTCA Method A Cleanup Level	Sample Number Date Boring Number Depth (feet)	Cabin Grill CGDP21-27-27.8 04/29/10 DP-21 27 to 27.8	CGDP21-37-38 04/29/10 DP-21 37 to 38	CGDP21-41.5-42.5 04/29/10 DP-21 41.5 to 42.5	CGDP21-42.5-43.5 04/29/10 DP-21 42.5 to 43.5	CGDP22-16-17 04/29/10 DP-22 16 to 17	CGDP22-32-33 04/29/10 DP-22 32 to 33	CDPG22-40-41 04/29/10 DP-22 40 to 41	CGDP23-41.5-42.3 04/29/10 DP-23 41.5 to 42.3	CGDP24-27-28 04/29/10 DP-24 27 to 28	CGDP24-37.4-38 04/29/10 DP-24 37.4 to 38	CGDP25-37-38 04/30/10 DP-25 37 to 38
1,1,1,2-Tetrachloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1,1-Trichloroethane	mg/kg	2		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1,2,2-Tetrachloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1,2-Trichloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1-Dichloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1-Dichloroethene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,1-Dichloropropene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2,3-Trichlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2,3-Trichloropropane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2,4-Trichlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2,4-Trimethylbenzene	mg/kg	NE		<0.0125	30.5	0.0261	0.0353	<0.0125	<0.0125	0.0309	<0.0125	<0.0125	11.9	17.3
1,2-Dibromo-3-chloropropane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2-Dibromoethane (EDB)	mg/kg	0.005		<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.05
1,2-Dichlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2-Dichloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,2-Dichloropropane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,3,5-Trimethylbenzene	mg/kg	NE		<0.0125	9.28	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	3.28	4.02
1,3-Dichlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,3-Dichloropropane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
1,4-Dichlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
2,2-Dichloropropane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
2-Chlorotoluene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
2-Hexanone	mg/kg	NE		<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<0.625
4-Chlorotoluene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Acetone	mg/kg	NE		<0.0625	<0.625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<0.625
Acrylontrile	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Benzene	mg/kg	0.03		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Bromobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Bromochloromethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Bromodichloromethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Bromoform	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Bromomethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Carbon disulfide	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Carbon Tetrachloride	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Chlorobenzene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Chloroethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Chloroform	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Chloromethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
cis-1,2-Dichloroethene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
cis-1,3-Dichloropropene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125

Analyte	Units	MTCA Method A Cleanup Level	Sample Number Date Boring Number Depth (feet)	Cabin Grill										
				CGDP21-27-27.8 04/29/10 DP-21 27 to 27.8	CGDP21-37-38 04/29/10 DP-21 37 to 38	CGDP21-41.5-42.5 04/29/10 DP-21 41.5 to 42.5	CGDP21-42.5-43.5 04/29/10 DP-21 42.5 to 43.5	CGDP22-16-17 04/29/10 DP-22 16 to 17	CGDP22-32-33 04/29/10 DP-22 32 to 33	CDPG22-40-41 04/29/10 DP-22 40 to 41	CGDP23-41.5-42.3 04/29/10 DP-23 41.5 to 42.3	CGDP24-27-28 04/29/10 DP-24 27 to 28	CGDP24-37.4-38 04/29/10 DP-24 37.4 to 38	CGDP25-37-38 04/30/10 DP-25 37 to 38
Dibromochloromethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Dibromomethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Dichlorodifluoromethane	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Ethylbenzene	mg/kg	6		<0.0125	6.08	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	0.252
Hexachlorobutadiene	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Isopropylbenzene	mg/kg	NE		<0.0125	0.865	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	0.225
m,p-Xylene	mg/kg	9		<0.0125	27.4	<0.0125	<0.0125	<0.0125	<0.0125	0.0259	<0.0125	<0.0125	1.01	2.51
Methyl ethyl ketone (MEK)	mg/kg	NE		<0.0625	<0.625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<0.625	<0.625	<0.625	<0.625
Methyl isobutyl ketone (MIBK)	mg/kg	NE		<0.0625	<0.625	<0.0625	<0.0625	<0.0625	<0.0625	<0.625	<0.625	<0.625	<0.625	<0.625
Methylene chloride	mg/kg	0.02		<0.0625	<0.625	<0.0625	<0.0625	<0.0625	<0.625	<0.625	<0.625	<0.625	<0.625	<0.625
Methylt buytl ether (MTBE)	mg/kg	0.1		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Naphthalene	mg/kg	5		<0.0125	5	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	4.39	2.72
n-Butylbenzene	mg/kg	NE		<0.0125	1.17	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	0.928	0.668
n-Propylbenzene	mg/kg	NE		<0.0125	4.09	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	0.735	1.25
o-Xylene	mg/kg	9		<0.0125	13.3	<0.125	<0.0125	<0.0125	<0.0125	0.0148	<0.0125	<0.0125	0.662	1.48
p-Isopropyltoluene	mg/kg	NE		<0.0125	0.249	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	0.148	0.131
sec-Butylbenzene	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Styrene	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
tert-Butylbenzene	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Tetrachloroethene	mg/kg	0.05		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Toluene	mg/kg	7		<0.0125	1.67	0.0225	0.0161	<0.0125	<0.0125	0.0252	<0.0125	<0.0125	<0.125	<0.125
trans-1,2-Dichloroethene	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
trans-1,3-Dichloropropene	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Trichloroethene	mg/kg	0.03		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Trichlorofluoromethane	mg/kg	NE		<0.0125	<0.125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125
Vinyl chloride	mg/kg	NE		<0.0125	<0.125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.0125	<0.125	<0.125

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. located in Spokane, Washington.

[2]Analyzed using by EPA Method 8260B.

mg/kg = milligrams per kilogram; NE = not established; MTCA = Model Toxics Control Act

Table 4

Summary of Chemical Analytical Results - Supplemental Exploration Phase Soil Samples[1]

Ione Petroleum Contamination
Ione, Washington

Analyte	Units	MTCA Method A Cleanup Level	Sample Number	101105046-003	101105046-003	101105046-006	101105046-006	101105046-010	101105046-010	101105046-015	101105046-015	101105046-020	101105046-020
			Date	11/01/10	11/01/10	11/02/10	11/02/10	11/02/10	11/02/10	11/03/10	11/03/10	11/03/10	11/03/10
			Boring Number	MW-9	MW-9	MW-10	MW-10	MW-11	MW-11	MW-12	MW-12	B-5	B-5
			Depth	33.5	38.5	13.5	18.5	18.5	23.5	33.5	38.5	33.5	38.5
GRPH[2]	mg/kg	30		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Volatile Organic Compounds[3]													
1,1,1,2-Tetrachloroethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1,1-Trichloroethane	mg/kg	2		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1,2,2-Tetrachloroethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1,2-Trichloroethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1-Dichloroethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1-Dichloroethene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,1-Dichloropropene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2,3-Trichlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2,3-Trichloropropane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2,4-Trichlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2,4-Trimethylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2-Dibromo-3-chloropropane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2-Dibromoethane (EDB)	mg/kg	0.005		NA	<0.001	<0.001	NA	<0.001	NA	<0.001	NA	<0.001	NA
1,2-Dichlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,2-Dichloroethane (EDC)	mg/kg	NE		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
1,2-Dichloropropane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,3,5-Trimethylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,3-Dichlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,3-Dichloropropane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
1,4-Dichlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
2,2-Dichloropropane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
2-Chlorotoluene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
2-Hexanone	mg/kg	NE		NA	<.1005	<.10675	NA	<.1085	NA	<.11475	NA	<0.11725	NA
4-Chlorotoluene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Acetone	mg/kg	NE		NA	<.1005	<.10675	NA	<.1085	NA	<.11475	NA	<0.11725	NA
Acrylontrile	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Benzene	mg/kg	0.03		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
Bromobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Bromochloromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Bromodichloromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Bromoform	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Bromomethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Carbon disulfide	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Carbon Tetrachloride	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Chlorobenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Chloroethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Chloroform	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Chloromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
cis-1,2-Dichloroethene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
cis-1,3-Dichloropropene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Dibromochloromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Dibromomethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Dichlorodifluoromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA

Analyte	Units	MTCA Method A Cleanup Level	Sample Number	101105046-003	101105046-003	101105046-006	101105046-006	101105046-010	101105046-010	101105046-015	101105046-015	101105046-020	101105046-020
			Date	11/01/10	11/01/10	11/02/10	11/02/10	11/02/10	11/02/10	11/03/10	11/03/10	11/03/10	11/03/10
			Boring Number	MW-9	MW-9	MW-10	MW-10	MW-11	MW-11	MW-12	MW-12	B-5	B-5
			Depth	33.5	38.5	13.5	18.5	18.5	23.5	33.5	38.5	33.5	38.5
Ethylbenzene	mg/kg	6		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
Hexachlorobutadiene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Isopropylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
m,p-Xylene	mg/kg	9[4]		NA	<0.01	<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
Methyl ethyl ketone (MEK)	mg/kg	NE		NA	<.1005	<.10675	NA	<.1085	NA	<.11475	NA	<0.11725	NA
Methyl isobutyl ketone (MIBK)	mg/kg	NE		NA	<.1005	<.10675	NA	<.1085	NA	<.11475	NA	<0.11725	NA
Methylene chloride	mg/kg	0.02		NA	<0.02	<0.02	NA	<0.02	NA	<0.02	NA	<0.02	NA
Methylt buytl ether (MTBE)	mg/kg	0.1		NA	<0.01	<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
Naphthalene	mg/kg	5		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
n-Butylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
n-Propylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
o-Xylene	mg/kg	9[4]		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
p-Isopropyltoluene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
sec-Butylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Styrene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
tert-Butylbenzene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Tetrachloroethene	mg/kg	0.05		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Toluene	mg/kg	7		NA	<0.005	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA
trans-1,2-Dichloroethene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
trans-1,3-Dichloropropene	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Trichloroethene	mg/kg	0.03		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Trichlorofluoromethane	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA
Vinyl chloride	mg/kg	NE		NA	<.0201	<.02135	NA	<.0217	NA	<.02295	NA	<.02345	NA

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. located in Spokane, Washington.

[2]Gasoline-range petroleum hydrocarbons (GRPH) analyzed using Northwest Method NWTPH-Gx.

[3]Volatile organic compounds analyzed using EPA Method 8260B.

[4]MTCA Method A cleanup level is 9 mg/kg for total xylenes (concentration of m,p-xylene + concentration of o-xylene)

mg/kg = milligrams per kilogram; NE = not established; MTCA = Model Toxics Control Act; NA = not analyzed

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 4

Table 5

Summary of Chemical Analytical Results - Second Supplemental Exploration Phase Soil Samples[1]

Ione Petroleum Contamination

Ione, Washington

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-13		MW-14		MW-15
				MW-13 (33.5) 07/26/11	MW-13 (38.5) 07/26/11	MW-14 (28.5) 07/26/11	MW-14 (33.5) 07/26/11	MW-15 (43.5) 07/27/11
GRPH [2]	mg/kg	100		NT	<2.5	NT	<2.5	<2.5
Volatile Organic Compounds [3]								
Benzene	mg/kg	0.03		<0.02455	NT	<0.02625	NT	NT
Ethylbenzene	mg/kg	6		<0.02455	NT	<0.02625	NT	NT
Toluene	mg/kg	7		<0.02455	NT	<0.02625	NT	NT
m,p-Xylene	mg/kg	9[4]		<0.02455	NT	<0.02625	NT	NT
o-Xylene	mg/kg			<0.02455	NT	<0.02625	NT	NT
1,1,1,2-Tetrachloroethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,1,1-Trichloroethane	mg/kg	2		<0.02455	NT	<0.02625	NT	NT
1,1,2,2-Tetrachloroethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,1,2-Trichloroethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,1-Dichloroethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,1-Dichloroethene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,1-Dichloropropene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2,3-Trichlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2,3-Trichloropropane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2,4-Trichlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2,4-Trimethylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2-Dibromoethane (EDB)	mg/kg	0.005		<0.02455	NT	<0.02625	NT	NT
1,2-Dichlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2-Dichloroethane (EDC)	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,2-Dichloropropane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,3,5-Trimethylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,3-Dichlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,3-Dichloropropane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
1,4-Dichlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
2,2-Dichloropropane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
2-Chlorotoluene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
2-Hexanone	mg/kg	NE		<0.12275	NT	<0.13125	NT	NT

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-13		MW-14		MW-15
				MW-13 (33.5) 07/26/11	MW-13 (38.5) 07/26/11	MW-14 (28.5) 07/26/11	MW-14 (33.5) 07/26/11	MW-15 (43.5) 07/27/11
4-Chlorotoluene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Acetone	mg/kg	NE		<0.12275	NT	<0.13125	NT	NT
Acrylonitrile	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Bromobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Bromochloromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Bromodichloromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Bromoform	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Bromomethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Carbon disulfide	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Carbon Tetrachloride	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Chlorobenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Chloroethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Chloroform	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Chloromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
cis-1,2-Dichloroethene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
cis-1,3-Dichloropropene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Dibromochloromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Dibromomethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Dichlorodifluoromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Hexachlorobutadiene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Isopropylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Methyl ethyl ketone (MEK)	mg/kg	NE		<0.12275	NT	<0.13125	NT	NT
Methyl isobutyl ketone (MIBK)	mg/kg	NE		<0.12275	NT	<0.13125	NT	NT
Methylene chloride	mg/kg	0.02		<0.0245(u)	NT	<0.02625(u)	NT	NT
Methyl tert buytl ether (MTBE)	mg/kg	0.1		<0.02455	NT	<0.02625	NT	NT
Naphthalene	mg/kg	5		<0.02455	NT	<0.02625	NT	NT
n-Butylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
n-Propylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
p-Isopropyltoluene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
sec-Butylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Styrene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
tert-Butylbenzene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Tetrachloroethene	mg/kg	0.05		<0.02455	NT	<0.02625	NT	NT
trans-1,2-Dichloroethene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
trans-1,3-Dichloropropene	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Trichloroethene	mg/kg	0.03		<0.02455	NT	<0.02625	NT	NT

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-13		MW-14		MW-15
				MW-13 (33.5) 07/26/11	MW-13 (38.5) 07/26/11	MW-14 (28.5) 07/26/11	MW-14 (33.5) 07/26/11	MW-15 (43.5) 07/27/11
Trichlorofluoromethane	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT
Vinyl chloride	mg/kg	NE		<0.02455	NT	<0.02625	NT	NT

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. located in Spokane, Washington.

[2]Gasoline analyzed using Northwest Method NWTPH-Gx.

[3]Volatile organic compounds analyzed using by EPA Methods 8260B/8260C.

[4]Cleanup level for total xylenes is 9 mg/kg.

mg/kg = milligrams per kilogram; NE = not established; MTCA = Model Toxics Control Act; NT = not tested; (u) flag qualifier indicates that due to trip blank contamination, the detected contaminant was qualified as "non-detect". See Appendix C, Data Quality Assessment Summary

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 5

Table 6

Summary of Chemical Analytical Results - Site Characterization Groundwater Samples - Direct-Push Phase[1]

Ione Petroleum Contamination

Ione, Washington

Sample Number	Exploration Number	Date Sampled	Benzene[2] (µg/L)	Ethyl-Benzene[2] (µg/L)	m+p-Xylene[2] (µg/L)	MTBE[2] (µg/L)	o-Xylenes[2] (µg/L)	Toluene[2] (µg/L)	DRPH[3] (µg/L)	ORPH[3] (µg/L)	GRPH[4] (µg/L)
Ione Airport											
IADP05-W		04/26/10	NA	NA	NA	NA	NA	NA	<100	<500	<2505
Airport Kwik Stop											
IKDP17-W		04/28/10	14.1	<1	<2	<1	<1	<1	<100	<500	<250
IKDP18-W		04/28/10	2,080	187	537	8.33	260	707	1140	<500	5,020
IKDP19-W		04/28/10	833	45.1	209	6.55	77.4	652	303	<500	2,680
Cabin Grill											
CGDP25-W		04/30/10	<1	<1	2.22	<1	1.15	1.62	<100	<500	<250
CGDP21-W		04/29/10	254	1.32	30.1	3.56	18.2	10.8	156	<500	362
CGDP22-W		04/29/10	593	35.8	32.7	4.98	6.83	39.8	241	<500	614
CGDP24-W		04/29/10	<1	2.93	5.99	<1	3.42	7.73	<100	<500	<250
CGWT6		04/29/10	1,300	1,030	3,020	7.63	1,470	4,400	4,840	<500	29,100
MTCA[6] Method A cleanup levels			5	700	1000 [8]	20	1000 [8]	1000	500	500	800

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. of Spokane, Washington.

[2]Benzene, ethylbenzene, m+p-xylene, methyl-t-butyl ether (MTBE), o-xylene and toluene analyzed using EPA Method 8021.

[3]Diesel and Lube Oil analyzed using Northwest Method NWTPH-Dx. Note that laboratory reports are in units of mg/L.

[4]Gasoline analyzed using Northwest Method NWTPH-Gx. Note that laboratory reports are in units of mg/L.

[5]Analyzed using Northwest Method NWTPH-HCID. Note that laboratory reports are in units of mg/L.

[6]CGWT = Cabin Grill Domestic Well.

[7]MTCA = Washington State, Model Toxics Control Act, Method A Cleanup levels.

[8]Cleanup levels for total xylenes.

µg/L = micrograms per liter; mg/L = milligrams per liter; Bolding indicates analyte was detected at concentrations greater than MTCA Method A cleanup levels.

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 6

Table 7

Summary of Groundwater Chemical Analytical Results - Monitoring Well Samples[1]

Ione Petroleum Contamination

Ione, Washington

Analyte	Unit	MTCA Method A Cleanup Level	Well No.	MW-1					MW-2				
			Sample Number	MW-1-080510	MW-1-111010	MW-1-021611	MW-1-051111	MW-1-080311	MW-2-080610	MW-2-111010	MW-2-021611	MW-2-051111	MW-2-080311
			Date	08/05/10	11/10/10	02/16/11	05/11/11	08/03/11	08/06/10	11/10/10	02/16/11	05/11/11	08/03/11
DRPH[2]	µg/L	500		<100					<100				
ORPH[2]	µg/L	500		<500					<100				
GRPH[3]	µg/L	800		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Volatile Organic Compounds[4]													
Benzene	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	700		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	1,000		1.81	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m,p-Xylene	µg/L	1,000[5]		1.93	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	µg/L			0.89	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	200		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trimethylbenzene	µg/L	NE		0.62	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (EDB)	µg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane (EDC)	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	µg/L	NE		0.58	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,2-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorotoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Hexanone	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chlorotoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acetone	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Acrylonitrile	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromochloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

		MTCA Method	Well No.	MW-1					MW-2				
		A Cleanup	Sample Number	MW-1-080510	MW-1-111010	MW-1-021611	MW-1-051111	MW-1-080311	MW-2-080610	MW-2-111010	MW-2-021611	MW-2-051111	MW-2-080311
Analyte	Unit	Level	Date	08/05/10	11/10/10	02/16/11	05/11/11	08/03/11	08/06/10	11/10/10	02/16/11	05/11/11	08/03/11
Dibromochloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl ethyl ketone (MEK)	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl isobutyl ketone (MIBK)	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methylene chloride	µg/L	5		<2.5	<2.5	0.850	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl tert buytl ether (MTBE)	µg/L	20		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	µg/L	160		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-Propylbenzene	µg/L	NE		0.55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
sec-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
tert-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	µg/L	0.2		<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5
Dissolved Lead[5]	µg/L	15		<1					<1				
Lead[6]	µg/L	15		<1	<1				<1	<1			

		MTCA Method	Well No.	MW-3					MW-4					MW-5		
		A Cleanup	Sample Number	MW-3-080610	MW-3-111010	MW-3-021611	MW-3-051111	MW-3-080311	MW-4-080610	MW-4-111010	MW-4-021711	MW-4-051111	MW-4-080311	MW-5-080610	MW-5-111010	MW-5-021711
Analyte	**Unit**	**Level**	**Date**	**08/06/10**	**11/11/10**	**02/16/11**	**05/11/11**	**08/03/11**	**08/06/10**	**11/11/10**	**02/17/11**	**05/11/11**	**08/03/11**	**08/06/10**	**11/11/10**	**02/17/11**
DRPH[2]	µg/L	500		<100					<100					<100		
ORPH[2]	µg/L	500		<500					<500					<500		
GRPH [3]	µg/L	800		24,500	20,200	24,200	40,300	74,700	4,940	1,190	359	394	687	188,000	80,600	110,000
Volatile Organic Compounds[4]																
Benzene	µg/L	5		2,680	1,940	1,980	2,460	5,470	21.3	9.36	1.27 (J)[7,8]	1.19	3.85	2,210	525	1,010
Ethylbenzene	µg/L	700		831	314 (u)[9]	647	963	1,700	80.6	7.04 (u)[9]	1.34 (J)[7,8]	1.82	9.36	3,210	2120 (u)	2,200
Toluene	µg/L	1,000		3,330	2870 (u)[9]	3,350	4,980	16,200	462	78.3 (u)[9]	11.8 (J)[7,8]	9.12	45.5	37,900	8420 (u)	13,800
m,p-Xylene	µg/L	1,000[5]		1,940	1680 (u)[9]	2,230	3,110	6,830	425	94.5 (u)[9]	16.8 [7,8]	30.4	74.8	13,900	9330 (u)	9,080
o-Xylene	µg/L			615	653	771	1,280	3,160	189	55.6	16.6 (J)[7,8]	31.1	63.6	5,510	3,360	3,840
1,1,1,2-Tetrachloroethane	µg/L	NE		<50	<5	<100	<50	<500	188	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1,1-Trichloroethane	µg/L	200		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1,2,2-Tetrachloroethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1,2-Trichloroethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1-Dichloroethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1-Dichloroethene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,1-Dichloropropene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2,3-Trichlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2,3-Trichloropropane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2,4-Trichlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2,4-Trimethylbenzene	µg/L	NE		305	259	353	363	853	154	24.9	1.82	15.7	19.2	2,000	1,060	2,250
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2-Dibromoethane (EDB)	µg/L	0.01		<50	<5	<100	<50	<500	<5	<5	<0.01	<0.01	<0.5	<500	<250	<25
1,2-Dichlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2-Dichloroethane (EDC)	µg/L	5		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,2-Dichloropropane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,3,5-Trimethylbenzene	µg/L	NE		<50	136	171	168	<500	68.3	19.3	10.2	9.57	10.9	968	376	850
1,3-Dichlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,3-Dichloropropane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
1,4-Dichlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
2,2-Dichloropropane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
2-Chlorotoluene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
2-Hexanone	µg/L	NE		<250	<25	<500	<250	<2500	<25	<25	<2.5	<2.5	<0.5	<2,500	<1,250	<125
4-Chlorotoluene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Acetone	µg/L	NE		<250	<25	<500	<250	<2500	36.0	<25	<2.5	<2.5	3.52	<2,500	<1,250	<125
Acrylonitrile	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Bromobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Bromochloromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Bromodichloromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Bromoform	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Bromomethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Carbon disulfide	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Carbon Tetrachloride	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Chlorobenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Chloroethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Chloroform	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Chloromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
cis-1,2-Dichloroethene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
cis-1,3-Dichloropropene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25

		MTCA Method	Well No.	MW-3					MW-4					MW-5		
		A Cleanup	Sample Number	MW-3-080610	MW-3-111010	MW-3-021611	MW-3-051111	MW-3-080311	MW-4-080610	MW-4-111010	MW-4-021711	MW-4-051111	MW-4-080311	MW-5-080610	MW-5-111010	MW-5-021711
Analyte	Unit	Level	Date	08/06/10	11/11/10	02/16/11	05/11/11	08/03/11	08/06/10	11/11/10	02/17/11	05/11/11	08/03/11	08/06/10	11/11/10	02/17/11
Dibromochloromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Dibromomethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Dichlorodifluoromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Hexachlorobutadiene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Isopropylbenzene	µg/L	NE		104	<5	<100	<50	<500	6.39	<5	<0.5	<0.5	<0.5	945	<250	118
Methyl ethyl ketone (MEK)	µg/L	NE		<250	<25	<500	<250	<2500	<25	<25	<2.5	<2.5	<2.5	<2,500	<1,250	<125
Methyl isobutyl ketone (MIBK)	µg/L	NE		<250	<25	<500	<250	<2500	<25	<25	<2.5	<2.5	<2.5	<2,500	<1,250	<125
Methylene chloride	µg/L	5		<250	<25	<500	<250	<2500	<25	<25	<2.5	<2.5	<2.5	<2,500	<1,250	<125
Methyl tert buytl ether (MTBE)	µg/L	20		<50	<5	<100	<50	<500	<25	<5	<0.5	<0.5	<0.5	<500	<250	<25
Naphthalene	µg/L	160		80.1	84.3	107	109	<500	10.3	<5	0.89 (J)[7,8]	0.75	0.96	<500	<250	364
n-Butylbenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	0.60	<500	<250	94.6
n-Propylbenzene	µg/L	NE		92.2	<5	<100	61.2	<500	15.1	<5	<0.5	0.53	0.51	691	<250	346
p-Isopropyltoluene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	0.54	0.63	0.56	<500	<250	<25
sec-Butylbenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Styrene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
tert-Butylbenzene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Tetrachloroethene	µg/L	5		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
trans-1,2-Dichloroethene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
trans-1,3-Dichloropropene	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Trichloroethene	µg/L	5		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Trichlorofluoromethane	µg/L	NE		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Vinyl chloride	µg/L	0.2		<50	<5	<100	<50	<500	<5	<5	<0.5	<0.5	<0.5	<500	<250	<25
Dissolved Lead[5]	µg/L	15		<1					<1					<1		
Lead[6]	µg/L	15		<1	<1				<1	<1				<1		

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-6					MW-7				
				MW-6-080610	MW-6-111010	MW-6-021711	MW-6-051111	MW-6-080311	MW-7-080610	MW-7-111010	MW-7-021611	MW-7-051111	MW-7-080311
				08/06/10	11/11/10	02/17/11	05/11/11	08/03/11	08/06/10	11/11/10	02/16/11	05/11/11	08/03/11
DRPH[2]	µg/L	500		<100					<100				
ORPH[2]	µg/L	500		<500					<500				
GRPH [3]	µg/L	800		76,400	16,600	15,600	6,850	21,900	<100	<100	<100	<100	<100
Volatile Organic Compounds[4]													
Benzene	µg/L	5		9,880	3,900	3,820	2,560	557	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	700		1,640	873 (u)[9]	628	325	547	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	1,000		14,400	466 (u)[9]	262	642	2,130	<0.5	<0.5	<0.5	<0.5	<0.5
m,p-Xylene	µg/L	1,000[5]		5,180	1410 (u)[9]	656	530	2,170	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	µg/L			2,720	1,280	1,250	360	1,680	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	200		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloropropene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichloropropane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trimethylbenzene	µg/L	NE		376	162	<100	62.8	237	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (EDB)	µg/L	0.01		<250	<125	<100	<50	<50	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane (EDC)	µg/L	5		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	µg/L	NE		<250	193	<100	59.1	192	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
2,2-Dichloropropane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorotoluene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
2-Hexanone	µg/L	NE		<250	<625	<500	<250	<250	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chlorotoluene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Acetone	µg/L	NE		<1,250	<625	<500	<250	<250	2.93	<2.5	<2.5	<2.5	<2.5
Acrylonitrile	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Bromochloromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-6					MW-7				
				MW-6-080610 08/06/10	MW-6-111010 11/11/10	MW-6-021711 02/17/11	MW-6-051111 05/11/11	MW-6-080311 08/03/11	MW-7-080610 08/06/10	MW-7-111010 11/11/10	MW-7-021611 02/16/11	MW-7-051111 05/11/11	MW-7-080311 08/03/11
Dibromochloromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene	µg/L	NE		466	162	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl ethyl ketone (MEK)	µg/L	NE		<1,250	<625	<500	<250	<250	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl isobutyl ketone (MIBK)	µg/L	NE		<1,250	<625	<500	<250	<250	<2.5	<2.5	<2.5	<2.5	<2.5
Methylene chloride	µg/L	5		<1,250	<625	<500	<250	<250	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl tert buytl ether (MTBE)	µg/L	20		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	µg/L	160		<250	200	147	59.0	97.7	<0.5	<0.5	<0.5	<0.5	<0.5
n-Butylbenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
n-Propylbenzene	µg/L	NE		312	144	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
sec-Butylbenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
tert-Butylbenzene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	5		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	NE		<250	<125	<100	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	µg/L	0.2		<250	<125	<100	<50	<50	<0.2	<0.5	<0.5	<0.5	<0.5
Dissolved Lead[5]	µg/L	15		<1					<1				
Lead[6]	µg/L	15		<1	<1				<1	<1			

Analyte	Unit	MTCA Method A Cleanup Level	Well No. Sample Number Date	MW-8 MW-8-080610 08/06/10	MW-8 MW-8-111010 11/11/10	MW-8 MW-8-021711 02/17/11	MW-8 MW-8-080311 08/03/11	MW-9 MW-9-111010 11/11/10	MW-9 MW-9-021611 02/16/11	MW-9 MW-9-051111 05/11/11	MW-9 MW-9-080311 08/03/11	MW-10 MW-10-111010 11/11/10	MW-10 MW-10-021711 02/17/11	MW-10 MW-10-051111 05/11/11	MW-10 MW-10-080311 08/03/11
DRPH[2]	µg/L	500		<100											
ORPH[2]	µg/L	500		<500											
GRPH [3]	µg/L	800		14,800	12,000	13,400	227,000	<100	<100	<100	<100	<100	<100	<100	<100
Volatile Organic Compounds[4]															
Benzene	µg/L	5		2,620	2,670	3,280	2,140	0.50	<0.5	<0.5	<0.5	0.50	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	700		334	321	421	6,740	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	1,000		1,750	1360 (u)[9]	2,010	26,700	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m,p-Xylene	µg/L	1,000[5]		902	756	1,490	27,200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	µg/L			403	187	548	12,100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	200		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloropropene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichloropropane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trimethylbenzene	µg/L	NE		186	112	191	3,560	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (EDB)	µg/L	0.01		<25	<50	<50	<500	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane (EDC)	µg/L	5		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	µg/L	NE		70.7	94.2	85.7	1,080	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,2-Dichloropropane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorotoluene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Hexanone	µg/L	NE		<125	<250	<250	<2500	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chlorotoluene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acetone	µg/L	NE		<125	<250	<250	<2500	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Acrylonitrile	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromochloromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	µg/L	NE		<25	<50	<50	<500	0.54	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-8				MW-9				MW-10			
			Sample Number	MW-8-080610	MW-8-111010	MW-8-021711	MW-8-080311	MW-9-111010	MW-9-021611	MW-9-051111	MW-9-080311	MW-10-111010	MW-10-021711	MW-10-051111	MW-10-080311
			Date	08/06/10	11/11/10	02/17/11	08/03/11	11/11/10	02/16/11	05/11/11	08/03/11	11/11/10	02/17/11	05/11/11	08/03/11
Dibromochloromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl ethyl ketone (MEK)	µg/L	NE		<125	<250	<250	<2500	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl isobutyl ketone (MIBK)	µg/L	NE		<125	<250	<250	<2500	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methylene chloride	µg/L	5		<125	<250	<250	<2500	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Methyl tert buytl ether (MTBE)	µg/L	20		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	0.60	0.59	<0.5	<0.5
Naphthalene	µg/L	160		<25	72.3	<50	869	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-Butylbenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-Propylbenzene	µg/L	NE		37.1	60.8	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
sec-Butylbenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
tert-Butylbenzene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	5		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	NE		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	µg/L	0.2		<25	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Lead[5]	µg/L	15		<1											
Lead[6]	µg/L	15		<1	<1			<1				<1			

		MTCA Method	Well No.	MW-11				MW-12				MW-13	MW-14	MW-15
		A Cleanup	Sample Number	MW-11-111010	MW-11-021711	MW-11-050000	MW-11-080311	MW-12-111010	MW-12-021711	MW-12-051211	MW-12-080311	MW-13-080411	MW-14-080411	MW-15-080411
Analyte	**Unit**	**Level**	**Date**	**11/11/10**	**02/17/11**	**05/11/11**	**08/03/11**	**11/11/10**	**02/17/11**	**05/12/11**	**08/03/11**	**08/04/11**	**08/04/11**	**08/04/11**
DRPH[2]	µg/L	500												
ORPH[2]	µg/L	500												
GRPH [3]	µg/L	800		<100	140	<100	<100	<100	126	<100	<100	771	<100	1,660
Volatile Organic Compounds[4]														
Benzene	µg/L	5		0.50	<0.5	<0.5	<0.5	0.50	<0.5	<0.5	<0.5	7.98	<0.5	847
Ethylbenzene	µg/L	700		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	31.0	<0.5	129
Toluene	µg/L	1,000		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.66	<0.5	29.8
m,p-Xylene	µg/L	1,000[5]		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	77.9	<0.5	<25
o-Xylene	µg/L			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	73.8	<0.5	73.2
1,1,1,2-Tetrachloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1,1-Trichloroethane	µg/L	200		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1,2,2-Tetrachloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1,2-Trichloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1-Dichloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,1-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2,3-Trichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2,3-Trichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2,4-Trichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2,4-Trimethylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	10.3	<0.5	<25
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2-Dibromoethane (EDB)	µg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.5	<0.01	<25
1,2-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2-Dichloroethane (EDC)	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,2-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,3,5-Trimethylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	35.8	<0.5	27.0
1,3-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,3-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
1,4-Dichlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
2,2-Dichloropropane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
2-Chlorotoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
2-Hexanone	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<125
4-Chlorotoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Acetone	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<125
Acrylonitrile	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Bromobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Bromochloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Bromodichloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Bromoform	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Bromomethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Carbon disulfide	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Carbon Tetrachloride	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Chlorobenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Chloroethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Chloroform	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Chloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
cis-1,2-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
cis-1,3-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25

Analyte	Unit	MTCA Method A Cleanup Level	Well No. / Sample Number / Date	MW-11				MW-12				MW-13	MW-14	MW-15
				MW-11-111010 11/11/10	MW-11-021711 02/17/11	MW-11-050000 05/11/11	MW-11-080311 08/03/11	MW-12-111010 11/11/10	MW-12-021711 02/17/11	MW-12-051211 05/12/11	MW-12-080311 08/03/11	MW-13-080411 08/04/11	MW-14-080411 08/04/11	MW-15-080411 08/04/11
Dibromochloromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Dibromomethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Dichlorodifluoromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Hexachlorobutadiene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Isopropylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.61	<0.5	<25
Methyl ethyl ketone (MEK)	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<125
Methyl isobutyl ketone (MIBK)	µg/L	NE		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<125
Methylene chloride	µg/L	5		<2.5	<2.5	<2.5	<2.5	<2.5	0.72	<2.5	<2.5	<2.5	<2.5	<125
Methyl tert buytl ether (MTBE)	µg/L	20		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Naphthalene	µg/L	160		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	16.5	<0.5	41.9
n-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.05	<0.5	<25
n-Propylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.28	<0.5	<25
p-Isopropyltoluene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.14	<0.5	<25
sec-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Styrene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
tert-Butylbenzene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Tetrachloroethene	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
trans-1,2-Dichloroethene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
trans-1,3-Dichloropropene	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Trichloroethene	µg/L	5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Trichlorofluoromethane	µg/L	NE		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Vinyl chloride	µg/L	0.2		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<25
Dissolved Lead[5]	µg/L	15												
Lead[6]	µg/L	15		<1				<1						

Analyte	Unit	MTCA Method A Cleanup Level	Well No. Sample Number Date	Cabin Well Cabin Well-080610 08/06/10	Cabin Well 101209043-001 12/08/10	Cabin Well 110221034-014 02/21/11	Cabin Well 110513012-012 05/12/11	Cabin Well Cabin Grill-080411 08/04/11	Duplicate-1 (MW-4) 80610 08/06/10	Duplicate-1 (MW-6) 10112036-013 11/11/10	Duplicate-1 (MW-4) 110221034-013 02/17/11	Duplicate-1 (MW-4) 110513012-011 05/12/11	Duplicate-1 (MW-4) 110805029-016 08/04/11
DRPH[2]	µg/L	500		<100					<100				
ORPH[2]	µg/L	500		<500					<500				
GRPH [3]	µg/L	800		40,000	26,100	21,500	14,000	45,500	4,920	10,800	476	467	708
Volatile Organic Compounds[4]													
Benzene	µg/L	5		770	227	440	540	143	21.6	4,530	1.98 (J)[7,8]	1.09	3.57
Ethylbenzene	µg/L	700		877	592	517	414	997	81.5	258	2.00 (J)[7,8]	1.62	9.67
Toluene	µg/L	1,000		4,920	3,640	2,210	982	5,440	472	430 (u)[9]	18.7 (J)[7,8]	7.97	41.8
m,p-Xylene	µg/L	1,000[5]		2,600	1,930	1,710	985	5,140	419	1,570	24.3 [7]	27.5	75.7
o-Xylene	µg/L			1,390	1,090	1,080	687	2,570	194	1,650	21.1 [7]	28.2	63.7
1,1,1,2-Tetrachloroethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	200		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,1-Dichloropropene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2,3-Trichlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2,3-Trichloropropane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2,4-Trimethylbenzene	µg/L	NE		369	289	216	99	967	148	<50	1.61	14.2	18.7
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2-Dibromoethane (EDB)	µg/L	0.01		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.01	<0.5
1,2-Dichlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,2-Dichloroethane (EDC)	µg/L	5		<50	<0.5	<50	<25	<100	<5	116	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	µg/L	NE		199	192	159	107	433	65.0	72.9	8.05	8.88	10.7
1,3-Dichlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,3-Dichloropropane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
2,2-Dichloropropane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
2-Chlorotoluene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
2-Hexanone	µg/L	NE		<250	<2.5	<250	<125	<500	<2.5	<250	<2.5	<2.5	<2.5
4-Chlorotoluene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Acetone	µg/L	NE		<250	9.7	<250	<125	<500	34.8	<250	<2.5	<2.5	<2.5
Acrylonitrile	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Bromobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Bromochloromethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Bromodichloromethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Bromoform	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Bromomethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Carbon Tetrachloride	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Chloroethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Chloroform	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Chloromethane	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5

Analyte	Unit	MTCA Method A Cleanup Level	Well No. Sample Number Date	Cabin Well					Duplicate-1 (MW-4)	Duplicate-1 (MW-6)	Duplicate-1 (MW-4)	Duplicate-1 (MW-4)	Duplicate-1 (MW-4)
				Cabin Well-080610 08/06/10	101209043-001 12/08/10	110221034-014 02/21/11	110513012-012 05/12/11	Cabin Grill-080411 08/04/11	80610 08/06/10	10112036-013 11/11/10	110221034-013 02/17/11	110513012-011 05/12/11	110805029-016 08/04/11
Dibromochloromethane	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Dibromomethane	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Dichlorodifluoromethane	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Hexachlorobutadiene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Isopropylbenzene	μg/L	NE		<50	29.9	<50	<25	<100	6.12	<50	<0.5	<0.5	<0.5
Methyl ethyl ketone (MEK)	μg/L	NE		<250	4.73	<250	<125	<500	<2.5	<250	<2.5	<2.5	<2.5
Methyl isobutyl ketone (MIBK)	μg/L	NE		<250	<2.5	<250	<125	<500	<2.5	<250	<2.5	<2.5	<2.5
Methylene chloride	μg/L	5		<250	<2.5	<250	<125	<500	<2.5	<250	<2.5	<2.5	<2.5
Methyl tert buytl ether (MTBE)	μg/L	20		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.6
Naphthalene	μg/L	160		147	410	92.8	92.3	**244**	7.54	50.7	1.12 (J)[7,8]	0.75	1.06
n-Butylbenzene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	0.60
n-Propylbenzene	μg/L	NE		88.1	70	<50	43.9	116	14.7	<50	<0.5	<0.5	0.50
p-Isopropyltoluene	μg/L	NE		<50	2.59	<50	<25	<100	<5	<50	<0.5	0.60	0.51
sec-Butylbenzene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Styrene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
tert-Butylbenzene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Tetrachloroethene	μg/L	5		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Trichloroethene	μg/L	5		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Trichlorofluoromethane	μg/L	NE		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Vinyl chloride	μg/L	0.2		<50	<0.5	<50	<25	<100	<5	<50	<0.5	<0.5	<0.5
Dissolved Lead[5]	μg/L	15		<1	<0.5				<1				
Lead[6]	μg/L	15		<1	<1				<1	<1			

Notes:

[1]Chemical analyses conducted by Anatek Labs, Inc. located in Spokane, Washington.

[2]Diesel and Lube Oil analyzed using Northwest Method NWTPH-Dx.

[3]Gasoline analyzed using Northwest Method NWTPH-Gx.

[4]Volatile organic compounds analyzed using by EPA Methods 8260B/8260C.

[5]Cleanup level for total xylenes is 1,000 μg/L.

[6]Lead and dissolved lead analyzed using by EPA Method 200.8. Note that laboratory reports are in units of mg/L and are converted to μg/L in this table.

[7] VOC results reported from RBCA volatiles list due to discrepancy between the RBCA volatiles list and the full 8260C list. Reported result is the higher of the two reported values.

[8](J) Flag qualifier indicates an estimated value. See Appendix B Data Quality Assessment Summary.

μg/L - micrograms per liter; mg/L = milligrams per liter; NE = not established; MTCA = Model Toxics Control Act

Table 8

Summary of Field Quality Parameters

Ione Petroleum Contamination

Ione, Washington

Sample Number	Date Sampled	pH	Specific Conductivity (mS/m)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	ORP (mV)	Well Headspace PID Readings (ppm)
MW-1	08/05/10	7.36	319.1	1.01	6.99	14.82	95	0.0
	11/10/10	7.09	54.0	4.02	9.12	8.02	363	0.0
	02/16/11	6.75	58.2	10.0	10.53	8.17	268	0.0
	05/11/11	7.40	30.46	8.5	8.39	10.09	105	0.0
	08/03/11	7.28	31.1	9.8	8.30	8.85	239	0.0
MW-2	08/06/10	6.98	46.0	0.00	3.66	14.66	95	13.6
	11/10/10	6.62	67.7	0.00	4.24	9.15	373	0.0
	02/16/11	6.56	71.0	5.68	4.07	9.29	278	0.0
	05/11/11	7.01	35.52	12.09	5.54	11.67	82	0.0
	08/03/11	7.07	34.86	13.12	5.69	10.53	214	0.0
MW-3	08/06/10	6.76	717.3	0.09	0.02	15.16	-107	19.8
	11/10/10	6.45	101.0	0.00	0.00	9.27	-127	0.0
	02/16/11	6.30	57.8	7.34	0.00	8.98	-149	0.0
	05/12/11	6.70	69.91	13.68	0.14	10.32	-117	10.3
	08/04/11	6.66	78.01	6.40	0.48	10.45	-22	18.9
MW-4	08/06/10	7.50	356.0	4.38	0.17	14.88	-72	2,100
	11/10/10	6.95	81.1	0.00	2.66	8.97	196	575
	02/17/11	6.73	99.9	3.12	0.00	8.79	273	575
	05/12/11	7.07	43.26	36.75	0.86	9.55	57	1,212
	08/04/11	7.08	40.82	78.28	2.25	11.75	202	1,158
MW-5	08/06/10	6.85	606.4	0.00	NR	17.16	29	2,400
	11/10/10	6.61	92.3	0.00	0.00	9.50	108	4,800
	02/17/11	6.93	91.4	0.00	0.00	8.84	94	4,800
	05/10/11	NA	NA	NA	NA	NA	NA	1,657
	08/04/11	NA	NA	NA	NA	NA	NA	1,425
MW-6	08/05/10	6.74	757.9	16.70	0.49	14.97	-27	0.3
	11/10/10	6.52	100.0	0.00	0.00	9.14	-38	0.0
	02/17/11	6.37	109.0	8.57	0.00	8.90	-75	0.0
	05/12/11	6.83	62.09	17.19	0.67	9.76	-13	37.2
	08/04/11	6.96	61.46	16.26	1.46	10.39	-18	0.0
MW-7	08/06/10	7.36	329.8	6.39	1.13	14.01	-57	1.2
	11/10/10	6.83	60.1	9.21	0.00	8.11	-20	0.0

Sample Number	Date Sampled	pH	Specific Conductivity (mS/m)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	ORP (mV)	Well Headspace PID Readings (ppm)
MW-7 cont.	02/16/11	6.80	61.7	3.84	0.00	7.83	-14	0.0
	05/11/11	7.34	28.87	13.57	0.00	9.79	-39	0.0
	08/03/11	7.07	31.11	8.93	7.06	9.86	-39	0.0
MW-8	08/06/10	6.66	508.6	0.00	NR	14.96	24	2,150
	11/10/10	6.38	90.4	0.00	0.00	9.52	-8	1,280
	02/17/11	6.72	79.3	0.00	0.00	8.57	15	1,280
	05/10/11	NA	NA	NA	NA	NA	NA	1,570
	08/04/11	NA	NA	NA	NA	NA	NA	1,817
MW-9	11/10/10	7.15	55.4	8.16	7.53	8.37	244	0.0
	02/16/11	6.99	57.8	11.12	9.51	8.12	251	0.0
	05/11/11	7.50	26.68	26.44	8.11	9.95	36	0.0
	08/03/11	7.43	30.11	1.75	8.38	10.03	239	0.0
MW-10	11/10/10	7.08	69.9	4.12	1.44	8.95	48	0.0
	02/16/11	6.89	79.2	0.00	0.00	8.20	226	0.0
	05/11/11	7.33	23.28	12.30	8.82	8.61	35	0.0
	08/03/11	7.13	27.75	17.17	6.98	11.37	285	0.0
MW-11	11/10/10	7.19	55.9	0.00	7.94	8.86	236	0.0
	02/17/11	7.00	65.2	8.34	10.72	8.73	283	0.0
	05/11/11	7.46	26.43	29.57	8.92	9.64	55	0.0
	08/03/11	7.41	25.23	10.36	9.12	9.16	282	0.0
MW-12	11/10/10	7.06	76.0	0.00	8.03	8.82	242	0.9
	02/17/11	6.93	74.3	8.12	11.81	8.54	297	0.9
	05/12/11	7.27	32.62	14.7	7.96	7.2	128	4.7
	08/03/11	7.31	33.41	11.1	8.48	12.09	307	0.0
MW-13	08/04/11	7.00	47.94	15.46	2.43	10.36	124	0.0
MW-14	08/04/11	7.28	30.92	13.59	9.03	10.57	239	0.0
MW-15	08/04/11	6.95	44.92	18.10	6.03	10.61	219	11.2

Notes:

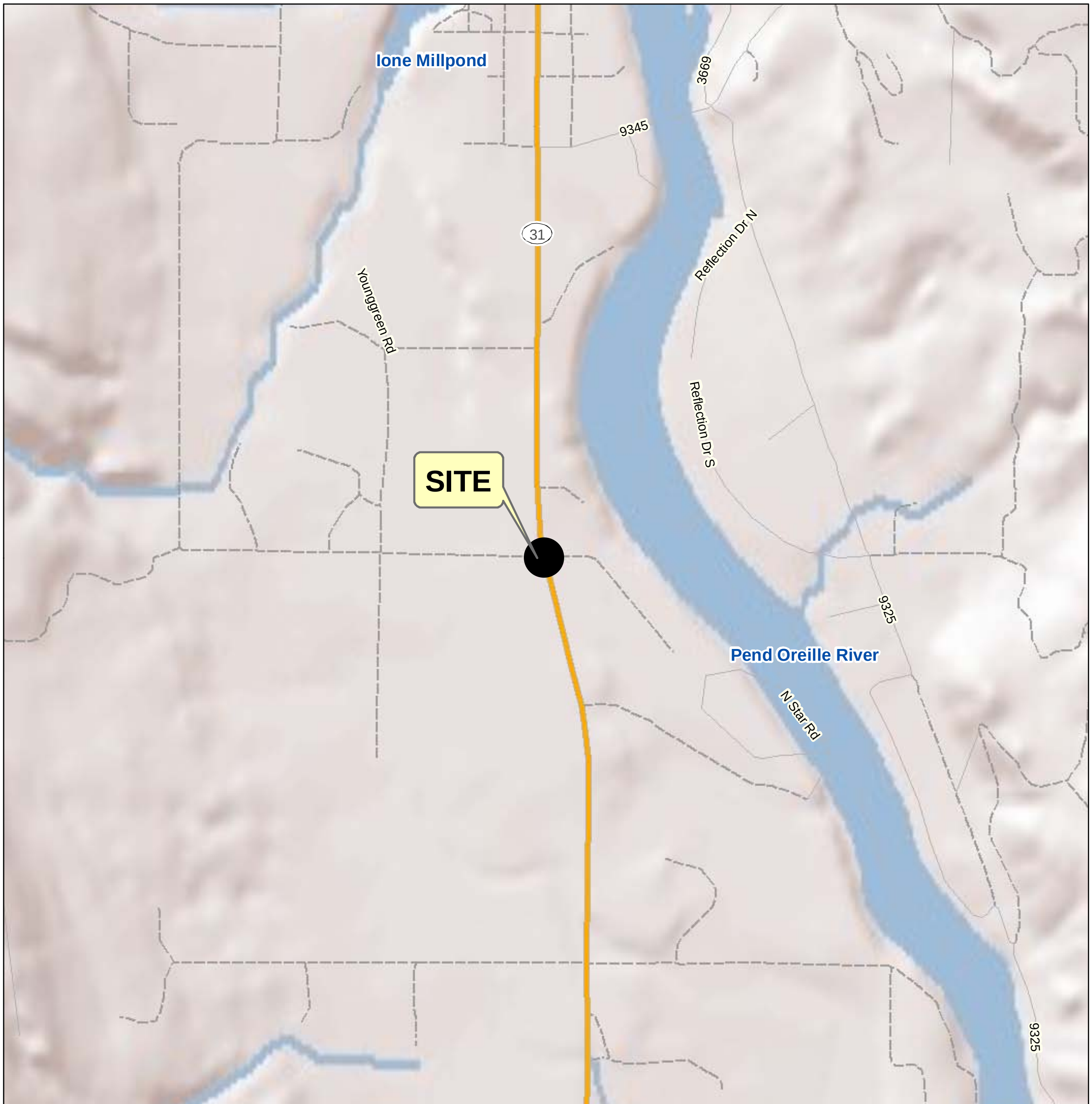
NA= not analyzed

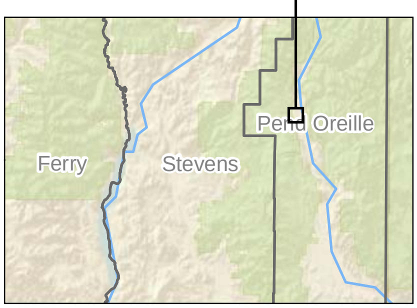
NR = not reported due to instrument error - readings were outside normal range and therefore not reported.

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/[Ione RIFS Tables 1-8.xlsx]Table 8

FIGURES

GeoEngineers





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Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Sources: ESRI Data & Maps, Street Maps 2008.
Projection: NAD 1983, UTM Zone 11 North.

Vicinity Map

Ione Petroleum Contamination
Ione, Washington

GEOENGINEERS

Figure 1

Office: SPO Path:W:\Spokane\Projects\0\0504058\GIS\050405801_VM_F1.mxd Map Revised: 09/09/2010 CRC

Well Number	GRPH (µg/L)	Benzene (µg/L)	Ethylbenzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)
MW-1	<100	<0.5	<0.5	<0.5	<1.0
MW-2	<100	<0.5	<0.5	<0.5	<1.0
MW-3	**74,700**	**5,470**	**1700**	**16,200**	**9,990**
MW-4	687	3.85	9.36	45.5	138.4
MW-5	NA	NA	NA	NA	NA
MW-6	**21,900**	**557**	547	**2,130**	**3,850**
MW-7	<100	<0.5	<0.5	<0.5	<1.0
MW-8	**227,000**	**2,140**	**6,740**	**26,700**	**39,300**
MW-9	<100	<0.5	<0.5	<0.5	<1.0
MW-10	<100	<0.5	<0.5	<0.5	<1.0
MW-11	<100	<0.5	<0.5	<0.5	<1.0
MW-12	<100	<0.5	<0.5	<0.5	<1.0
MW-13	771	**7.98**	31.0	2.66	151.7
MW-14	<100	<0.5	<0.5	<0.5	<1.0
MW-15	**1,660**	**847**	129	29.8	73.2
Cabin Grill Well	**45,500**	**143**	**997**	**5,440**	**7,710**

Bold = Exceeded cleanup level

NA = Not Analyzed

Legend

- MW-1 — Approximate Location of Monitoring Well and Groundwater Elevation on August 2, 2011
- Approximate Location of Direct-Push Boring
- 2077 — Approximate Groundwater Elevation Contour (0.5-Foot Interval)
- Interpreted Groundwater Flow Direction

Reference: Bing Maps aerial from ESRI, Online Data Resource Center.
ESRI Data & Maps, Street Maps 2008

Notes:
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3. Elevations are referenced in NAVD 88.
4. The equivalent (true) groundwater elevation at MW-5 and MW-8 as showing calculated to account for the presence of the free product using the following equation: GW = SG X T + IE;
where GW = equivalent groundwater elevation SG = specific gravity of free product (0.75) for gasoline; T = thickness of product measured in well using oil/water interface probe;
IE =elevation of water/product interface measured in the well.
5. NA = Not Analyzed

N S W E

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Feet

Groundwater Elevations and Flow Direction - August 2011

Ione Petroleum Contamination
Ione, Washington

GEOENGINEERS

Figure 2

Map Revised: August 22, 2011 CRC

Path:W:\Spokane\Projects\0\0504058\GIS\050405801_GWContour_F2_Aug2011.mxd

OfficeLocation: SPO

Legend

- DP-1 — Direct-Push Boring Number and Approximate Location
- B-1 — Hollow-Stem Auger Boring Number and Approximate Location
- MW-1 — Monitoring Well Number and Approximate Location
- Ⓦ — Existing Water Well
- GRPH Detected in Soil Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.
- BTEX Detected in Soil Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.

Reference: Bing Maps aerial from ESRI, Online Data Resource Center.
ESRI Data & Maps, Street Maps 2008

Notes:
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GRPH and BTEX in Soil Samples

Ione Petroleum Contamination
Ione, Washington

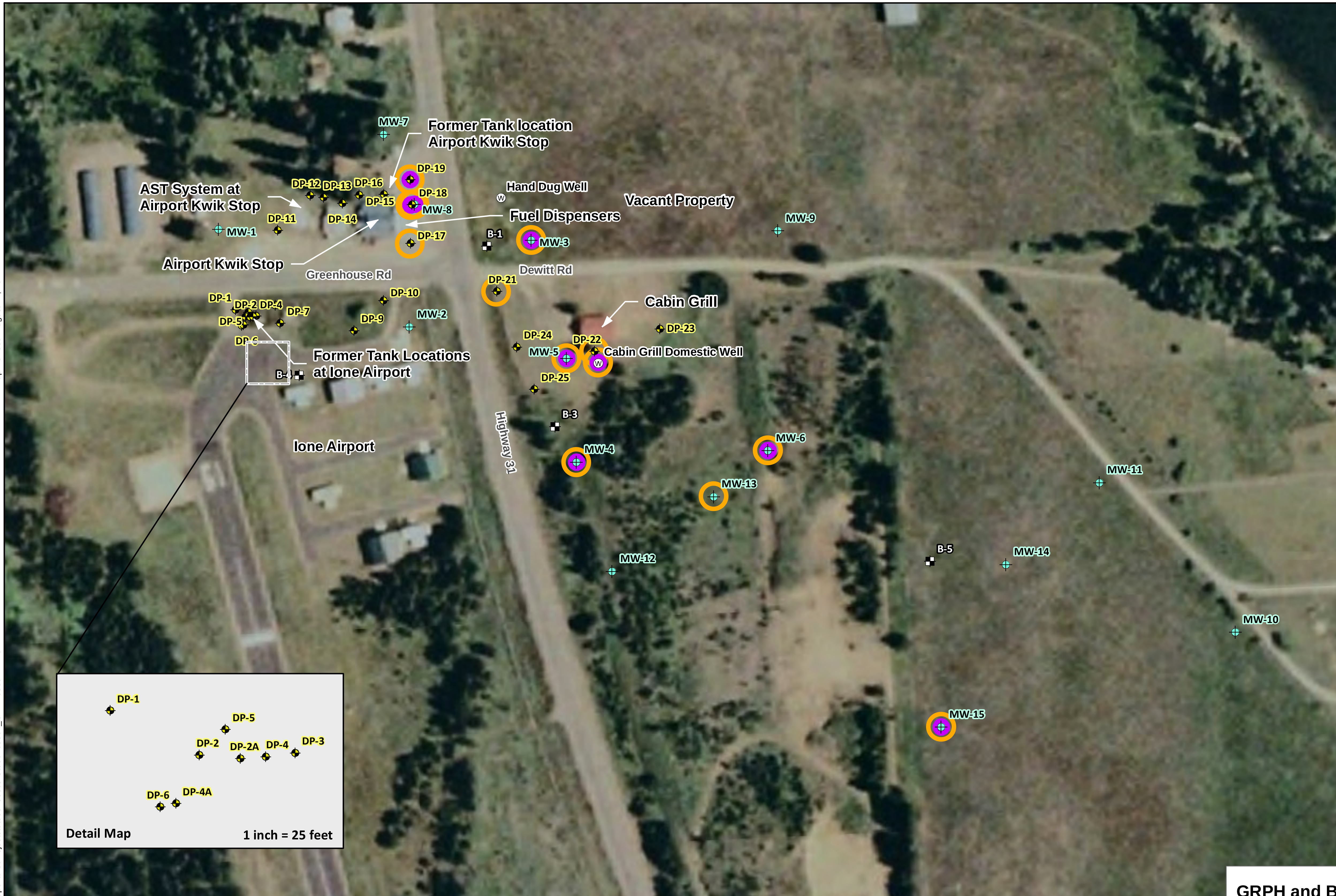
GEOENGINEERS

Figure 3

Map Revised: August 22, 2011

Path:W:\Spokane\Projects\0\0504058\GIS\050405801_SoilExceed_F3.mxd

OfficeLocation: SPO



Legend

- DP-1 Approximate Location of Direct-Push Boring
- B-1 Approximate Location of Exploration
- MW-1 Approximate Location of Monitoring Well
- W Existing Water Well
- GRPH Detected in Groundwater Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.
- BTEX Detected in Groundwater Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.

Reference: Bing Maps aerial from ESRI, Online Data Resource Center.
ESRI Data & Maps, Street Maps 2008

N W E S

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Feet

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GRPH and BTEX in Groundwater Samples

Ione Petroleum Contamination
Ione, Washington

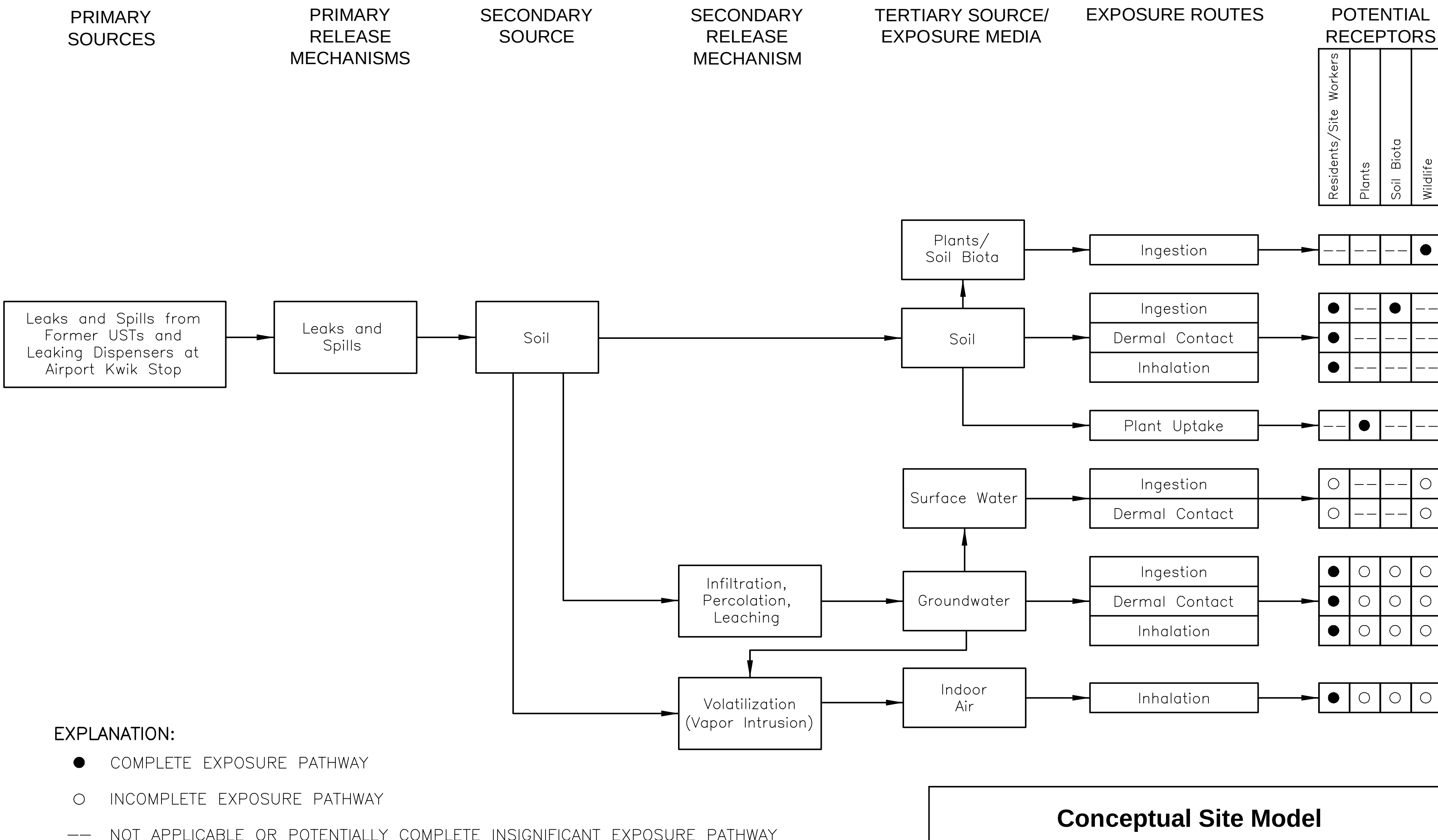
GEOENGINEERS

Figure 4

Map Revised: August 22, 2011

Path:W:\Spokane\Projects\0\0504058\GIS\050405801_GWExceedF4.mxd

OfficeLocation: SPO



Tertiary Source/Exposure Media	Exposure Route	Residents/Site Workers	Plants	Soil Biota	Wildlife
Plants/Soil Biota	Ingestion	——	——	——	●
Soil	Ingestion	●	——	●	——
Soil	Dermal Contact	●	——	——	——
Soil	Inhalation	●	——	——	——
Soil	Plant Uptake	——	●	——	——
Surface Water	Ingestion	○	——	——	○
Surface Water	Dermal Contact	○	——	——	○
Groundwater	Ingestion	●	○	○	○
Groundwater	Dermal Contact	●	○	○	○
Groundwater	Inhalation	●	○	○	○
Indoor Air	Inhalation	●	○	○	○

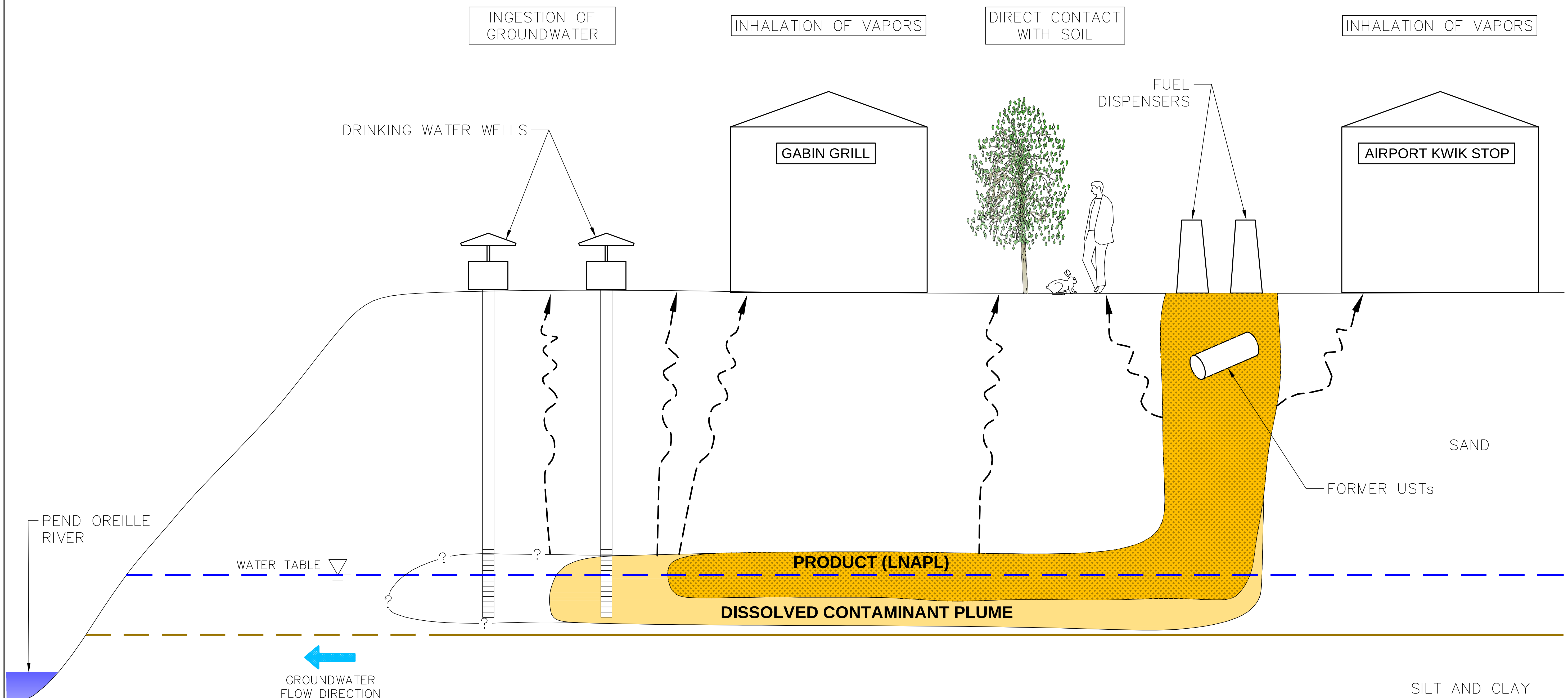
Notes:
1. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Conceptual Site Model

Ione Petroleum Contamination Site
Ione, Washington

GEOENGINEERS

Figure 5



NOT TO SCALE

LEGEND

VOLATILIZATION OF VAPORS

UNDEFINED EXTENT OF CONTAMINANT

SOIL CONTACT (DASHED WHERE INFERRED)

Notes

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

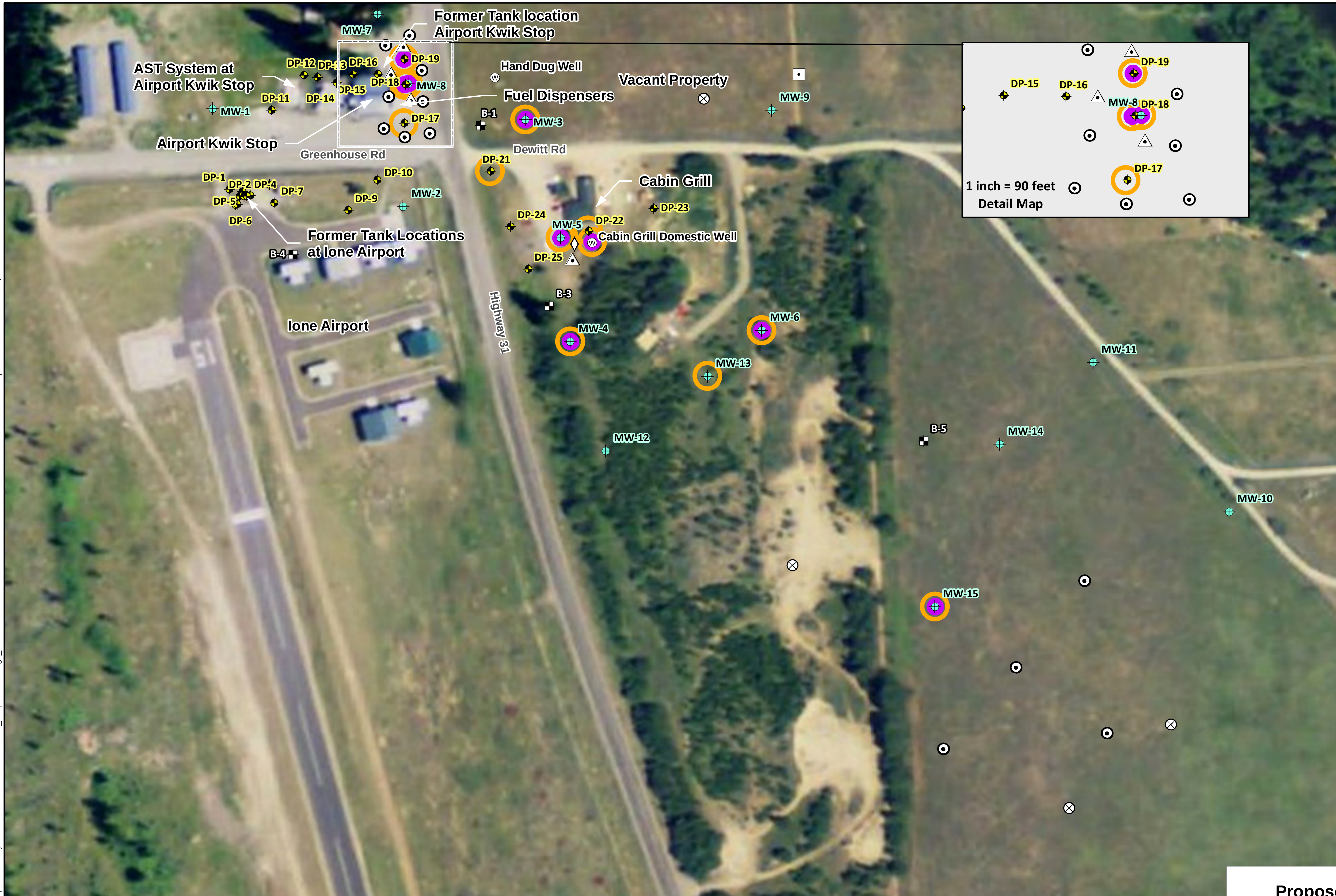
Reference: Drawing created from previous GeoEngineers figure.

Conceptual Site Model

Ione Petroleum Contamination Site
Ione, Washington

GEOENGINEERS

Figure 5



Legend

- Approximate Location of Direct-Push Boring
- Approximate Location of Exploration
- Approximate Location of Monitoring Well
- Existing Water Well
- GRPH Detected in Groundwater Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.
- BTEX Detected in Groundwater Samples at Concentrations Greater Than MTCA Method A Cleanup Levels.
- Approximate Location of Proposed Air Sparge Test Well (subject to change depending on results of investigation)
- Approximate Location of Proposed Direct-Push Boring (subject to change depending on results of investigation)
- Approximate Location of Proposed Monitoring Well (subject to change depending on results of investigation)
- Approximate Location of Proposed Pump Test Well (subject to change depending on results of investigation)
- Approximate Location of Proposed SVE Test Well (subject to change depending on results of investigation)

Reference: Bing Maps aerial from ESRI, Online Data Resource Center.
ESRI Data & Maps, Street Maps 2008

N S E W

150 0 150
Feet

Notes:
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Proposed Exploration Locations

Ione Petroleum Contamination
Ione, Washington

GEOENGINEERS

Figure 6

Map Revised: November 22, 2011
Path:W:\Spokane\Projects\0\0504058\GIS\050405802_ProposedBorings_F6.mxd
OfficeLocation: SPO

APPENDICES

GeoEngineers

APPENDIX A
Sampling and Analysis Plan

APPENDIX A
SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This SAP presents the planned RI/FS work at the Site located near Ione, Washington. The scope of the project includes sampling domestic wells, completing 12 to 16 direct-push borings, installing 10 groundwater wells (3 groundwater monitoring wells, 4 soil vapor extraction wells, 1 air sparge well, 1 pilot test well, and 1 observation well), collecting soil and groundwater samples for laboratory analysis, evaluating laboratory data, conducting pilot tests (soil vapor extraction, air sparge, and pumping tests) and preparing a written report of the results.

This SAP has been prepared as Appendix A of the Work Plan. Included in this SAP are general guidelines with the following sections:

- Background and General Site Characterization Scope - Section 2.0
- General Remedial Investigation Procedures – Section 3.0
- Data Validation and Usability – Section 4.0

2.0 BACKGROUND AND GENERAL REMEDIAL INVESTIGATION SCOPE

2.1. Background/Environmental Issues Definition

The Airport Kwik Stop and Cabin Gill site is located near the intersection of State Route 31 and Greenhouse and Dewitt Roads, south of Ione, Washington. The results of the previous site characterization and groundwater monitoring efforts indicate that a plume of petroleum-contaminated groundwater (gasoline) is present beneath the site, extending from the Airport Kwik Stop property, downgradient through the Cabin Grill property to undeveloped property (referred to as the Vacant Property) located north, south and east of the Cabin Grill property.

2.2. Project Description

The scope of services for the RI/FS includes the following activities:

- Identify and mark proposed direct-push boring and groundwater monitoring well locations, contact local utility companies to mark the locations of their underground utilities, and subcontract a private utility locating contractor to locate and mark underground utilities near proposed exploration areas. Obtain right-of-way permits from the WSDOT for borings located within State Rights-of-way.
- Subcontract a driller to complete 12 to 16 direct-push borings. We anticipate that the borings will be advanced to depths in the range of about 20 to 50 feet.
- Subcontract a licensed well driller, to install 10, 2-inch or 4-inch-diameter groundwater monitoring wells to depths of approximately 40 to 50 feet below ground surface. Locations of the monitoring wells are yet to be determined, and will be selected based on the results of the

initial direct-push borings. The wells will be drilled using either hollow-stem auger drilling techniques. Develop newly installed wells.

- Collect soil sub-samples from areas potentially impacted with COPCs based on field-screening results; refer to Section 3.2 Field-Screening Methods for details on field-screening methods.
- Submit soil samples from direct-push and monitoring well borings to a qualified laboratory for analysis of the relevant COPCs as described in the Work Plan.
- Subcontract a survey of newly installed groundwater monitoring wells with a surveying company.
- Survey the location of direct-push borings by either using a mapping grade global positioning system (GPS) unit with sub-meter accuracy, or by the subcontracted surveyor, if scheduling permits.
- Measure and record VOCs in the well headspace using a photo-ionization detector (PID) by inserting the PID probe into the well casing immediately after removing the well cap. Measure free product in wells using either small disposable bailers or an oil-water-interface probe.
- Measure the depth to water at existing and newly installed wells with an electronic level indicator to calculate groundwater elevations and the inferred groundwater flow direction.
- Collect groundwater samples from existing and newly installed wells using low-flow sampling techniques.
- Submit the groundwater samples to a qualified laboratory for analysis of the COPCs and geochemical indicators as described in the Work Plan.
- Containerize, label, and store investigation derived waste (IDW) in a secure location onsite pending waste characterization and disposal. IDW will be stored in 55-gallon WSDOT - approved drums.
- Review field and analytical data obtained during the RI, to assess if the Site has been sufficiently characterized or if additional data gaps exist.

2.3. Data Quality Objectives, Special Training/Certification, And Documentation

Data quality objectives, special training/certification, and documentation will conform to the requirements of the QAPP.

3.0 GENERAL SITE CHARACTERIZATION PROCEDURES

This section contains standard procedures for field data collection that are anticipated during the remedial investigation including the following:

- Collecting Soil Samples from Soil Borings;
- Field-screening Methods;
- Monitoring Well Construction, Development, and Surveying;
- Groundwater Elevations;
- Groundwater Sampling;

- Domestic Well Sampling;
- Pilot Testing
- Decontamination Procedures;
- Handling of IDW; and
- Sample Location Control.

3.1. Collecting Soil Samples from Soil Borings

Soil borings will be advanced using hollow-stem auger or direct-push drilling techniques by a licensed driller.

For hollow-stem auger drilling methods, soil samples will be collected using either a 2-inch, outside-diameter, split spoon sampler or a 2.5-inch, inside-diameter California-style split barrel sampler driven into the relatively undisturbed soil using a 140 pound-hammer free falling approximately 30 inches. For hollow-stem auger borings drilled within areas of know or suspected surface contamination, samples will be collected at approximately 2½- to 5-foot depth intervals. For hollow-stem auger borings drilled outside areas of known or suspected surface contamination, samples will be collected near the groundwater interface

Direct-push drilling is useful for shallow subsurface explorations. Continuous soil samples are collected using 4-foot-long, 1-inch-diameter acrylic sleeves. Samples will be collected from the sleeves, field-screened according to the procedures outlined below, and transferred into laboratory-prepared containers.

Each boring will be continuously monitored by an engineer or geologist from our firm, who will observe and classify the soil encountered, and prepare a detailed log of each boring. Soil encountered in the borings will be classified in the field in general accordance with ASTM International (ASTM) D-2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure. If field-screening results (moderate to high sheen and/or PID readings of 50 ppm or greater above background) indicate high concentrations of petroleum hydrocarbons, VOC samples will be collected by EPA Method 5035. Submittal of samples for analytical testing will be based on results of hydrocarbon identification (HCID) analyses and in coordination with Ecology. Sample containers will be labeled and placed into an ice chest containing ice. Chain-of-custody (COC) procedures will be observed during transport of the soil samples.

Sampling equipment will be decontaminated between each sampling attempt. Samples will be collected using either a decontaminated soil knife or new, clean nitrile gloves, and placed into 8-ounce glass sample jars with Teflon lids.

Samples will be placed in a cooler with ice and delivered to the analytical laboratory; standard chain-of-custody procedures will be observed during transport of the samples to the laboratory.

3.2. Field-screening Methods

A GeoEngineers field engineer or geologist will perform field-screening tests on selected soil samples. Field-screening results will be used to aid in the selection of soil samples for chemical analysis. Screening methods will include (1) visual examination; (2) water sheen screening; and

(3) headspace vapor screening using a PID. Visual screening consists of inspecting the soil for discoloration indicative of the presence of petroleum material in the sample. Water sheen screening involves placing soil in water and observing the water surface for signs of sheen. Sheen classifications are as follows:

No Sheen (NS)	No visible sheen on the water surface;
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil might produce a slight sheen;
Moderate Sheen (MS)	Light to heavy sheen; might have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface; and
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface might be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic bag. Air is captured in the sealed bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a PID is inserted into the bag, and the PID measures VOC vapor concentrations in ppm. The PID is calibrated to isobutylene. The PID is designed to quantify VOC vapor concentrations in the range between 1 ppm and 2,000 ppm with an accuracy of 10 percent of the reading, and between 2,000 ppm and 10,000 ppm with an accuracy of 20 percent of the reading.

Soil samples will be field-screened using the methods described above during exploration activities. Samples obtained from the borings which indicate petroleum contamination will be submitted for laboratory testing in consultation with Ecology.

Field-screening results are site specific. The results vary with temperature, soil type, type of contaminant, and soil moisture content. Water sheen testing equipment will be disposable or decontaminated before field-screening each sample using a Liquinox soap solution with a water rinse. Decontamination water will be stored on-site in a labeled DOT-approved drum pending disposal with IDW.

3.3. Monitoring Well Construction, Development, and Surveying

Monitoring wells will be constructed in accordance with WAC 173-160, Section 400, Washington State Resource Protection Well Construction Standards. All monitoring well records will be submitted in accordance with Washington monitoring well construction standards. Monitoring well installation will be observed by a GeoEngineers field engineer or geologist, who will maintain a detailed log of the materials and depths of the well. Well construction details, including the depths of the well screen and filter packs, will be recorded on the monitoring well construction record.

Each monitoring well will be constructed using 2- or 4-inch-diameter polyvinyl chloride (PVC) well casing. The annular space in each well will be sealed between the top of the filter pack and the ground surface with bentonite to prevent infiltration of groundwater into the well bore from shallower zones. A lockable compression-type cap will be installed in the top of the PVC well casing. For aboveground completions, a lockable above-grade monument equipped with a watertight cover will be installed to protect the PVC well casing. A concrete surface seal will be placed around the monument at the ground surface to divert surface water away from the well location. A minimum of three bollards will be installed around above-grade monuments.

Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil.

The depth to water in the monitoring well will be measured prior to development. The total depth of the well will also be measured and recorded. The monitoring wells will be developed by pumping, surging, bailing, or a combination of these methods after construction. Development of each well will continue until the water is as free of sediment as practicable with respect to the composition of the subsurface materials within the screened interval. The removal rate and amount of groundwater removed will be recorded during well development procedures.

During well development, water will be collected and stored on site. After development, wells will be allowed to equilibrate a minimum of 72 hours prior to sampling.

The horizontal locations and elevations of the monitoring wells will be surveyed by a licensed surveyor subcontracted to GeoEngineers. A survey reference notch will be established on the north side of each monitoring well casing.

3.4. Groundwater Elevations

Depths to groundwater relative to the monitoring well casing rims will be measured using an electronic water level indicator. Depths to water will be measured to the nearest 0.01 foot. The electronic water level indicator will be decontaminated with Liquinox® solution wash and a distilled water rinse prior to use in each well. Groundwater elevations will be calculated by subtracting the water table depth from the surveyed casing rim elevations.

3.5. Groundwater Sampling

Groundwater samples will be collected at least 72 hours after well development. Each groundwater sample will be collected using low-flow purging methods, unless use of low-flow procedures is not possible. In which case, disposable bailers will be used. During well purging, water quality parameters (temperature, pH, conductivity, dissolved oxygen and turbidity) will be monitored and recorded. The groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. The sample containers will be filled completely to eliminate headspace in the container. COC procedures will be observed from the time of sample collection to delivery to the testing laboratory.

Additionally, measurement of VOCs in the well headspace will be taken using a PID by first inserting the PID probe into the well casing immediately after removal of the well cap. Measurement of free product, if present, will be completed by lowering a disposable bailer into the well until it partially penetrates the groundwater table. Alternatively an oil-water-interface probe will be used to measure free product.

3.6. Domestic Well Sampling

Water samples will be obtained from downgradient domestic wells after permission has been obtained from the property owners. Water samples will be obtained, if possible, from existing faucets or taps, preferably upstream of any existing water treatment components. Faucets or taps will be purged for at least 5 minutes, if feasible, before collecting samples water will be discharged into existing drains, if possible. Otherwise water will be characterized pending results of analytical testing. The groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. The sample containers will be filled completely to eliminate headspace in the container. COC procedures will be observed from the time of sample collection to delivery to the testing laboratory.

3.7. Pilot Testing

SVE tests will be conducted at the Airport Kwik Stop and Cabin Grill. Two-hour stepped vacuum tests will be conducted at each of the three SVE wells using a regenerative blower; each test will begin with partial dilution and the last hour of each test will be conducted with the dilution valve closed. Applied vacuum will be measured at the test well; induced vacuum and water level measurements (if applicable) will be measured at adjacent monitoring wells, which will include the other two SVE wells and wells MW-7 and MW-8. Effluent air from the test well will be monitored for air flow, oxygen and carbon dioxide content, and VOCs. Air flow will be measured using an anemometer and blower rating curves. Oxygen and carbon dioxide will be measured using a four-gas meter. VOCs will be measured using a PID.

An air sparge test will be conducted using the dedicated air sparge well at Cabin Grill. The 6-hour test will be stepped such that air flow into the well will be increased during the first hour of the test, then stabilized for the remainder of the test. Air flow and air pressure will be measured at the test well. Air pressure, oxygen and carbon dioxide content, VOCs and groundwater levels will be measured at nearby observation wells, which include an SVE well, MW-5 and possibly MW-3 and/or MW-4. During the final two hours of the test, a vacuum will be applied to the SVE well, and monitoring procedures listed above will be followed for the duration of the test.

Pumping tests will be conducted using the installed test well near MW-9. Testing will consist of approximate 4-hour step-rate and 24-hour constant-rate tests, if feasible, as well as associated recovery periods. During testing and recovery, water levels within the test well and up to three monitoring/observation wells (including MW-9 and the proposed 2-inch-diameter located near MW-9) will be monitored at logarithmic intervals using pressure transducers and dataloggers. Water levels within other nearby monitoring wells also will be monitored during the test to evaluate the effect of the pump tests on the aquifer. Well discharge will be measured by a calibrated in-line flowmeter or manometer. Groundwater samples will be collected and analyzed for COCs in the pump test well and surrounding wells before initiating the pump test. The pump test may proceed if analytical results indicate that groundwater near the pump test well is not contaminated. We assume that the test well will be located outside of the contaminant plume and water generated during testing later can be disposed of to ground downgradient of the test well pending laboratory results. The duration and pumping rate of the tests will be adjusted if results of monitoring during the test indicate the potential to draw the plume to currently uncontaminated areas.

3.8. Decontamination Procedures

The objective of the decontamination procedure is to minimize the potential for cross-contamination between sample locations.

A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned using high-pressure/low-volume cleaning equipment.

Sampling equipment will be decontaminated in accordance with the following procedures before each sampling attempt or measurement.

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.

3.9. Handling of Investigation-Derived Waste

IDW, which consists of mainly drill cuttings and decontamination/purge water, typically will be placed in WSDOT-approved 55-gallon drums. Each drum will be labeled with the project name, general contents, date and source location (boring number) of contents. The drummed IDW will be stored on-site pending analysis and disposal.

Disposable items, such as sample tubing, disposable bailers, bailer line, gloves and protective overalls, paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

3.10. Sample Location Control

Vertical and horizontal sample control will be maintained throughout the project. Benchmarks have been established for vertical and horizontal survey control. Horizontal and vertical control for monitoring wells and direct-push borings will be tied to datums that are acceptable to Ecology's Environmental Information Management (EIM) System. The elevations of monitoring wells will be surveyed by a licensed surveyor. Ground elevations of direct-push explorations also will be surveyed by a licensed surveyor, if scheduling permits. Alternatively, ground elevations of direct-push borings will be surveyed by GeoEngineers field staff using either an optical or laser level, or will be interpolated from a topographic site plan developed for the project by a licensed surveyor.

Horizontal control will be established either by GeoEngineers using measuring tapes or hand-held GPS meter, or by a licensed surveyor. The GPS system is accurate to approximately 3 lateral feet. To achieve optimum accuracy, several epoch cycles will be used to obtain each coordinate.

3.11. Sampling And Analytical Methods

Field sampling methods, including quality control (QC) and maintenance of field instrumentation, for soil and groundwater sampling will adhere to the requirements of the QAPP.

Analytical methods requirements also will adhere to the QAPP. During laboratory procurement, analytical method reporting limits for each proposed analysis will be compared to the reporting limits listed in the QAPP to ensure that data generated will be sufficient for assessment purposes.

3.12. Sample Handling And Custody Requirements

Samples will be handled in accordance with the QAPP. A complete discussion of the sample identification and custody procedures is provided in the QAPP.

3.13. Field Measurements And Observations Documentation

Field measurements and observations will be recorded in project logs. Daily logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily log and signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be signed and dated. At a minimum, the following data will be recorded in the log book:

- Purpose of activity
- Location of activity (referenced to either the Cabin Grill Site, Ione Airport Site or Airport Kwik Stop Site)
- Description of sampling reference point(s)
- Sample number identification
- Sample number and volume
- Sample transporting procedures
- Field measurements made
- Calibration records for field instruments
- Visitors to site
- Relevant comments regarding field activities
- Signatures of responsible personnel

Sufficient information will be recorded in the log book so that field activities can be reconstructed without reliance on personnel memory.

3.14. Data Management And Documentation

Data logs and data report packages will be located in the project file system in GeoEngineers' Spokane, Washington office. Data reports will be available in both hard copy and electronic formats. Laboratory data reports will include internal laboratory QC checks and sample results. Data logs and packages that are anticipated to be generated during the investigation including laboratory data report packages, boring logs, field sampling data sheets, and COC forms.

Analytical data will be supplied to GeoEngineers in both Electronic Data Deliverable (EDD) format and hard copy format. The hard copy will serve as the official record of laboratory results. The EDD will be compatible with Earthsoft EQUIS environmental data management software, and will include the following minimum data requirements in unique cells within the EDD:

- Sample identification
- The reported concentration;
- The method reporting limit;
- Any flags assigned by the laboratory;
- The sampling date and time; and
- The Chemical Abstracts Service (CAS) registry number.

Upon receipt of the analytical data, the EDD will be uploaded to an EQUIS database and reduced into summary tables for each group of analytes and media. Upon completion of the summary tables, the accuracy of the data reduction will be verified using the hard copy of the data received from the laboratory. Any exceptions will be noted and corrections will be made. The EDD data will be submitted to Ecology's EIM system.

4.0 DATA VALIDATION AND USABILITY

Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP.

5.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1998. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Revision 5. April.

Washington State Department of Ecology (Ecology), 2004. Collecting and Preparing Soil Samples for VOC Analysis

APPENDIX B
Quality Assurance Project Plan

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed for RI activities at the Site, located near the intersection of State Route 31 and Greenhouse and Dewitt Roads, south of Ione, Washington. The RI is being conducted to assist Ecology in completing characterization of the source and extent of groundwater and soil contamination. Objectives of the RI are discussed in the Work Plan. Sampling procedures are outlined in the SAP included as Appendix A of the work plan. The QAPP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into RI activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on guidelines specified in WAC 173, Chapter 173-340-820 and the EPA Requirements for Quality Assurance Project Plans (EPA, 2004b).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness, and comparability (PARCC) of data generated meet the specified data quality objectives.

1.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Descriptions of the responsibilities, lines of authority and communication for the key positions to QA/QC are provided below. This organization facilitates the efficient production of project work, allows for an independent quality review, and permits resolution of QA issues before submittal.

1.1. Project Leadership and Management

The Project Manager's (PM) duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. David Lauder, Professional Engineer (PE) is the PM for activities at the Sites. The Principal-in-Charge is responsible to Ecology for fulfilling contractual and administrative control of the project. Bruce Williams is the Principal-in Charge.

1.2. Field Coordinator

The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Provides technical direction to the field staff.
- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Supervises the compilation of field data and laboratory analytical results.

- Assures that data are correctly and completely reported.
- Implements and oversees field sampling in accordance with project plans.
- Supervises field personnel.
- Coordinates work with on-site subcontractors.
- Schedules sample shipment with the analytical laboratory.
- Monitors that appropriate sampling, testing, and measurement procedures are followed.
- Coordinates the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation.
- Participates in QA corrective actions as required.

The Field Coordinators for RI exploration activities at the site are Katie Hall, Brent Randall, Kevin Randall and/or Scott Lathen.

1.3. QA Leader

The GeoEngineers project QA Leader is under the direction of David Lauder and Bruce Williams, who are responsible for the project's overall QA. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Mark Lybeer is the QA Leader. The QA Leader has the following responsibilities:

- Serves as the official contact for laboratory data QA concerns.
- Responds to laboratory data, QA needs, resolves issues, and answers requests for guidance and assistance.
- Reviews the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
- Maintains the authority to implement corrective actions as necessary.
- Reviews and approves the laboratory QA Plan.
- Evaluates the laboratory's final QA report for any condition that adversely impacts data generation.
- Ensures that appropriate sampling, testing, and analysis procedures are followed and that correct QC checks are implemented.
- Monitors subcontractor compliance with data quality requirements.

1.4. Laboratory Management

The subcontracted laboratories conducting sample analyses for this project are required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensure implementation of the QA Plan.
- Serve as the laboratory point of contact.

- Activate corrective action for out-of-control events.
- Issue the final QA/QC report.
- Administer QA sample analysis.
- Comply with the specifications established in the project plans as related to laboratory services.
- Participate in QA audits and compliance inspections.

The chemical analytical laboratory QA Coordinator will be determined after an Ecology-accredited laboratory is chosen.

1.5. Health and Safety

A site-specific HASP will be used for site characterization field activities and is presented in Appendix C. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The PM will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will conduct a tailgate safety meeting each morning before beginning daily field activities. The Field Coordinator will terminate any work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP. GeoEngineers will review subcontractor HASPs before commencement of their work at the site.

2.0 DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable, and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness, and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives (MQO) associated with these data quality factors are summarized in Table B-1 and are discussed below.

2.1. Analytes and Matrices of Concern

Samples of soil and groundwater will be collected during the RI. Tables B-2 and B-3 in the work plan summarize the analyses to be performed at the Site for soil and groundwater, respectively.

2.2. Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Individual instruments often can detect but not accurately quantify compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, QA dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL). The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. The PQL for site COPCs are presented in Tables B-2 and B-3 for soil and groundwater, respectively. These reporting limits were obtained from Ecology-certified laboratories (Anatek Labs, Spokane, Washington and TestAmerica, Spokane, Washington). Other criteria include State of Washington (WAC 173-201) and federal Ambient Water Quality Criteria (AWQC). The analytical methods and processes selected will provide PQLs less than the TRLs under ideal conditions. However, the reporting limits in Tables B-2 and B-3 are considered targets because several factors may influence final detection limits. First, moisture and other physical conditions of soil affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value much higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize site conditions.

2.3. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons of various matrices and field duplicate comparisons for water samples. This value is calculated by:

$$RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} X\ 100,$$

Where

D_1 = Concentration of analyte in sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Persons performing the evaluation must review one or more pertinent documents (EPA October 1999; EPA October 2004a) that address criteria exceedances and courses of action. Relative percent difference goals for this effort is 30 percent in groundwater and 40 percent in soil for all analyses, unless the duplicate sample values are within 5 times the reporting limit.

2.4. Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported value versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

Accuracy will be expressed as the percent recovery of a surrogate compound (also known as "system monitoring compound"), a matrix spike (MS) result, or from a standard reference material where:

$$Recovery\,(\%) = \frac{Sample\ Result}{Spike\ Amount}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA October 1999; EPA October 2004a) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, MS, and laboratory control spikes (LCS) are found in Table B-1 of this QAPP.

2.5. Representativeness, Completeness and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within the SAP and this QAPP.

- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

2.6. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents have volatilized from the sample or degraded. Results for that analysis will be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Table B-4.

2.7. Blanks

According to the *National Functional Guidelines for Organic Data Review* (EPA 1999), "The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Organic Data Review* and professional judgment.

3.0 SAMPLE COLLECTION, HANDLING AND CUSTODY

3.1. Sampling Equipment Decontamination

The objective of the decontamination procedure is to minimize the potential for cross-contamination between sample locations.

A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned using high-pressure/low-volume cleaning equipment.

Sampling equipment will be decontaminated in accordance with the following procedures before each sampling attempt or measurement.

Brush equipment with a nylon brush to remove large particulate matter.

6. Rinse with potable tap water.
7. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
8. Rinse with potable tap water.
9. Rinse with distilled water.

3.2. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling, and documentation. Soil and groundwater samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table B-4.

Sample containers will be labeled with the following information at the time of collection:

- project name and number,
- sample name, which will include a reference to depth if appropriate, and
- date and time of collection.

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between the SAP, sample containers/labels, field log books, and the COC.

3.3. Sample Storage

Samples will be placed in a cooler with "blue ice" or double-bagged "wet ice" immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of 4 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table B-4.

3.4. Sample Shipment

The samples will be transported and delivered to the analytical laboratory in the coolers. Field personnel will transport and hand-deliver samples that are being submitted to a local laboratory for analysis. Samples that are being submitted to an out-of-town laboratory for analysis will be transported by a commercial express mailing service on an overnight basis. The Field Coordinator will monitor that the shipping container (cooler) has been properly secured using clear plastic tape and custody seals.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to minimize damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being place in coolers. Trip blanks will be included in coolers with groundwater samples.

3.5. COC Records

Field personnel are responsible for the security of samples from the time the samples are taken until the samples have been received by the shipper or laboratory. A COC form will be completed at the end of each field day for samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number.
- Sample identification number.
- Date and time of sampling.
- Sample matrix (soil, water, etc.) and number of containers from each sampling point, including preservatives used.
- Depth of subsurface soil sample.
- Analyses to be performed.
- Names of sampling personnel and transfer of custody acknowledgment spaces.
- Shipping information including shipping container number.

The original COC record will be signed by a member of the field team and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for shipment. This record will accompany the samples during transit by carrier to the laboratory.

3.6. Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, time, and date.

3.7. Field Documentation

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on-site. The field logs will be prepared on field report forms or in a bound logbook. Entries in the field logs and associated sample documentation forms will be made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the site characterization field explorations.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description.
- Site or sampling area sketch showing sample location and measured distances.

- Sampler's name(s).
- Date and time of sample collection.
- Designation of sample as composite or discrete.
- Type of sample (soil or water).
- Type of sampling equipment used.
- Field instrument readings.
- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.).
- Preliminary sample descriptions (e.g., lithologies, noticeable odors, colors, field-screening results).
- Sample preservation.
- Shipping arrangements (overnight air bill number).
- Name of recipient laboratory.

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling:

- Team members and their responsibilities.
- Time of arrival/entry on Site and time of Site departure.
- Other personnel present at the Site.
- Summary of pertinent meetings or discussions with regulatory agency or contractor personnel.
- Deviations from sampling plans, Site safety plans, and QAPP procedures.
- Changes in personnel and responsibilities with reasons for the changes.
- Levels of safety protection.
- Calibration readings for any equipment used and equipment model and serial number.

The handling, use, and maintenance of field log books are the field coordinator's responsibilities.

4.0 CALIBRATION PROCEDURES

4.1. Field Instrumentation

Equipment and instrumentation calibration facilitates accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use, and environmental conditions. The basic calibration frequencies are described below.

The PID or flame-ionization detector (FID) used for vapor measurements will be calibrated daily, if required (based on the model used), for site safety monitoring purposes in general accordance with the manufacturer's specifications. If daily calibration is not required for a specific PID model, calibration of the PID will be checked to make sure it is up to date. The calibration results will be recorded in the field logbook.

The Horiba U-22 water quality measuring system will be calibrated prior to each monitoring event in general accordance with the manufacturer's specifications. The calibration results will be recorded in the field report.

4.2. Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of six months.

5.0 DATA REPORTING AND LABORATORY DELIVERABLES

Laboratories will report data in formatted hardcopy and digital form. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates, and detection limit (PQL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory EDD will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the PM.

Chromatograms will be provided for samples analyzed by Northwest Methods NWTPH-Gx. The laboratory will assure that the full heights of all peaks appear on the chromatograms and that the same horizontal time scale is used to allow for comparisons to other chromatograms.

6.0 INTERNAL QC

Table B-5 summarizes the types and frequency of QC samples to be collected during the site characterization, including both field QC and Laboratory QC samples.

6.1. Field QC

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the influence of off-site factors on environmental samples. Off-site factors include airborne volatile organic compounds and potable water used in drilling activities.

6.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Under ideal field conditions, field duplicates (referred to as splits), are created when a volume of the sample matrix is thoroughly mixed, placed in separate containers, and identified as different samples. This tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel.

One field duplicate will be collected for every twenty soil samples. Duplicate soil samples will be analyzed for the COPCs specified for the given sample location. A field duplicate water sample will be collected from one of the monitoring wells and analyzed for the suite of COPCs that is specified for that well.

6.1.2. Trip Blanks

Trip blanks accompany groundwater sample containers used for VOC analyses during shipment and sampling periods. Trip blanks will be analyzed on a one per cooler basis.

6.2. Laboratory QC

Laboratory QC procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method but generally include:

- method blanks
- internal standards
- calibrations
- MS/matrix spike duplicates MSD)
- LCS/laboratory control spike duplicates (LCSD)
- laboratory replicates or duplicates
- surrogate spikes

6.2.1. Laboratory Blanks

Laboratory procedures employ the use of several types of blanks but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil like material having undergone a contaminant destruction process or high performance liquid chromatography (HPLC) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is found in the method blank then one (or more) of the following occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.
- Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

6.2.2. Calibrations

Several types of calibrations are used, depending on the method, to determine whether the methodology is 'in control' by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

6.2.3. MS/MSD

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH affects the results of semivolatile organic compounds (SVOCs). Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. A MS is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The samples for the MS and MSD analyses should be collected from a boring or sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. This MS/MSD sample will be a composite to achieve a level of representativeness and reproducibility in the data.

6.2.4. LCS/LCSD

Also known as blanks spikes, LCSs are similar to MSs in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS media is considered "clean" or contaminant free. For example, HPLC water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

6.2.5. Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

6.2.6. *Surrogate Spikes*

The purposes of using a surrogate are to verify the accuracy of the instrument being used and extraction procedures. Surrogates are substances similar to, but not one of, the target analytes. A known concentration of surrogate is added to the sample and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified range of acceptance a possibility of false positives exist, although non-detected results are considered accurate.

7.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

7.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA Leader and PM.

7.2. Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below and procedures in the SAP. Field data documentation will be checked against the applicable criteria as follows:

- Sample collection information.
- Field instrumentation and calibration.
- Sample collection protocol.
- Sample containers, preservation and volume.
- Field QC samples collected at the frequency specified.
- Sample documentation and COC protocols.
- Sample shipment.

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. The final report will contain what effects, if any, an incident has on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

7.3. Field QC Evaluation

A field QC evaluation will be conducted by reviewing field log books and daily reports, discussing field activities with staff, and reviewing field QC samples (trip blanks and field duplicates). Trip blanks will be evaluated using the same criteria as method blanks.

Precision for field duplicate soil samples will not be evaluated because even a well mixed sample is not entirely homogenous due to sampling procedures, soil conditions, and contaminant transport mechanisms.

7.4. Laboratory Data QC Evaluation

The laboratory data assessment will consist of a formal review of the following QC parameters:

- Holding times
- Method blanks
- MS/MSD
- LCS/LCSD
- Surrogate spikes
- Replicates

In addition to these QC mechanisms, other documentation such as cooler receipt forms and case narratives will be reviewed to fully evaluate laboratory QA/QC.

8.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1998. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Revision 5. April.

U.S. Environmental Protection Agency (EPA). 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. 540/R-99/008.

U.S. Environmental Protection Agency (EPA). 2004a. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. 540/R-04/004.

U.S. Environmental Protection Agency (EPA). 2004b. EPA Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. EPA 04-03-030.

Washington State Department of Ecology (Ecology), 1997. Analytical Methods for Petroleum Hydrocarbons. Publication No. ECY 97-602. June.

Table B-1

Measurement Quality Objectives

Ione Petroleum Contamination RI/FS
Ione, Washington

		Check Standard (LCS) %R Limits[2,3]		Matrix Spike (MS) %R Limits[3]		Surrogate Standards (SS) %R Limits[1,2,3]	MS Duplicate Samples or Lab Duplicate RPD Limits[4]		Field Duplicate Samples RPD Limits[4]	
Laboratory Analysis	Reference Method	Soil	Water	Soil	Water	Soil/Water	Soil	Water	Soil	Water
Hydrocarbon Identification	Ecology NWTPH-HCID	50%-150%	50%-150%	50%-150%	50%-150%	50%-150%	≤25%	≤25%	≤25%	≤25%
Gasoline-range Petroleum Hydrocarbons	Ecology NWTPH-Gx	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤20%	≤20%	≤20%	≤20%
Diesel- and Heavy oil-range Petroleum Hydrocarbons	Ecology NWTPH-Dx with silica gel/acid wash cleanup	50%-150%	50%-150%	50%-150%	50%-150%	50%-150%	≤25%	≤25%	≤25%	≤25%
VOCs	EPA 8260	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤20%	≤20%	≤20%	≤20%
PAHs	EPA 8270	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤30%	≤30%	≤35%	≤20%
PCBs	EPA 8082	74%-130%	40%-130%	35%-157%	50%-150%	35%-157%	≤30%	≤35%	≤35%	≤35%
Alkalinity	SM 2320B	70%-130%	70%-130%	NA	NA	NA	≤20%	≤20%	≤20%	≤20%
Sulfate/Nitrate	EPA 300 series	90%-110%	90%-110%	80%-120%	NA	NA	≤20%	≤20%	≤35%	≤20%
Metals	EPA 6000/7000 Series	80%-120%	80%-120%	75%-125%	75%-125%	70%-130%	≤20%	≤20%	≤35%	≤20%

Notes:

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

[1] Individual surrogate recoveries are compound specific

[2] Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[3] Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes

[4] RPD control limits are only applicable if the concentration are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than 2X the MRL for soils and 1X the MRL for waters.

VOCs = Volatile Organic Compounds; PAHs = polycyclic hydrocarbons; PCBs = polychlorinated biphenyls; BTEX = benzene, toluene, ethylbenzene, xylenes;
LCS = Laboratory Control Sample; MS/MSD = Matrix Spike/Matrix Spike Duplicate; EPA = Environmental Protection Agency;RPD = Relative Percent Difference;
NA = Not Applicable

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/Table B-1.xlsx

Table B-2

Methods of Analysis and Practical Quantitation Limits (Soil)

Ione Petroleum Contamination RI/FS
Ione, Washington

Analyte	Analytical Method	Practical Quantitation Limit (mg/kg)	MTCA Method A Cleanup Level (mg/kg)
Total Petroleum Hydrocarbons			
TPH-Gasoline Range	NWTPH-Gx/NWTPH-HCID	2.5/25	100/30[1]
TPH - Diesel Range	NWTPH-Dx with silica gel/acid wash cleanup	5/50	2,000
TPH - Oil Range	NWTPH-Dx with silica gel/acid wash cleanup	10/100	2,000
Volatile Organic Compounds			
Benzene	EPA 8260	0.0125	0.03
Toluene	EPA 8260	0.0125	7
Ethylbenzene	EPA 8260	0.0125	6
M+P Xylene	EPA 8260	0.0375	9[2]
O-Xylene	EPA 8260	0.0375	9[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260	0.0125	0.1
1,2-Dichloroethane (EDC)	EPA 8260	0.0125	
1,2-Dibromoethane (EDB)	EPA 8260/8260B-SIM	0.0125/0.002	0.005
Naphthalene	EPA 8260	0.0125	5
PAHs	EPA 8270	0.02	0.1 [4]
PCBs	EPA 8082	0.1	1
Metals			
Lead	EPA 6010	0.001	250

Notes:

[1] MTCA Method A cleanup level for gasoline-range hydrocarbons is 100 mg/kg if benzene is not detected and the total concentration of ethylenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 30 mg/kg.

[2] Cleanup level for total xylenes

[4] Cleanup level for benzo(a)pyrene; other carcinogenic PAHs must meet this value using the toxic equivalency method (WAC 173-340-708[8]).

BTEX = benzene, toluene, ethylbenzene, xylene

EPA = Envionmental Protection Agency

mg/kg = milligrams per kilogram

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/Table B-2.xlsx

Table B-3

Methods of Analysis and Target Reporting Limits (Groundwater)

Ione Petroleum Contamination
Ione, Washington

Analyte	Analytical Method	Practical Quantitation Limit (µg/l)	MTCA Method A Cleanup Levels (µg/l)
Total Petroleum Hydrocarbons			
TPH-Gasoline Range	NWTPH-Gx / NWTPH-HCID	100/250	1,000/800[1]
TPH - Diesel Range	NWTPH-Dx (with silica gel/acid wash cleanup) / NWTPH-HCID	100/630	500
TPH - Oil Range	NWTPH-Dx (with silica gel/acid wash cleanup) / NWTPH-HCID	500/630	500
Volatile Organic Compounds			
Benzene	EPA 8260	0.5	5
Toluene	EPA 8260	0.5	1,000
Ethylbenzene	EPA 8260	0.5	700
M+P Xylene	EPA 8260	1.5	1,000[2]
O-Xylene	EPA 8260	1.5	1,000[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260	0.5	20
1,2-Dichloroethane (EDC)	EPA 8260	0.5	5
1,2-Dibromoethane (EDB)	EPA 8260SIM/EPA 8011	0.01	0.01
Naphthalene	EPA 8260	0.5	160
PAHs	EPA 8270	0.05	0.1
PCBs	EPA 8082	0.05	0.1
Metals			
Lead	EPA 7421	1	15
Dissolved Iron	EPA 6020A	1	NA
Dissolved Manganese	EPA 6020A	1	NA
Wet Chemistry			
Laboratory pH (SU)	EPA 150.1	0.1	NA
Alkalintiy (mg/L)	SM 2320B	10	NA
Nitrate/Sulfate (mg/L)	EPA 300.1	0.1	NA

Notes:

[1]MTCA Method A cleanup level for gasoline-range petroleum hydrocarbons is 1,000 µg/l if benzene is not detected and the total concentrations of ethylbenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 800 µg/l.

[2]Cleanup level for total xylenes

[3]Practical quantitation limit (PQL) based on information provided by by Anatek Labs, PQL also depend on concentrations of contaminants and dilutions required in order to analyze samples

BTEX = benzene, toluene, ethylbenzene, xylene

EPA = Environmental Protection Agency

µg/l = micrograms per liter

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/Table B-3.xlsx

Table B-4

Test Methods, Sample Containers, Preservation and Holding Time

Ione Petroleum Contamination

Ione, Washington

		Soil				Groundwater			
Analysis	**Method**	**Minimum Sample Size**	**Sample Containers**	**Sample Preservation**	**Holding Times**	**Minimum Sample Size**	**Sample Containers**	**Sample Preservation**	**Holding Times**
Hydrocarbon Identification	NWTPH-HCID	100 g	8 or 16 oz amber glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 28 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4 C, HCl to pH < 2	14 days to extraction 40 days from extraction to analysis
Gasoline-Range Hydrocarbons	NWTPH-Gx	100 g	8 or 16 oz amber glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 28 days from extraction to analysis	120 mL	3 - 40 mL VOA Vials	HCl - pH<2	14 days preserved 7 days unpreserved
Diesel- and Oil-Range Hydrocarbons	Ecology NWTPH-Dx with silica gel/acid wash cleanup	100 g	8 or 16 oz amber glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 28 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4 C, HCl to pH < 2	14 days to extraction 28 days from extraction to analysis
VOCs	EPA 8260	100 g	4 or 8 oz glass widemouth with Teflon-lined lid and 5035 kit with methanol preserved vial and two dry vials	Cool 4°C	48 hours to freeze samples in laboratory then 14 days	120 mL	3 - 40 mL VOA Vials	HCl - pH<2	14 days preserved 7 days unpreserved
EDB	EPA 8011	-	-	-	-	120 mL	1 - 40 mL VOA Vial	HCl - pH<2	14 days preserved, 7 days unpreserved
Lead	EPA 6000/7000 Series	100 g	4 or 8 oz glass widemouth with Teflon-lined lid	Cool 4°C	180 days	500 mL	1 L poly bottle	HNO_3 - pH<2 (Dissolved metals preserved after filtration)	180 days
Alkalinity	SM 2320B	NA	NA	NA	NA	250 mL	250 mL poly bottle	Cool 4 C	14 days
Nitrate/Sulfate	EPA 300.0	NA	NA	NA	NA	125 mL	125 mL poly bottle	Cool 4 C	48 hours for nitrate/28 days for sulfate

Analysis	Method	Soil				Groundwater			
		Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
cPAHs and Naphthalenes	EPA 8270SIM	NA	NA	NA	NA	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	7 days to extraction 40 days from extraction to analysis
Metals (Diss. Mn, Fe)	EPA 6010/6020	NA	NA	NA	NA	250 mL	250 mL poly bottle	HNO_3 - pH<2 (Dissolved metals preserved after filtration)	180 days (28 days for Mercury)
pH	EPA 150.1	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Holding Times are based on elapsed time from date of collection

* For both soil and water the Gx and BTEX can be combined and do not require separate containers

BTEX = benzene, toluene, ethylbenzene, xylenes

VOCs = Volatile organic compounds (to include naphthalene, ethylene dibromide (EDB), 1,2-dichloroethane (EDC), and methyl tert butyl ether (MTBE).

- = no information available

EPA = Environmental Protection Agency; HCl = Hydrochloric Acid; HNO3 = Nitric Acid; PAHS = polycyclic aromatic hydrocarbons

Diss. Mn, Fe = Dissolved Manganese and Iron

oz = ounce; mL = milliter; L = liter; g = gram

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/Table B-4.xlsx

Table B-5

Quality Control Samples Type and Frequency

Ione Petroleum Contamination

Ione, Washington

Parameter	Field QC		Laboratory QC			
	Field Duplicates	**Trip Blanks**	**Method Blanks**	**LCS**	**MS / MSD**	**Lab Duplicates**
Hydrocarbon Identification	1/20 groundwater samples and 1/20 for soil samples	NA	1/batch	1/batch	NA	1/batch
Gasoline Range Hydrocarbons	1/20 groundwater samples and 1/20 for soil samples	NA	1/batch	1/batch	NA	1/batch
Diesel and Oil Range Hydrocarbons with silica gel/acid wash cleanup	1/20 groundwater samples and 1/20 soil samples	NA	1/batch	1/batch	NA	1/batch
BTEX	1/20 groundwater samples	1/cooler	1/batch	1/batch	1 set/batch	NA
VOCs	1/20 groundwater samples	1/cooler	1/batch	1/batch	1 set/batch	NA
Lead	1/20 groundwater samples	NA	1/batch	1/batch	1 MS/batch	1/batch
Alkalinity	None	NA	1/batch	1/batch	NA	NA
Nitrate/Sulfate	None	NA	1/batch	1/batch	1/batch	1/batch
PCBs	1/20 groundwater samples	NA	1/batch	1/batch	1 set/batch	1/batch
cPAHs	1/20 groundwater samples	NA	1/batch	1/batch	1 set/batch	NA
Metals (Diss. Fe, Mn)	None	NA	1/batch	1/batch	1 MS/batch	1/batch
pH	None	NA	1/batch	1/batch	1 MS/batch	1/batch

Note:

An analytical lot or batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/ MSD (or MS and lab duplicate).

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

PCB = polychlorinated biphenyls

cPAH = carcinogenic polycyclic aromatic hydrocarbns

Diss. Fe, Mn = Dissolved iron and manganese

VOCs = Volatile organic compounds (to include naphthlalene, ethylene dibromide (EDB), 1,2-dichloroethane (EDC), and methyl tert butyl ether (MTBE)).

BTEX = benzene, toluene, ethylbenzene, xylenes

https://projects.geoengineers.com/sites/0050405802/Final/RI-FS Work Plan/Table B-5.xlsx

APPENDIX C
Health and Safety Plan

Site Health and Safety Plan

Ione Petroleum Contamination Project
Ione, Washington

November 22, 2011

GeoEngineers

523 East 2nd Avenue
Spokane, Washington 99202
509.363.3125

Table of Contents

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
Ione Petroleum Contamination Project
File No. 0504-058-02

This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on-site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual.

Liability Clause: If requested by subcontractors, this site safety plan may be provided for informational purposes only. In this case, Form C-3 shall be signed by the subcontractor. Please be advised that this Site Safety Plan is intended for use by GeoEngineers Employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this Site Safety Plan. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by them.

GENERAL PROJECT INFORMATION

Project Name:	*Ione Petroleum Contamination Project*
Project Number:	0504-058-02
Type of Project:	Environmental Site Assessment
Start/Completion:	November 1, 2011 through June 30, 2012
Subcontractors:	Geophysical surveyors, drillers, surveyors, analytical laboratory, IDW transporters

WORK PLAN

Please refer to **Section 4, Remedial Investigation** of the Work Plan.

List of Field Activities

Check the activities to be completed during the project

X	Site reconnaissance	X	Field Screening of Soil Samples
X	Exploratory Borings	X	Vapor Measurements
	Construction Monitoring	X	Groundwater Sampling
X	Monitoring Well Installation		Soil Stockpile Testing
X	Monitoring Well Development		Remedial Excavation
X	Soil Sample Collection		UST Removal Monitoring
X	Remedial Pilot tests	X	Geophysical Survey

LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hour)	Date of 8-Hour Refresher Training	Date of HAZWOPER Supervisor Training	First Aid/ CPR	Date of Other Trainings	Date of Respirator Fit Test
Scott Lathen	5/21/07	2/16/11		11/18/09		2/18/11
Kevin Randall	4/1/07	3/16/11		10/07/10		2/18/11
Katie Hall				2/23/11		Needs respirator fit test and baseline medical
Dave Thompson	3/30/00	2/16/11		11/18/09		Needs respirator fit test and baseline medical

Notes:

CPR – cardiopulmonary resuscitation

HAZWOPER – hazardous waste operations and emergency response

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Dave Lauder	509.363.3125
2	HAZWOPER Supervisor	Bruce Williams	509.363.3125
3	Field Engineer/Geologist	Scott Lathen	251-5239
		Kevin Randall	435-764-7169
4	Site Safety and Health Supervisor	Kevin Randall	435-764-7169
5	Client Assigned Site Supervisor		
6	Health and Safety Program Manager	Wayne Adams	253-383-4940
N/A	Subcontractor(s)	TBD	
	Current Owner		

EMERGENCY INFORMATION

Hospital Name and Address:

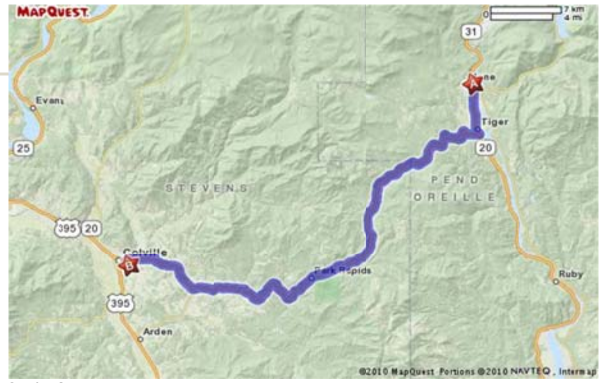
Mount Carmel Hospital
982 E Columbia
Colville, WA 99114
(509) 685-510

Phone Numbers (Hospital ER): Phone: (509) 685-5100

Distance:

Route to Hospital:

Start out going West on Main Street Toward N 1st Ave
Turn **LEFT** onto **S 2ND AVE / WA-31**.
Continue to follow **WA-31**.
Turn right on WA-20
Turn left onto N Alder Street
Turn right onto E Birch Ave
Turn Left onto E Columbia Ave
Arrive 982 E Columbia Avenue on right



Ambulance: 9-1-1
Poison Control: Other (800) 732-6985
Police: 9-1-1
Fire: 9-1-1
Location of Nearest Telephone: Cell phones are carried by field personnel.
Nearest Fire Extinguisher: Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit: Located in the GeoEngineers vehicle on-site.

Standard Emergency Procedures

Get help

- send another worker to phone 9-1-1 (if necessary)
- as soon as feasible, notify GeoEngineers' PM

Reduce risk to injured person

- turn off equipment
- move person from injury location (if in life-threatening situation only)
- keep person warm
- perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary) -

- by ambulance (if necessary) or GeoEngineers vehicle
- stay with person at medical facility
- keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation

HAZARD ANALYSIS

- Total petroleum hydrocarbons, gasoline, diesel, volatile organic hydrocarbons, and lead
- Drill rig operation hazards

Note: A hazard assessment will be completed at every site prior to beginning field activities. Updates will be included in the daily log. This list is a summary of hazards listed on the form.

Physical Hazards

X	Drill rigs
X	Utilities/ utility locate

- Utility checklist will be completed as required for the location to prevent drilling into utilities.
- Field personnel will coordinate activities with appropriate contacts at the Ione Airport. Approximate flagging and lighting will be attached to drilling equipment during drilling activities at the airport.
- Work areas will be marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware at all times of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet depending on the client and the use of a safety watch. Note: If it is later determined that overhead lines are a hazard on this job site a copy the overhead lines safety section from the HASP Supplemental document will be attached.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/Division of Occupational Safety and Health (DOSH) regulations and the GeoEngineers Health and Safety Program.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

Engineering Controls

_________ Trench shoring (1:1 slope for Type B Soils)
_________ Location work spaces upwind/wind direction monitoring
_________ Other soil covers (as needed)
_________ Other (specify) ____

Chemical Hazards

Chemical Hazards (Potentially Present at Site)

SUBSTANCE	PATHWAYS
Aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylenes [BETX])	ingestion, inhalation, and direct contact
Gasoline	ingestion, inhalation, and direct contact
Diesel fuel	ingestion, inhalation, and direct contact

Specific Chemical Hazards and Exposures (Potentially Present at Site)

COMPOUND/ DESCRIPTION	EXPOSURE LIMITS/IDLH	EXPOSURE ROUTES	SYMPTOMS/HEALTH EFFECTS
Benzene	OSHA PEL 1 ppm Short term: 5 ppm ACGIH PEL 0.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m^3 for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Gasoline (Unleaded) — clear liquid with a characteristic odor	PEL 300 ppm TLV 300 ppm STEL 500 ppm	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis

Notes:
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
mg/m^3 = milligrams per cubic meter
TWA = time-weighted average (Over 8 hrs.)

PEL = permissible exposure limit
TLV = threshold limit value (over 10 hrs)
STEL = short-term exposure limit (15 min)
ppm = parts per million

Biological Hazards and Procedures

Y/N	Hazard	Procedures
	Poison Ivy or other vegetation	
X	Insects or snakes	Work gloves and long sleeve shirt
X	Used hypodermic needs or other infectious hazards	Do not pick up or contact
	Others:	

Additional Hazards

Update in Daily Report. Include evaluation of:

- *Physical Hazards* (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)
- *Biological Hazards* (snakes, spiders, other animals, discarded needles, poison ivy, pollen, bees/wasps and others present)

AIR MONITORING PLAN

Work upwind if at all possible.

Check instrumentation to be used:

X Photoionization Detector (PID)

CHECK MONITORING FREQUENCY/LOCATIONS AND TYPE (SPECIFY: WORK SPACE, BOREHOLE, BREATHING ZONE):

	15 minutes – continuous during soil disturbance activities or handling samples
	30 minutes – continuous during soil disturbance activities or handling samples
X	Hourly (in breathing zone during excavations, drilling, sampling)

Additional personal air monitoring for specific chemical exposure:

Action levels:

- The workspace will be monitored using a PID. These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area. The PID can be tuned to read chemicals specifically if there are not multiple contaminants on-site. It can be tuned to detect one chemical with the response factor entered into the equipment, but the PID picks up all VOCs present. The ionization potential (IP) of the chemical has to be less than the PID lamp (11.7 / 10.6eV), and the PID does not detect methane. The ppm readout on the instrument is relative to the IP of isobutylene (calibration gas), so conversion must be made in order to estimate ppm of the chemical on-site.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes and in event of odors	5 to 25 ppm in breathing zone	Upgrade to Level C PPE
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Manager for guidance.

Notes:

PID – photoionization detector

PPE – personal protective equipment

ppm – parts per million

SITE CONTROL PLAN

Work zones will be considered to be within 50 feet of the drill rig. Employees should work upwind of the machinery if possible. To the extent practicable, use the buddy system. Do not approach heavy equipment unless you are sure the operator sees you and has indicated it is safe to approach. All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during each morning's safety tailgate meeting (drill rig shutoff switch, location of fire extinguishers, cell phone numbers etc.). For medical assistance, see Section 3.0 above.

A contamination reduction zone should be established for personnel before leaving the site or before breaking for lunches etc. The zone should consist of garbage bags into which used PPE should be disposed. Personnel should wash hands at the site before eating or leaving the site.

Traffic or Vehicle Access Control Plans

Site personnel will be instructed to stop and look both ways before exiting the site and entering the access road.

Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-site, a buddy system can be arranged with subcontractor/contractor personnel. If this is not possible, periodic communication should be established between field personnel at GeoEngineers office. Field personnel should inform PM before leaving site.

Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, you should consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.
2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right: or I understand.
5. Thumbs down: No, negative.

Decontamination Procedures

Decontamination consists of removing outer protective Tyvek clothing, if required, and washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. Inner gloves will then be removed, and respirator, if required, hands and face will be washed in either a portable wash station or a bathroom facility in the support zone. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the site.

Waste Disposal or Storage

PPE disposal (specify): Used PPE to be placed in on-site drums pending characterization and disposal.

Drill cutting/excavated sediment disposal or storage:

X On-site, pending analysis and further action

_____ Secured (list method) ____

_____ Other (describe destination, responsible parties): ______________________________

_____

PERSONAL PROTECTIVE EQUIPMENT

After the initial and/or daily hazard assessment has been completed the appropriate protective PPE will be selected to ensure worker safety. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations.

Site activities include handling and sampling solid subsurface material (material may potentially be saturated with groundwater). Depth-to-groundwater measurements will be performed as well. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls, heavy equipment, and exposure.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE unless a higher level of protection is required will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Check applicable personal protection gear to be used:

__X__ Hardhat (if overhead hazards, or client requests)
__X__ Steel-toed boots (if crushing hazards are a potential or if client requests)
__X__ Safety glasses (if dust, particles, or other hazards are present or client requests)
__X__ Hearing protection (if it is difficult to carry on a conversation 3 feet away)
_____ Rubber boots (if wet conditions)

Gloves (specify):

__X__ Nitrile

Protective clothing:

_____ Tyvek (if dry conditions are encountered, Tyvek is sufficient)
_____ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)
__X__ Cotton
__X__ Rain gear (as needed)
__X__ Layered warm clothing (as needed)

Inhalation hazard protection:

__X__ Level D
_____ Level C (respirators with organic vapor/HEPA or P100 filters)

8.1 PPE Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

TABLE 1. HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

Keeping workers hydrated in a hot outdoor environment requires that more water be provided than at other times of the year. GeoEngineers is prepared to supply at least one quart of drinking water per employee per hour. When employee exposure is at or above an applicable temperature listed in Table 1, PMs shall ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

Emergency Response

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- Wind indicators visible to all on-site personnel should be provided by the Site Safety and Health Supervisor to indicate possible routes for upwind escape. Alternatively, the Site Safety and Health Supervisor may ask on-site personnel to observe the wind direction periodically during site activities.

- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

Sampling, Managing and Handling Drums and Containers

Drums and containers shall meet the appropriate DOT, OSHA and EPA regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for HAZWOPER projects:

- Field Log
- Health and Safety Plan acknowledgment by GeoEngineers employees (Form C-2)
- Contractors Health and Safety Plan Disclaimer (Form C-3)
- Conditional forms available at GeoEngineers office: Accident Report

NOTE: The Field Report is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

APPROVALS

1. Plan Prepared	______________________ Signature	______________ Date
2. Plan Approval	______________________ PM Signature	______________ Date
3. Health & Safety Officer	Wayne Adams Health & Safety Program Manager	______________ Date

FORM C-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
IONE PETROLEUM CONTAMINATION PROJECT
FILE NO. 0504-058-02

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name	Signature	Date

FORM C-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
IONE PETROLEUM CONTAMINATION PROJECT
FILE NO. 0504-058-02

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date

Have we delivered World Class Client Service?

Please let us know by visiting **www. geoengineers.com/feedback**.

GeoEngineers